

TECHNOLOGY

Vol. 3 Issue 1
October 2017

NOW



ABHIWARG

A special report on Blockchain and TeamIndus

Space Travel gets real · Beyond the dark matter · Breakthroughs in flight · Meet the science skeptics
A new look on Solar panel technology · Dr. Nicholas Ulrich on the Theory of Relativity



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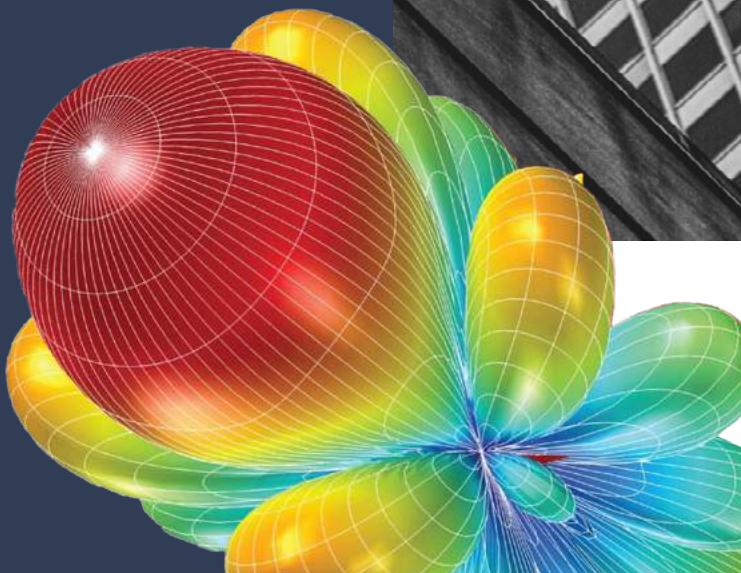
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DEAN'S MESSAGE



DR. LOCHAN JOLLY | DEAN SSW

Zephyr as rightly said by one of the students during inauguration is a platform provided by TCET where the experience of organizing team is similar to putting stones into stone mixer which makes lot of noise and in the end what comes out are polished stones.

Zephyr is a platform where students of all the branches come together, they fight, indulge in argument, discussions and finally what comes out is the “Mega event” where everything is in its best form along with the team which is polished with many skills like team building, leadership, event organizing, people management, crowd management etc.. All these skills are very important for the overall development of a student and make them different with an edge above others.

After inauguration I had a chance to sit for one of the seminars by Mr. Suhas Naik, Director, Nehru Science Planetarium, and Worli. One beautiful question he asked was why there are only seven days in a week. Most of the student answers were “This is what we were taught by our teacher and I never questioned my teacher because I trusted her”. The answer which was given by Mr. Suhas was an eye opener for me too. He answered that it was because our forefathers had discovered only five planets at that time so five days are after the name of five planets and the remaining two days are after Sun and Moon. He asked students to thank their ancestors that they did not discover Uranus Neptune and Pluto at that time otherwise the week would have been 11 days long. Isn't it amazing that without so many high end instruments that we have today our ancestors could discover planets and other celestial bodies. This is because they had the urge to know more and question everything and find the source of its existence which helped them to formulated theories which are now proved experimentally.

This ability to question is decaying slowly because human brain is already loaded with so much information that he does not have time to experiment and formulate new theories. This ability to question leads to development of scientific temperament which is missing in today's youth.

!

He insisted that one visit to temples of science like Nehru planetarium, BARC, GMRT, ISRO center should be arranged every year because it will not only motivate students but also give directions to them to become scientists in such esteemed organization. He said the students have immense potential and if they visit such centers may be some of them may be motivated to be like Vikram Sarabhai and Homi Bhabha.

His talk was so engaging that students wanted him to continue but every good thing has to come to an end. I came out of the lecture room with high motivation to provide my students a platform which enhances their scientific temperament and motivates them to serve their country as research scientists. I hope with my team of professional body we will at least arrange one visit to these temples of science next semester.

Amen

Take care and Stay blessed

HOD'S MESSAGE



DR. VINITKUMAR DONGRE | HOD, EXTC DEPT

Someone once said," Teamwork is the ability to work together towards a common vision." It is the zeal and enthusiasm of the faculty members & students that ensured the launch of our Department Magazine. I would like to thank everyone who contributed towards the magazine some way or the other.

The world is currently working on two main words, these are 'change' and 'adapt'. Every other day a new discovery is made and these are changing the course of human life. With these changes, there comes a necessity to adapt with them. The vision of this magazine is very simple, to make the readers aware of the trending technologies and the scenario of the industry as a whole. The articles in the magazine cover a wide range of technical topics, a few of them being by industry experts.

Abhivarg is acting as a platform for students to showcase their talents. The magazine gives an idea of all the department activities going on throughout the academic year. A section, like always has been dedicated for acknowledging the individuals who actually made a difference by participating in different extra and co-curricular activities. A reader may also find some tips given by individuals who have cracked tough competitive exams. The magazine has blend of articles which will surely enlighten students and give them the inspiration to do something extraordinary in life.

Concluding I'd like to say that I'm sure that this edition will inspire the readers and help them achieve the so called 'impossible feats'.

!



FACULTY'S MESSAGE

MS. MEGHA GUPTA | FACULTY INCHARGE

Hello Friends,

It's 2017 now and by 2020 or earlier we all can expect Smart India: bullet train running all the way, metro-web in India, every citizen doing online transaction and what not!

All this is possible only because of the technology!!

It is important to have goal for yourselves in life. Once you have your goals set, work hard towards achieving that goal and soon will realize that you have actually achieved what you want. So, here in we have Abhivarg 3.1 with all the technological combinations to serve every student with knowledge beam. This edition includes alumni input, faculty involvement, industry requirement and of course our students contributions.

Every time we are trying to make our magazine better and better, your suggestions are always welcome!

!

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The Blossoming of the Blockchain

THERE WILL BE A BLOCKCHAIN IN YOUR FUTURE, WHETHER YOU LIKE IT OR NOT

Blockchain

WHEN BITCOIN WAS unleashed on the world eight years ago, it filled a specific need, for a digital currency that wasn't under anybody's control. But it wasn't long before people realized the technology behind Bitcoin—the blockchain—could do much more than record monetary transactions. • That realization has lately blossomed into a dazzling and often bewildering array of startup companies, initiatives, corporate alliances, and research projects. Collectively, they're facing a question that will have an enormous impact: What can the blockchain do better than conventional databases? Billions of dollars will hinge on the answer in the next several years. • Can the technology link neighborhood buyers and sellers of rooftop-generated solar electricity? Can it keep track of property titles, academic transcripts, energy market credits, and state licenses for health care providers? Can it check the status of airline flights—and make reparations to weary travelers if their flights are delayed? We'll soon see: All of those proposals have been embodied

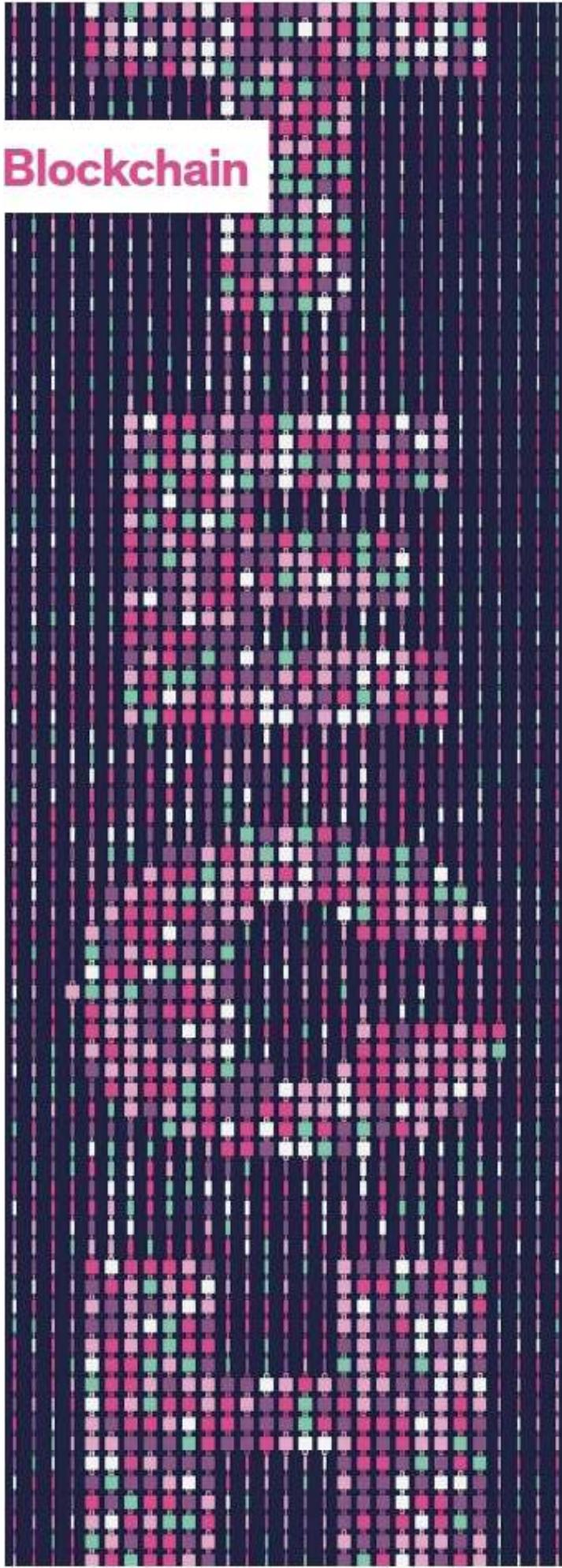
in blockchain-based agreements called smart contracts, which are being tested right now. • The schemes aren't limited to startup-level experiments, either. Remember credit-default swaps? Those financial instruments that nearly crashed the global economy a decade ago? The world's biggest clearinghouse for these contracts thinks it can make them more secure by switching them to a blockchain-like system in 2018. If the plan works, US \$11 trillion will be moving through this system every year. • The future may belong to smart contracts, but for now Bitcoin is still the biggest user of blockchain technology, and it's a major driver of innovation in computing hardware. Most of that computing is dedicated to mining—the process that runs the network and rewards those who do the work with newly minted bitcoins. That computing is done on purpose-built machines packed with custom chips. To describe it firsthand, *IEEE Spectrum* sent a reporter to the "mines" of Inner Mongolia, where one of the world's

Illustrations by
**MARIO
DE MEYER**

largest concentrations of powerful computers makes millions for its owners. • These machines have been built in the parched sands of Mongolia for one reason: cheap electricity. Each day, a single server slurps a city's-worth of energy to perform a fraction of the transactions that major credit networks accomplish. But there are other reasons to run a cryptocurrency, and Intel thinks it's found one. Not coincidentally, the technique has the proprietary workings of its own processor. Enthusiasts are sure that blockchain technology could take over the world. To realists it could be just a solution to a few important problems. Regardless of who's right, there are going to be blockchain technologies in your life. Whether they're in the background or the foreground, you should understand how they work, and what could happen if they don't.

—Morgen E. Peck & Samu

Blockchain



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OCT 2017 | INTERNATIONAL | SPECTRUM SCIENCE

Blockchains: How They Work and Why They'll Change the World

By MORGAN E. PECK





Blockchain World

BITCOIN WAS HATED as an act of defiance. Unleashed in the wake of the Great Recession, the cryptocurrency was touted by its early champions as an antidote to the inequities and corruption of the traditional financial system. They cherished the belief that as this parallel currency took off, it would compete with and ultimately dismantle the institutions that had brought about the crisis. Bitcoin's unofficial catchphrase, "In cryptography we trust," left no doubt about who was to blame: It was the middlemen, the bankers, the "trusted" third parties who actually couldn't be trusted. These humans simply got in the way of other humans, skimming profits and complicating transactions.

Bitcoin sought to replace the services provided by these intermediaries with cryptography and code. When you use a check to pay your mortgage, a series of agreements occur in the background between your financial institution and others, enabling money to go from your account to someone else's. Your bank can vouch that your money is good because it keeps records indicating where every penny in your account

came from, and when.

Bitcoin and other cryptocurrencies replace those background agreements and transactions with software—specifically, a distributed and secure database called a blockchain. The process with which the ownership of a Bitcoin token will pass from one person to another—wherever they are, no matter what government they live under—is entrusted to a bunch of computers.

Now, eight years after the first blockchain was built, people are trying to apply it to procedures and processes beyond merely the moving of money with varying degrees of success. In effect, they're asking, What other agreements can a blockchain automate? What other middlemen can blockchain technology retire?

Can a blockchain find people offering rides, link them up with people who are trying to go somewhere, and give the two parties a transparent platform for payment? Can a blockchain act as



PEOPLE Satoshi Nakamoto

If the blockchain were a religion, Satoshi would be God. This anonymous hacker is responsible for writing the Bitcoin white paper, releasing the first Bitcoin code, and inspiring legions of blockchain developers. Many have sought to reveal his/her/their identity, but to this day that information remains secret.

a repository and a replay platform for TV shows, movies, and other digital media while keeping track of royalties and paying content creators? Can a blockchain check the status of airline flights and pay travelers a previously agreed upon amount if their planes don't take off on time?

If so, then blockchain technology could get rid of Uber, Netflix, and every flight-insurance provider on the market.

Those three proposed applications aren't hypothetical—they're just a few of the things now being built on Ethereum, a blockchain platform that remotely executes software on a distributed computer system called the Ethereum Virtual Machine. In the blockchain universe, Ethereum, which has its own cryptocurrency, called ethers, is by far the project that is most open to experimentation. But zoom out and a diverse collection of potentially disruptive innovators floods into view. New groups are pitching blockchain schemes almost daily. And the tech world's titans don't plan to miss out: Microsoft is offering its customers tools to experiment with blockchain applications on its Azure cloud. IBM, Intel, and others are collaborating on an open-source blockchain initiative called Hyperledger, which aims to

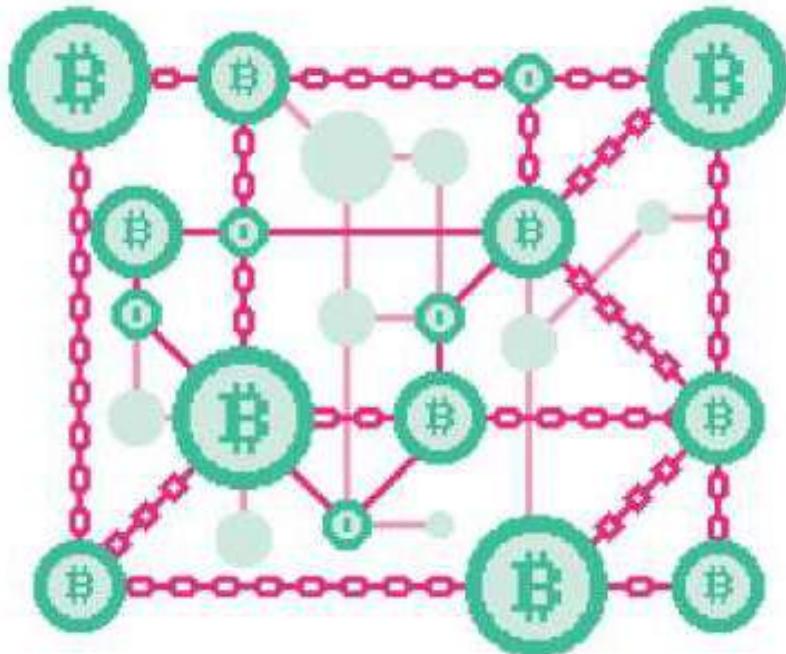
provide the bones for business-oriented blockchains. Meanwhile, many of the largest banks—the very institutions that blockchain pioneers were trying to neutralize—have cobbled together their own version of the technology in an attempt to stay ahead of the curve. And even Bitcoin, which runs on the first and most successful blockchain, is being retrofitted for applications its designers never dreamed of.

Pretty much without exception, these new blockchain projects remain unencumbered by actual mass adoption. No single blockchain concept or strategy has yet revolutionized any industry. Bitcoin itself is used by no more than 375,000 people in the entire world on any given day, according to Blockchain.info. But the investor dollars are pouring in, and proposals are floating and colliding like tectonic plates on a hot undercurrent of hype and intrigue.

When the mantle cools, which blockchain platforms will persist, and which will slowly sink back beneath the surface? To make any kind of prediction, you've got to understand what a blockchain really is and what it does. The place to start, logically enough, is with Bitcoin.

HACKS & HEISTS

2016: Shortly after the Distributed Autonomous Organization debuted on the Ethereum blockchain, someone siphoned US \$60 million in ethers from this autonomous version of a venture-capital fund. In a bold move, the Ethereum developers rewrote the blockchain code to return the money.



How Do Blockchains Work? The Bitcoin Example

In 2009, an anonymous hacker (or group of hackers) going by the name of Satoshi Nakamoto unveiled the first entirely digital currency. The technology worked on the principle that, at its foundation, money is just an accounting tool—a method for abstracting value, assigning ownership, and providing a means for transacting.

Cash is the historic means of accomplishing these chores. Simply possessing the physical tokens—bills, coins—equals ownership, and it's up to the individuals to negotiate transactions among themselves in person. As long as cash is sufficiently difficult to replicate, there is no need for a complete accounting of who owns what portions of the money supply, or for the details of who the various holders were of a single \$50 bill going back to when it was printed.

However, if you could piece together a running tabulation of who held every bill, then suddenly the physical representations would become unneces-

sary. Banks and payment processors have already partially sublimated our physical currency into digital records by tracking and processing transactions within their closed systems.

Bitcoin completed the transformation by creating a single, universally accessible digital ledger, called a blockchain. It's called a chain because changes can be made only by adding new information to the end. Each new addition, or block, contains a set of new transactions—a couple of thousand in late August—that reference previous transactions in the chain. So if Helmut pays Hendrieke a bitcoin, that transaction appears at the end of the chain, and it points to the transaction in which Helmut was previously paid that coin by Helche, which in turn points to the time before that when Helche was paid the coin by Halfrid, and so on.

Bitcoin's blockchain, unlike the ledgers maintained by traditional financial institutions, is replicated on networked computers around the globe and is accessible to anyone with a computer and an Internet connection. A class of participants on this network, called miners, is responsible for detecting transaction requests from users, aggregating them, validating them, and adding them to the blockchain as new blocks.

Validation entails both verifying that Helmut actually owns the bitcoins in his transaction and that he has not yet spent them elsewhere. Ownership on the Bitcoin blockchain is determined by a

pair of cryptographic keys. The first, called the public key, resides in the blockchain for anyone to see. The second is called the private key, and its owner keeps it safe from view. The two keys have a special mathematical relationship that makes them useful for signing digital messages. Here's how that happens: Helmut takes a message, combines it with his private key, does some calculations, and ends up with a long number. Anyone who has the original message and knows the corresponding public key can then do some calculations of their own to prove that the long number was in fact created with the private key.

In Bitcoin, transactions are signed with private keys that correspond to the public key most recently associated with coins being spent. And when the transaction gets processed, those coins get assigned a new public key.

But the main role of miners is to ensure the irreversibility of new transactions, making them final and tamperproof. The method they use for doing so is thought to be the most significant contribution that Satoshi Nakamoto—whoever he or she is—made to the field of computer science.

Blockchain World

Ensuring irreversibility becomes necessary only when you invite anyone and everyone to take part in the curation of a ledger. If the Bitcoin blockchain were being run by a single bank with a set of known validators operating under a single jurisdiction, then enforcing the finality of transactions would be as simple as writing it into company policy and punishing anyone who didn't follow the rules.

But in Bitcoin, there is no central authority to enforce the rules. Miners are operating anonymously all over the world—in China, Eastern Europe, Iceland, Venezuela—driven by a diversity of cultures and bound by different legal systems and regulatory obligations. Therefore, there is no way of holding them accountable. The Bitcoin code alone must suffice. To ensure proper behavior, Bitcoin uses a scheme called proof of work.

How Does Proof of Work Secure Blockchains?

First, let's be a bit more specific about the problem that public blockchains are trying to solve with proof of work. In this open peer-to-peer network, miners—whoever is running the bitcoin code—are receiving news of transactions and gathering them to create a new block. They are doing so in competition with one another, because the first to create a valid block gets paid (in bitcoins) for that service. In this situation, what's to stop a miner from deleting previous transactions in the blockchain after they have been added? While this type of reorganization does not enable a miner to steal coins, it could be used to spend the same coins multiple times. For instance, I could go to some unwitting merchant and pay for a cup of coffee with bitcoins. If I were a miner, I could later go into my version of the Bitcoin blockchain, remove the transaction, and send the modified chain out to my peers, thereby redepositing the bitcoins I spent back into my own pocket.

Therefore, it is crucial that all miners on the Bitcoin network have the same copy of the blockchain, and that all changes and transactions are irreversible. "The fact that they're all playing the same music is very important for the music to sound good," says Stefan Thomas, a developer for Ripple, a bitcoin-inspired digital currency.

To keep all the musicians in sync, the Bitcoin mining software makes it very expensive—in terms of computing power and, therefore, electricity—to add new blocks and even more expensive to change blocks further back in the record.

Any miner trying to add a new block must also provide a cryptographic proof to go along with it. In order to produce the proof, the miner digests the new block through multiple rounds of a hash function—a computation that takes a chunk of data of arbitrary length and reduces it to a meaningless alphanumeric string with a fixed length, called a hash. To make the process more challenging, the blockchain algorithm demands that the resulting hash start with a certain number of zeroes. The difficulty comes from the fact that there is no way to predict what hash any given data set will spit out, and so miners run the computation over and over on their validated blocks, each time inserting a random number into the data set. When that number is changed, a new hash results. When at last the mine get the correct number of zeroes, they're done.

The first miner who finds a satisfactory hash then announces the new block to the other miners, who check it and append it to the full version of the blockchain that they are harboring on their computers. For performing all this work, miners collect a reward of newly minted bitcoins as well as any mining fees, which users voluntarily tack onto their transactions in hopes of pushing to the head of the line.

Think of hashing as a way of locking the blocks on a chain. Suppose you have a lock that requires a key to close. You also have a huge pile of keys at your disposal, but you don't know which one will work. You have to try them one by one. When you finally find the correct key, you leave it in the lock so that anyone can check that it's the right fit.

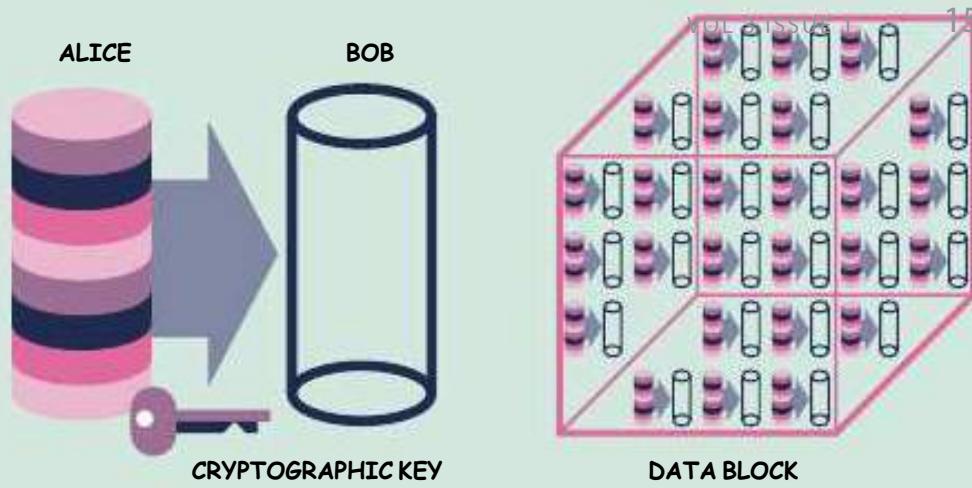
Theoretically, this work and the payoff that miners receive act as incentives for good behavior. Bitcoin miners are heavily invested in the network that they serve, both in the electricity they consume and in the hardware they buy. Therefore, the thinking goes, they should be disinclined to damage the currency in any way, including by taking any actions, such as double-spending, that might call into question the integrity of Bitcoin and devalue the currency.

Such attacks are further thwarted because the cost of changing the contents of old blocks is compounded by each new block that gets added to the chain. When a new block is made, it contains the hash of the one before it. Any changes in old blocks will result in invalid hashes for all subse-

Miners & Signers

EVERY BLOCKCHAIN

needs a way to determine who will add the next block of data. Two strategies prevail: proof of work and proof of stake. Both randomly assign the right to add new blocks. But proof of work gives preference to those with more computing power. And proof of stake—of which there are many versions, some wildly complex—gives preference to those with more coins.

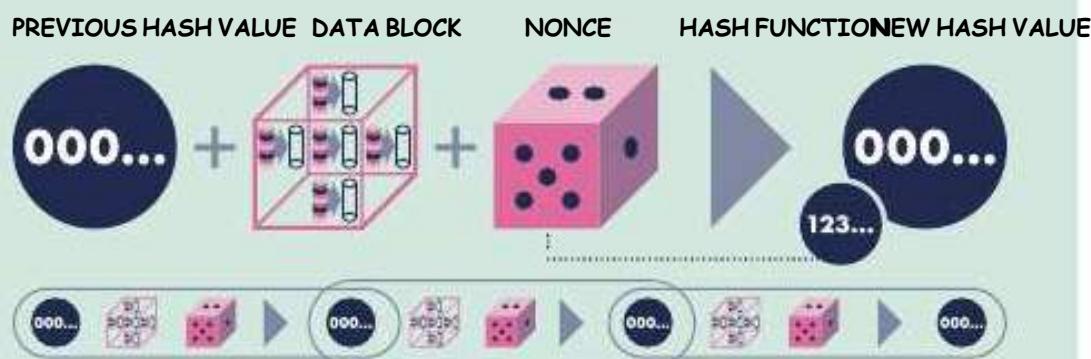


ALICE TELLS the network she wants to pay Bob. She uses a cryptographic key to digitally sign off on the transaction, proving that she owns those coins.

NETWORK OPERATORS, called miners or block signers, scoop up a bunch of transactions to validate them. They check that the digital signatures are correct and that there are enough coins for the requested transactions. Then they put those transactions into a new data block to be added to the blockchain.

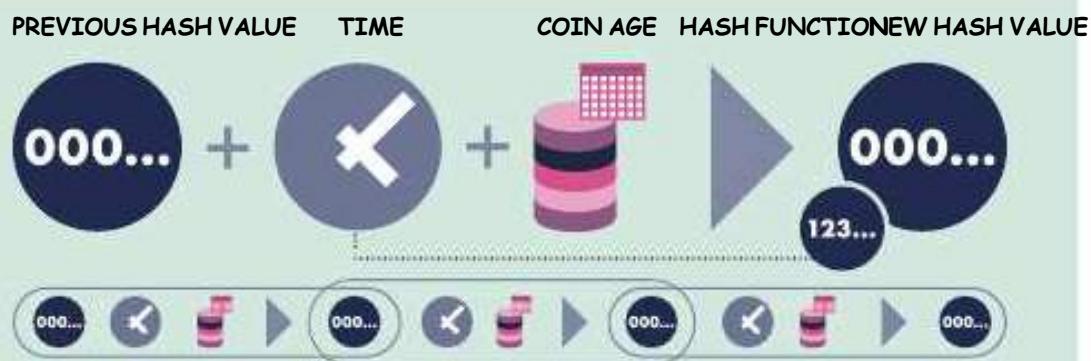
PROOF OF WORK (Bitcoin)

THE BITCOIN MINER creates a hash from a particular set of data. If the hash does not begin with a particular number of zeros, the hash function is rerun using a new random number (the nonce). Including previous blocks in every new hash compounds the difficulty of tampering with older transactions.



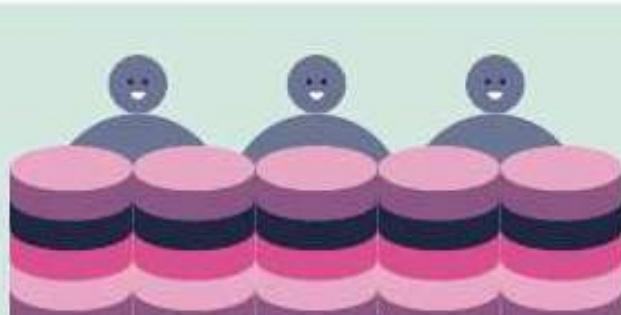
PROOF OF STAKE (Peercoin)

THE PEERCOIN BLOCK signer creates a hash from a set of data that includes coin age—a number indicating an amount of coins owned by the signer and how long they've owned them. If the hash does not begin with a particular number of zeros, the function is rerun using a new time stamp.

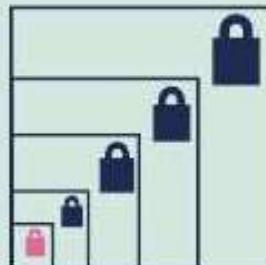


PAYING FOR SECURITY

THE FIRST MINER or block signer to get the right hash adds their version of the block of transactions to the blockchain. They also get paid in newly generated coins [left]. As more blocks are added, it becomes harder and harder to hack old transactions [right].



MINERS AND THEIR NEWLY AWARDED COINS



BOB & ALICE ...40 MINUTES LATER

Blockchain World

quent blocks. Therefore, it is impossible to insert bogus modifications into a previous block without having to repeat all the work that was performed after that block. In that lock analogy, it's as though the design for the lock at the end of the chain depends on all the locks that came before it. So changing one lock in the middle of the blockchain means having to find new keys for every lock after it.

Bitcoin "deters misbehaving parties because the damage a misbehaving party can do is bounded by how much [computational] power he has," says Emin Gün Sirer, a codirector of Cornell University's Initiative for Cryptocurrencies & Contracts (IC3).

By forcing miners to provide costly proofs and then repaying them for their work, Satoshi created the first viable peer-to-peer digital currency. But he also solved a more general problem that had vexed computer scientists for decades—consensus. Bitcoin, which has never been knocked off-line for any substantial period of time over the past eight years, reliably incentivizes a network of potentially dishonest participants to process transactions and secure a single version of those events. The result is an ever-growing chain of data that anyone with an Internet connection can inspect and add to, and one that has proven remarkably impervious to attack.



Although these ideas were around from Bitcoin's inception, it would take several years and a 19-year-old computer science student in Toronto to make them popular. In 2013, Vitalik Buterin devised an entirely new blockchain called Ethereum. The goal of Ethereum was to take what Bitcoin had done for currency and expand it into other realms.

Like Bitcoin, Ethereum uses a blockchain that has its own currency, called ethers. Unlike Bitcoin, Ethereum uses transactions that are miniprograms, called smart contracts, that can be written with an unlimited amount of complexity. Users can then interact with programs by sending them transactions loaded with instructions, which miners then process.

In practice, this means that anyone can embed a software program into a transaction and know that it will remain there, unaltered and accessible for the life span of the blockchain. Theoretically, with Ethereum, you could replace Facebook, Twitter, Uber, Spotify, or any other digital service with new versions that would be invulnerable to censors and transparent in their policies, and which could operate indefinitely in the absence of the people who created them.

"The amazing thing is you can put a computer program on that network...and, similar to Bitcoin, everybody on the system can agree on exactly what happened and when it happened...I think that's a profound idea," says Joseph Lubin, a founder of Ethereum, who now runs ConsenSys, a Brooklyn-based incubator for decentralized applications.

How Can You Use a Blockchain to Do Other Things?

It turns out that such a system may be useful for much more than just money. Almost as soon as Bitcoin debuted, people began imagining what other kinds of applications you could run on a blockchain if you generalized the technology. When miners validate transactions, they are really running small programs that process the data and deliver a thumbs-up or a thumbs-down on the transaction request. But what if they could run more complex programs, like the software for a social media network? And what if the blockchain were used to represent data other than simple currency transactions, like messages on an online forum?

THINGS TO DO WITH A BLOCKCHAIN

Self-Driving Cars: Cars can now drive themselves (sort of). Isn't it about time they got an allowance? The blockchain startup Oaken Innovations is looking into equipping self-driving cars with cryptocurrency wallets for minor expenses like paying tolls and buying oil changes.



What's a Permissioned Ledger?

Concurrent with Buterin's attempts to use blockchain technology to make a world-spanning computer, another trend was pushing the technology in the opposite direction, toward a more closed and controlled iteration of Satoshi's masterpiece. In September of 2014, a group of financial institutions—including Barclays, Goldman Sachs, and J.P. Morgan—formed a consortium, called R3, to explore how blockchains might improve the efficiency of payments between banks. [To see how far this has gone, read "Wall Street Occupies the Blockchain," in this issue.]

It didn't take long for these institutions to realize that the open structure of blockchains like Bitcoin and Ethereum ran counter to their needs. Of primary concern was the anonymity of users, who on open blockchains are represented by alphanumeric public addresses, providing no indication of their real-world identities. Banking laws in the United States and elsewhere forbid such anonymity. "We have to know particularly who our participants and counterparties are on these platforms," says Tim Swanson, the director of market research at R3.

Financial institutions are also legally required to protect customer data and control its export across national or regional lines. Given that public blockchains replicate the entire transaction record on every computer in the network, it's impossible to restrict the chain of custody while using them.

Thus was born the "permissioned ledger" approach to blockchain technology. In a permissioned ledger, the identity of people adding blocks is known, and data in the system is viewable only by selected parties. Because the right to create new blocks is assigned by the people who run the code rather than by a lottery, there is no need for proof-of-work mining or a cryptocurrency to pay for it.

This kind of system is intended to be used in situations where all participants on a blockchain already

have a small degree of trust among them but want to simulate the services of a neutral third party, as might be the case with banks when settling international wire transfers.

Last year, R3—which recently raised US \$107 million from more than 40 institutions—released its first permissioned ledger, Corda. And Corda already has a competitor; J.P. Morgan, which left the R3 consortium this past spring, has released its own permissioned ledger, called Quorum.

The permissioned-ledger approach has also spread beyond banks to other industries that find themselves serving as guardians to sensitive customer data. Many of these projects are built with tools provided by Hyperledger, an open-source project hosted by the Linux Foundation and backed by big tech firms. Hyperledger is building products for companies that want to work with smart contracts but are hesitant to embrace open blockchains like Ethereum and Bitcoin.

"People have to understand the actual concerns and the regulatory requirements that entities such as banks, insurance, and the health care industry have to adhere to. They cannot afford the risk and uncertainty that is introduced by some of the open systems," says Jonathan Levi, creator of Hacera, an access-control management system for blockchains.



How Are Smart Contracts Really Going to Work?

Regardless of what flavor of blockchain wins in the end, the smart contracts that will run on it will need a variety of supporting technologies. These supplementary technologies are now being developed, to little fanfare, in the shadow of the blockchain carnival. And they will be absolutely crucial to the expansion of blockchain technology.

"Once you've got smart contracts, a whole host of problems arise," says Ari Juels, a codirector of Cornell University's IC3. These problems fall into a couple of categories.

For one thing, blockchains can't store much data. That's going to be a problem for the many projects that, for example, propose to live-stream video over the blockchain—there's nowhere to put the video content.

The Bitcoin blockchain records the inputs and outputs of every coin on the network, as well as the content of an additional field that allows for up to a mere 40 bytes of metadata per transaction. That's all.

Another problem with putting contracts on blockchains is that blockchains by themselves don't know what's going on in the real

Blockchain World

world. That's a problem if, say, your smart contract is a flight insurance system, because it needs to know when your flight really takes off and lands. Blockchains were never designed to query websites. "Anything they learn about the outside world has to be injected into them," says IC3's Juels.

Ideally, developers will devise schemes for storing and accessing data in ways that do not reintroduce the weaknesses—vulnerability to censorship and a reliance on potentially dodgy humans—that blockchains were invented to avoid. To accomplish that, developers will have to carefully consider which "trusted parties" they can actually trust.

The problem of storing static data might be solved with distributed file sharing services, such as Protocol Labs' Interplanetary Database or Storj Labs' decentralized cloud storage system. These are systems that would enable people all over the world to rent out surplus space on their hard drives. Such schemes would work for a blockchain-based smart contract system because the data would be redundantly stored on multiple computers around the world, and thus would always be available and difficult to censor.

As for importing real-time data into a blockchain, this could be handled by what blockchain developers are calling "oracles." These are services that get paid for reliably querying sources of real-time data and feeding it to smart contracts on the blockchain.

At IC3, Juels has implemented an automated oracle called Town Crier.

It's meant to ensure that data injected onto a blockchain comes from a trust-

worthy source and hasn't been tampered with. It uses a "trusted software" enclave on Intel processors. The chips run code behind a cryptographic shield but still provide proof that the program was executed as promised.

Where's All the Money for This Stuff Coming From?

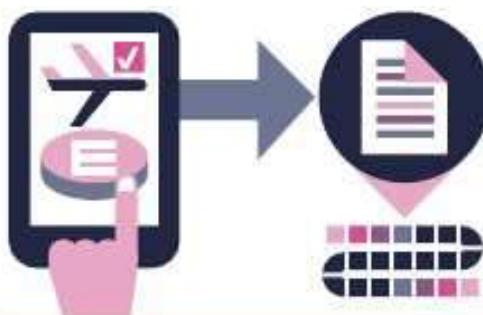
If the many digital services that modern society has come to rely on are to be rebuilt on blockchain technology, then someone is going to have to pay for all of the engineering and research that will have to be done.

But how do you get money for those functions when what you're trying to do is create a technology that—if it succeeds—will destroy the valuable data many enterprises survive on? Ideally, open blockchains, like Ethereum, entrust custody of data to the people who created it, giving them the option to choose how they share it. In such an environment, it is no longer feasible for a company to survive off a business model that harvests and sells its customer's browsing behavior, purchasing history, or location data. Nor could blockchain companies rely on the restricted

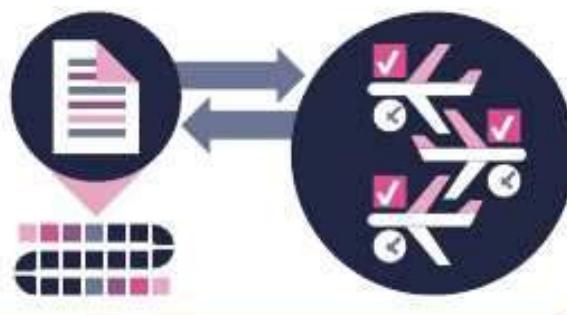
possession of their intellectual property, as programs on an open blockchain are there for everyone to see.

Nevertheless, a potential funding mechanism for blockchain-based businesses has already emerged: A new trend in blockchain funding called initial coin offerings (or ICOs, after initial public offer-

How Smart Contracts Work



A passenger requests flight insurance by sending ethers to a smart contract—an application that exists on the Ethereum blockchain—along with her flight information.



The smart contract sends a request to an "oracle"—a service that exists outside the blockchain—to verify the flight details and gather historical information about that route.



The smart contract then uses that information to determine if the offered premium is adequate. If the



Educational Records: Most people would change some detail of their school records if they could. Today, principles and the fear of being caught keep us honest. But tomorrow it might be the blockchain. Sony and IBM are creating a new blockchain for tracking and storing diplomas, transcripts, and other kinds of educational records.

ing, or IPO) has turned out to be wildly lucrative, although legally questionable.

Groups that choose to fund their projects with ICOs design their smart contracts in such a way that a user must own an app-specific coin in order to use the app. These groups then create a bunch of the coins before their launch and sell them on the open market.

In the nondigital world, it would be like someone opening a laundromat where you could use only custom coins to run the machines. And so, instead of just getting investors, the owner stamps out a bunch of coins to sell to the public, which can then be traded at prices determined by the value of the laundry service.

To date, over half a billion dollars has flooded into blockchain companies by way of token sales, and the last few months have seen an eye-popping acceleration in the rate and price of new offerings. This July, a blockchain project called Tezos set a record by raking in over \$200 million with an ICO.

Such astronomical investments have led some observers to complain that there is a grim hypocrisy at work. "The blockchain entrepreneurs who are pushing these schemes are really demonstrating all the avarice and cupidity which they ascribe to standard financial services" and government-backed currencies, says Preston Byrne, the cofounder of Monax Industries, an open platform for blockchain developers. "So, when the money starts flowing in their direction, they're becoming equally careless about the public—whom they once were."

However, others argue that the ICO, as a new class of investment vehicle, is just as disruptive as the applications being funded.

"Money is not the root of all evil. Equity is the root of all evil," says Joel Monegro, who left Union Square Ventures to start Placeholder, a new fund devoted exclusively to blockchain technologies.

His argument, which is often repeated by blockchain startup leaders, is that giving founders and employees equity in a company encourages them to hoard that wealth rather than use it to improve their products.

An app-specific coin, on the other hand, is not only a financial instrument but the means for accessing a technology. It follows the adage that the more people use a service, the more demand there will be for the token required to access that service.

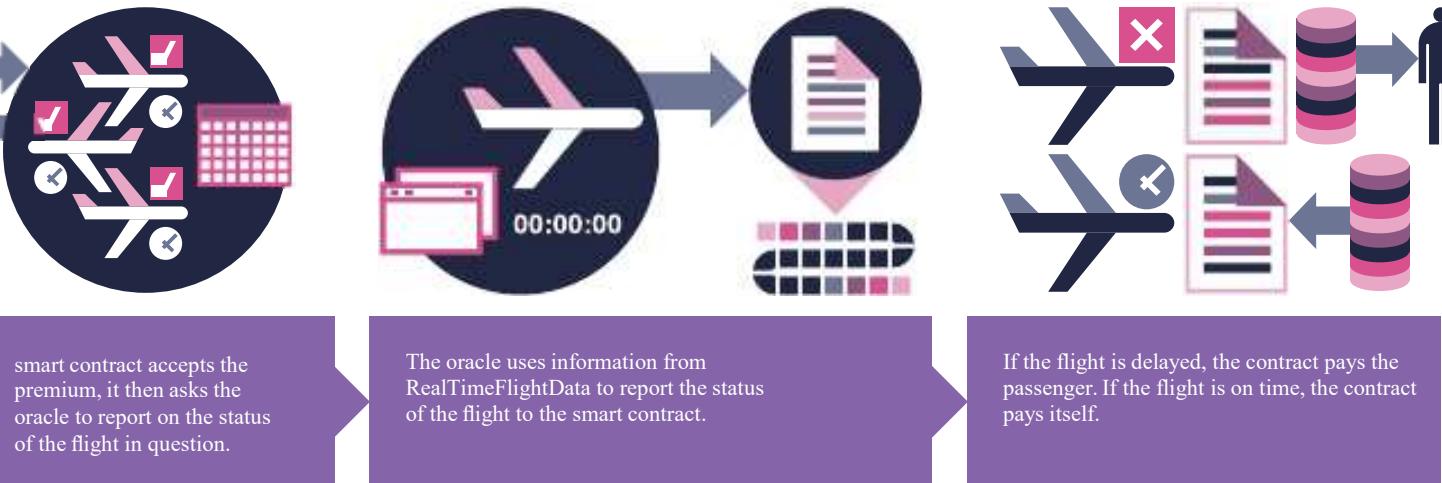
"My incentive as a company is not to extract more profits but to encourage more usage, because the token appreciates in value with the usage of the service. You completely flip the incentives," says Monegro.

In the United States at least, the ICO binge has likely come to a standstill. In late July, the U.S. Securities and Exchange Commission sent a chill through the startup scene. It issued a warning that many of the ICOs reviewed by the department fell into the category of securities and would therefore be bound by its rules.

Nevertheless, the trailing edge of the tsunami of ICO cash is still washing up on the shores of the industry. Only time will tell if it's put to good use.

"Times have changed, and very quickly. Some of us early adopters, who struggled financially three and four years ago but held onto their beliefs and their coins, are very well off now," says Hacera's Levi. "We still need Bitcoin and Ethereum to operate at larger scales, and enterprises need to decentralize more and secure their sensitive data. We are now facing a new and different kind of a challenge. Given the vast amounts of money invested, it remains to be seen how many old-timers and newcomers will stay true to the cause and continue to work to change the world with the technology that already changed theirs." ■

POST YOUR COMMENTS AT <http://spectrum.ieee.org/blockchainoverview1017>



CREDITS: IEEE SPECTRUM OCT 17

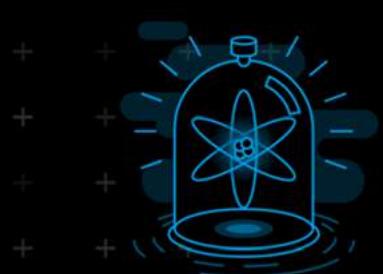
ABOUT US

Team Indus is a deep technology company, engineering path-breaking solutions that take on critical challenges for humanity. We believe that tomorrow's solutions will come when we break away from the dogmas of the past, collaborate by questioning what is and merge the old with the new in inspiring ways.



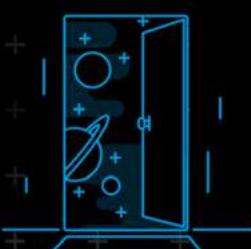
Imagine the brightest and youngest scientific minds. Imagine their passion infused with the knowledge of those who have been there and done that. Imagine if we untethered them to co-create, collaborate and come together. Imagine what they could achieve.

There are momentous questions that keep us awake at night — can space be made accessible to everyone? Can space be harnessed for the benefit of all of humankind? Can the world come together for a mission to space? We believe the answers to these questions lie in our four core beliefs.



Pure Unadulterated Science

We love engineering and all that it represents. The fundamentals of science are guiding us all.



Space Demystified

We have seen the power of collaboration and open source. There is no going back.



Transcending Traditions

We see opportunities wherever there are limits.
Conventions are meant to be broken.



Made-in-India

We believe that plenty more ground-breaking technology is on its way to emerge out of India. Without doubt.

As a winner of the Google Lunar XPRIZE Milestone Prize we have shown proof of concept. This is only the beginning. We realise that our approach must be applied to many of the world's problems. Because at TeamIndus, we believe that the further we go the more we inspire change.

DESTINATION MOON



India's fascination with the Moon and the space beyond spans millennia—from knowledge recorded in ancient texts to ISRO's Chandrayaan mission in 2008. TeamIndus aims to take India back to the Moon, only this time to land and explore the lunar surface.

Now, the mission splits into five phases, each as challenging as the next.



BUILD



LAUNCH



JOURNEY



LAND



EXPLORE



MISSION PROFILE

TeamIndus will launch its spacecraft aboard the Polar Satellite Launch Vehicle (PSLV), from the Satish Dhawan Space Centre in Sriharikota in late 2017. This dedicated launch will inject the spacecraft into an orbit 880 km x 70,000 km above the surface of the earth. There on, the spacecraft will set course to the Moon using a series of complex orbital manoeuvres.

DESTINATION

The Moon

MISSION DURATION

24 Earth days

DISTANCE

3,84,400 kms



WHERE DO WE GO FROM HERE?

The GLXP mission is the first time that a private enterprise will soft-land on the Moon, since man's first mission to the Moon. This also marks the first time that a private enterprise from India is setting its sights on outer space. Not only would it open doors for space exploration in our country, but it would also make possible for greater participation in space programs here. We believe that solutions for tomorrow's challenges will follow when we break away from the dogmas of the past by questioning what is. Can the Moon become the first outpost of an interplanetary species of humans? Can Helium 3 on the Moon be the solution to Earth's energy needs? The Moon and beyond will be the future for humankind in ways unimagined. For us in India, home to one in every sixth human, building the capabilities to venture into outer space as a private entity will lead the path to many opportunities that have so far been only dreams. We are making them possible.



ADVICE FROM INDUSTRY



Prof. A R Rao

Department of Astronomy
and Astrophysics, Tata
Institute of Fundamental
Research

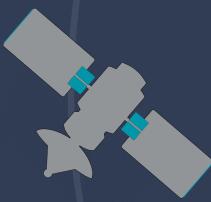
PROFILE

Prof. A R Rao has years and years of experience in the field of Astronomy and Astrophysics and is currently working with TIFR in the Department of Astronomy and Astrophysics.

He is also the member of various Internationally Renowned committees and is also responsible for designing various satellites. He has also launched various Satellites using Helium Balloons and is part of the Balloon Committee at TIFR.

He is the Payload Manager of ASTROSAT-CZTI Telescope and is currently handling the data acquisition and analysis from the same.

Interview credits: Dhruv Bal



“...YOU DON'T NEED LUCKY CHANCES TO GROW; YOU CAN GET THEM IF YOU WANT. YOU ONLY NEED THE DESIRE TO GROW.”

* Q. Could you tell us a little about your journey before joining TIFR?

I feel I am the luckiest person in the whole world! Several incidences/ circumstances fortuitously happened in my life which helped me to grow as a scientist, grow as an individual.

W

To start with, I was born and brought up in a very small village in Kerala. The village life of fifties and sixties are the places where raw emotions are on display. This helped me in human understanding and empathy. The village life, I believe, made me rugged to hardship and made me fitter - I had to walk a few km for my school and college every day. Though there were bus services, I walked to save the bus ticket money for other uses!

The second 'accident': by some mistake, I joined school at an early age, 4 years. Since I was physically smaller than others, I took recourse to reading. I was a voracious reader in Kannada, and when all available Kannada books are exhausted, I started reading English books - mainly classics. I was also very keen on solving riddles and math problems.

The third happy incident was the Physics Department of Calicut University where I did my M Sc: this was a (then) freshly started department with good faculty and semester system. Since I had a headway in English and maths, I absorbed all that are taught quite fast.

Q. What was your best project after joining TIFR?

I was part of several projects in Space Astronomy: balloon borne hard X-ray telescope at TIFR, WATCH (a Danish-Russian project when I was in Denmark as a post-doc), IXAE (flown on IRS-P3 satellite, 1996), SOXS (flown on GSAT-2 satellite, 2003), RT-2 (flown on the Russian Coronas-Photon satellite, 2009) and CZTI (in AstroSat satellite, 2015).

RT-2 is my favourite. Eighties and nineties were bad times for doing space astronomy in India: technology embargo (post Pokhran-I and II), lack of resources, lack of good Indian satellite platforms etc. were the reasons. I was even despairing whether I, or for that matter anybody else, can make a good quality competitive space experiment in India. RT-2 taught me that it can be done. Timely execution of a project, evolving a methodology to collaborate extensively were learnt while doing the RT-2 experiment.

Q. What is your current project and could please tell something about it?

Currently I am involved in the following two things: pushing the AstroSat data analysis pipeline to the best possible level. The data received from the AstroSat CZTI Telescope is analysed and converted to different levels for noise cancellation, detection of millisecond events etc. As there are many different levels to be performed, a pipeline structure is made. Also I am involved in evolving and formulating new projects to study transient high energy sky. In transient high energy sky, we study about new born stars and death of many old stars. After the death, we analyse the remnants of the dead star too.

Q. Could you tell us about your role in ASTRO-SAT CZTI project?

I am the Payload Manager of CZTI. This means doing everything! Conceiving the project, making the proposal and execution. But, from RT-2 experiment, I learnt that complex space experiment cannot be done in isolation and one of the major tasks was to have vibrant collaboration. It can be said that all best available talents in India have been used for this project and many Insti-

tutes and people across India have contributed to this project.

Q. What courses are required for an Engineer to participate in Astronomy projects?

Astronomy is generally coupled with Astrophysics: that is use of Physics to learn about Astros. Hence, a decent and sound knowledge of Physics is necessary. And in the end, the most essential ingredient is curiosity and the ability to search out answers.

Q. How many different fields collaborate during a single astronomy project?

Space astronomy requires diverse talents. The following are a brief sub-division:

a. Astronomer/ astrophysicist: when you are measuring something about Astros, it is essential to have, in your team, an astronomer who has already measured something about Astros! This also helps in optimising and revising the specifications of the experiment.

b. Instrumentalist: somebody who has some (say 5 - 10 years) experience of making instruments work.

c. Software specialist: these days software is used extensively: in the devices used in the experiment as well as for the data.

These 3 are required practically full time. Other allied specialisations (like mechanical engineering, thermal engineering, communication, etc.) can be obtained as consultation and perhaps outsourcing.

Q. Could you tell us what is the future scope of an Engineer in this field?

As the previous question shows, most of the required talents are from the engineering field!

Q. Could you give Engineers a message to inspire them and motivate them into joining this field?

Two messages: you are in the modern connected world where you can get everything - you don't have to have lucky chances (like me) to grow: you can go get them if you want. You only need the desire to grow.

Come to terms with yourself: you should not pursue this field if you aspire to accomplish anything. Because, accomplishment, by and large, is by chance and don't waste your time chasing mirages. This field is highly collaboration based, and you should pursue this only for the love of doing things and should have the emotional stability to interact and collaborate with a large number of people.

DIVYAKUMAR JOTWANI

Client Technical Sales Specialist-
PowerAI, HPC HPDA, Open
Databases

IBM

Jul 2017 – Present

"I have a passion of technology and the reading comes from many sources: Books, internet, company websites, discussions and a great network of similar thinking people. I would like to develop my technology skills by adapting different mediums and help in strategizing clients to not only sell more but sell better as profit can be achieved by even reducing redundant cost."

Profile



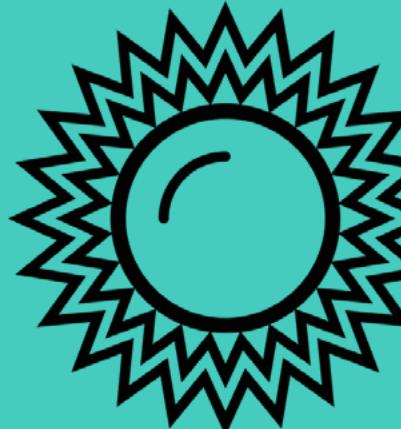
**"ASKING RIGHT QUESTION
IS HALF IMPORTANT,
FINDING RIGHT SOLUTION
IS THE REST OF HALF"**

**Could you tell us a bit
about your journey
after graduation ?**

My first company was Microsoft. It was the reason I wanted to sit for campus placements. So, placement is the time when students have a panic attack and uncertainty about getting a dream job. We didn't have Pre-placement training like you guys so I guess that helped me in some ways because my responses in the interview were natural. In some ways you guys are being streamlined to face to the rounds of the interviews.

I cleared the usual six rounds of the interview process and got an offer. In the first couple of months, I learnt different many new things right from Active Directory, CRM, and Networking to Hypervisor (VM). Then I worked on my project on database. I have a particular interest in database since my college years. I worked that Microsoft for over 2 years during which I also wrote a research paper on Improving education with gaming.

The paper was about how Microsoft can create an ecosystem using Kinect, wherein they could work on making students engage in gaming for the purpose of education. During this process I realized that pursuing MBA should be next goal. So, I went ahead. Then, I got into HCL and I'm currently working with IBM.



2. What is the best part of working in a professional environment like yours?

My current field of work is CRM which is pretty exciting. I get to meet entrepreneurs and CTOs of companies like ICICI, working in the same field. So, I guess networking is one of the perks. Also, getting my hands on new technologies. I mentioned Kinect earlier, which was a pretty exciting project to work on given my love for games.

3. As we know IBM is one of leaders in AI research. Can you give us some insight about the AI scene in India and the extent of IBM's involvement in AI through India?

IBM's AI operation is generally synonymous with IBM Watson. Watson is a cloud offering which is provided to clients who are ready to put their data on the cloud. My current profile doesn't allow me to know the details of this but I've seen quite a number of events being organized for startups working on AI, chatbots etc. We've also given them free credits for working on these platforms to create an ecosystem. Like most MNCs, I believe, IBM develops its analytics platform in the country they operate from.

4. What are some job prospects that an EXTC(electronics and telecommunications) engineer can look forward to at IBM?

Speaking of AI, requirement of AI is very domain driven. Some of our major clients who are into analytics are telecom companies. For instance, behind every phone call a massive amount of date analytics goes on to optimize the services for customers. So, when an EXTC engineer has a fair amount of information on how telecom infrastructure works and he has a flair for understanding new technologies, there are a lot of multidisciplinary fields he can get into.

Coming to semiconductor industry. It has changed a lot after mobile computing came into the picture but the scenario is limited to job offerings in India. Like Nokia operates from India. They have an arrangement with Siemens and they work on developing applications. When you get into a cross domain job, they always train you. The training sessions, lasting 2-3 months, give you an understanding how for instance, the networking infrastructure works and what would be your job as, say, a programmer.

There's this false notion that the IT domain is the biggest job providing field. People don't realize that in a few years there won't be any IT jobs. They will be replaced by AI. So, EXTC people need to cheer up. People who code today, say in HTML or Js will be irrelevant because coding is something engineers from all domains will have to learn and they have the added benefit of knowing their core fields, say, electronics or civil.

What I think the future will have is need for expertise in specific domains and not just IT or Computer skills. So, IT will be divided into all these paradigms and people with just the limited knowledge of Computer Science might find their jobs in danger.

5. So, our college provides bridge courses to close in the gap between the industry requirements and the limited curriculum. Do you have any suggestions for this?

Presently, in the industry there are two courses which are in huge potential demand. The first being AI and other is the emerging technology of Blockchain. Besides that, there's other mature fields like big data and cloud. AI and Blockchain are their primary stages of development so anybody with this knowledge will have the highest level of advantage in the future. But since the industry has become so very volatile, the chances are these fields may become mainstream very soon and we move on to the next big thing.



Siddharth Singh PROFILE

Head Business Development

Avanti Learning Centres

M.Tech, Green Technology
Institute of Chemical Technology

Associated with Sanjeevani S3, a Solid Waste management NPO which provides consultancy to residential societies to converted them to zero disposal systems for a **greener** tomorrow!

Career interests :

Social enterprises, sustainable development, climate change policy development and sustainability reporting.



"...KEEP GOING EVEN WHEN YOU DON'T FIND ANYTHING BECAUSE YOU NEVER KNOW WHAT YOU MIGHT END UP FINDING."

Q. Could you tell us a little about your journey, starting from your Bachelor's degree to your present status?

I got into engineering in 2008 batch, engineering was fun, I miss those days. Till the third year, I had no clue where I was and what I was doing, as we do not have a lot of application embedding in our educational dimension. It was only in the third year when I started looking for jobs I realized that there are too many and too good engineers around and I stood no chance against them.

I had to stand out of the crowd for people to notice me for consideration of a good job, so I decided to pursue Masters and started preparing for GATE. I got through in the next year with a score of 44/100 and secured a seat in ICT for M.Tech with scholarship provided by AICTE. 2 years of my life spent at ICT was a great learning curve, the application part which was missing had somehow come into existence and I learned a great deal, not only related to academics but practical knowledge & problem solving as well. I spent a good 1 year at DBT-ICT- Centre for Energy & Biosciences as a Graduate research fellow, trying to find solutions to industrial problems alongside a bunch of talented people pursuing PhD in various fields. . On completion of my term at DBT, I got an opportunity to teach environmental management at TCET-MU, my concern for the subject made me take up the offer and I got a chance to interact with hundreds of youngsters, full of life and energy, ready to take on the world.

While teaching I came across this social Enterprise - Avanti learning centres, which is helping students from humble background across India to crack competitive exams and get into tier 1 colleges like ICT, I applied for the job, unfortunately there was no teaching vacancy, but the whole concept they had was so fascinating that

I took up a job at the position of business associate. I spent a year traveling, exploring & understanding the secondary schools system in rural Maharashtra. One day, due to a teacher unavailability I was asked to conduct a lecture, I had a person from operations management observing my lecture. Post the lecture the manager called me and offered me a teaching job based in Mumbai. Today, I am Business head at Avanti and have an operations and sales team of over 15 people working with me. I am also spearheading the sales and marketing division of a solid waste management firm based in suburban Mumbai-Sanjeevani S3.

Q-What is your present status?

I am currently Business head at Avanti learning centres, a PAN India organisation. Sales and Marketing head at Sanjeevani S3-a solid waste management organisation based in Suburban Mumbai.

Q-What according to you is a start-up?

A start up according to me is when you start to take charge of your life. When you start to believe in an idea, I would say believe is a small word, you have been possessed by the idea.

Q-What are your views on start-up?

Start-ups are the buzz word and a lot of youth are taking these treacherous path to money, fame and satisfaction. Fundamentally, start-ups are important to maintain the job seeker to job provider ratio, and play a major role in strengthening the economy of the nation. It's so great to see so many youngsters come up with great ideas and those ideas catching the market overnight. I personally believe in a start-up that solves a social problem and at the same time give you the monetary benefit. A win-win situation for everyone around. But, unfortunately we have only handful of such start-ups which are solving a social problem and are making a lot of money.

Q-What would you say about funds that start-ups require?

If you believe in your idea, and have done enough groundwork funding's should never be a problem. There are a lot of incubation centres as well as angel investors who are looking to invest in great ideas and dedicated youngsters

Q-How does one get sponsored for a start up?

The first step is thinking idea and having a brainstorming session with your team members to polish it. The second step is to run pilot projects/ surveys and get a better idea of the acceptance of the idea among the people. Third step is to document it and make sense out of the data collected. Fourth step is interpretation of the data in the most positive way and last but definitely not the least is to present your idea to the committee with confidence.

Q-How did you think of a start-up?

Like I mentioned earlier, my idea is to solve a social problem and make money out of it. Solid waste management is a very sensitive issue which has been ignored by the people and the authorities alike. We have all policies in place but nothing being followed, that's what triggered the idea of a solid waste management start up. Sanjeevani is headed by Mr Zulkif Shaikh, who was my classmate in ICT, and is managed by Ms. Dhvani Damani who was my lab mate at ICT.

Q-What do you do at Sanjeevani?

We are a solid waste management firm, have developed our own carbon neutral technology for composting which in a period of 15-20 days gives you a high quality compost. We work with housing societies, malls, restaurants, hotels, shopping complexes, SME's, corporate offices, schools, colleges etc. to manage their waste and make the best out of it. Our services range from awareness sessions, training sessions, clean up drives, waste segregation system set up, waste pick up services, treatment of waste. Our goal is always to make your organisation a zero waste disposing entity.

Q- How do you advice our students to go about start-ups?

A-Believe in yourself, have that confidence in yourself and your idea, keep going even when you don't find anything because you never know what you might end up finding.

Q-Do our students have any opportunity to work with you?

At Avanti definitely, we can pay you really well as it is a well-funded start up. At Sanjeevani, we are in need of students who want to make a real difference, you can't expect a fat salary but you can expect a great learning experience.

Bluetooth 5.0- What does it offer?



Vignesh Iyer
Application Development
Associate
Accenture Solutions Pvt. Ltd

Good news is that the technology has just been improved. Bluetooth 5.0 is more powerful than ever, with enormous potential for the Internet of Things and also wireless music listening.

All of us at some point of time have used Bluetooth which has simplified the process of transferring data between devices. Nowadays, the use of Bluetooth is not only limited to smartphones but also being used in various other devices such as speakers, wireless keyboard, fitness bands etc. which has simplified our lives to a great extent.

Bluetooth comes in two flavors: "Classic" and "Low Energy". Bluetooth Classic is what we use in our wireless keyboards, mouse, headphones and speakers whereas the Bluetooth Low Energy abbreviated as LE is uses a lot less power and is designed for applications such as healthcare, fitness and beacons. Fitness bands such as Fitbit uses Bluetooth LE instead of Classic.

The latest version of Bluetooth i.e. Bluetooth 5.0 has a quite a few tricks up its sleeves as compared to its previous generations.

With the growing popularity of wireless headphones and wearable devices, Bluetooth is more common than ever. In fact, according to the Bluetooth Special Interest Group (SIG), which oversees the development of the technology, 13.9 billion Bluetooth-enabled devices will ship by

2020. The main advantage is in the field of IoT, which can be made connection-barrier free by use of Bluetooth 5.0 by adopting beacons to provide a seamless IoT experience to all. This means that whole-home and building coverage, as well as new use cases for outdoor, industrial, and commercial applications will now be a reality.



Fig 1. Bluetooth Tech representation

The main improvements are in the areas of range, speed and broadcast message capacity. Bluetooth 5.0 offers four times range, two times speed, and eight times broadcast message capacity. With the help of longer range complete home and building coverage can be made possible for more robust and reliable connections.

Higher speed on the other hand will enable devices to be more responsive and help them deliver high performance. Finally, increased broadcast message capability increases the data sent for improved and more context relevant solutions. Another lesser known but important feature is the ability to co-exist with other wireless technologies which means Bluetooth 5.0, also includes updates that help reduce potential interference with other wireless technologies to ensure Bluetooth devices can coexist within the increasingly complex global IoT environment.

Being an EXTC engineer we always have to talk numbers so to put things into perspective let me give you some statistics. The best case range of Bluetooth 4.2 is 50m but using Bluetooth 5.0 we are looking at a range of almost 200m. The data rate is up from 1Mbps to 2Mbps. The way Bluetooth 5 doubles the bandwidth is by doubling the speed of transmission. So previously a packet of data (actually 251 bytes worth) was sent in a set time frame (2120 microseconds). Now, with Bluetooth 5 the same data is sent in 1060 microseconds.

The latest android phones have already started using Bluetooth 5.0 and are compatible with older phones that make use of previous versions of Bluetooth 4.2 or older versions. However, to experience the full potential of Bluetooth 5.0 both the devices should be communicating using Bluetooth 5.0.

Android has always been forward thinking when it comes to Bluetooth, and we see this with every new release. Just be on the lookout for other devices that are Bluetooth 5-compliant to take advantage of the new standards.

Hope to see more and more applications of this amazing technology in the future. Best of Luck!!!

If we talk about software, the latest version of android i.e... Android O has full support for Bluetooth 5.0, so device makers don't have to do the work themselves. When Bluetooth 5.0 becomes old news and everything supports it (which won't be anytime soon) this will change and we'll see the benefits. One good piece of news is that IoT (Internet of Things) devices are usually ahead of the curve and we'll see Bluetooth 5 support long before other devices start to use it.

ENGINEERING EDUCATION, WHITHER & WHY?

Dr.Sangeeta R.Mishra

Associate Professor,EXTC

In fact, these days, the definition system of engineering education has changed. There were days when the students on their own strived in the pursuit of knowledge as it was very necessary for defending the interview committees for getting some suitable job. This does not mean the students of this time are negligent about this, but the focus and the way of gaining the knowledge has changed. In the past, the only source of gaining knowledge was by books but internet these days has become a potential source of getting knowledge on every aspect of life and therefore, we find the increased IQ of the students, in general. As a result, the current students are more interested in learning about the techniques of facing an interview, speaking English with a proper accent, personality development, etc.

In my opinion, if these students pay some more attention to the instructions imparted by the teachers in the class, it will act as catalyst in the process of acquiring the skills for better learning.

It is interesting to write this articles for the college magazine as well all are concerned with this subject. This articles,therefore, focuses on the current scenario on some of the aspects of engineering education

The students are intelligent enough to understand better but in general, most of them are careless about day to day coaching in the class and believe in .Studying only when the end semester exams or the periodic tests are sitting on their heads. Therefore, these students are deprived of all the advantages of process of regular learning.While studying engineering, more attention needs to be given to the courses on Mathematics, because every discipline of engineering is based on the concepts from Physics and the development of the concept is based on Mathematics. It is always better to understand the basic principles clearly before going further in the direction of studying the advances in the related theory.

It is always better to refer to the proper texts. For example, take the case of a core course on Control Theory. This is an interdisciplinary course as its applications are found in many fields of engineering. In this course, it is not simply enough to understand how to draw Bode diagram and mug-up the Principle of Argument, but it is necessary to understand the basic idea behind drawing Bode diagram and the right interpretation of the Principle of Argument.

In fact, when we draw the Bode diagram for any given system, the system under consideration is always stable and in order to study its relative stability we want to find as to how far away the system is from the point of becoming unstable. But after finding-out the gain margin and phase margin of the system it is quoted in some of the books that the system is unstable. These are misconceptions and only a teacher can save the students from reading such books by way of taking utmost care in recommending the good books to the students.

Similarly the answers to the questions like how does the capacitor charge, what is the physical interpretation of standing waves, what is the physical interpretation of the impulse response of the system, what is generalized impulse function etc., can only be understood by the student-teacher interactions.

This also requires that the teachers should responsibly do the job of teaching their courses. But these days due to processes like Grading and Accreditations from different agencies, most of the work related to these processes has come on to the teachers. The teachers are therefore in a dilemma as to how much time should they spare for these activities, lest, in the process of doing these activities they may lose their focus of concentrating on their main goal of teaching and consequently their performance and in turn the credibility of the institution may come to stake! In essence, it is being observed that the teaching in the colleges has taken a secondary place and other clerical activities have attained the primary position. In fact, we follow some norms regarding allotment of teaching load to the teachers in different cadres. Professors are given less load, Associate Professors are given a little more load than Professors and the Assistant Professors are given the maximum load.

This is not for leaving the Professors free but as they have sufficient experience they require less time for the preparation of their teaching load and so they can spare some time for helping the Principal/Director in the administrative activities. However, junior teachers require more time for their course preparation and hence they should not be overloaded by activities other than teaching.

In fact, in any institution, a large part of the teaching load is shared by the teachers in the cadre of Assistant Professor. Therefore, the teachers in this cadre should not be made to deviate from their regular activity of teaching. Moreover, one can say that if the teachers cannot pay attention to their teaching activity, then the students coming out of such institution will be of reduced quality and in turn this will hamper the reputation and therefore, the development of the institution.

However, some people from the field other than teaching, say that if the load of the teachers is 18 periods per week then what do the teachers do during the time available after discharging their load of the day?

Autonomy is another issue which has been held high by many institutions of good repute. The concept of allotting Autonomous status to the institutions is really naïve from the point of view of the global development of the Institution.

But before going in for autonomy there are some prerequisites which must be taken care of. For example, faculty should be adequately qualified, well trained, devoted to the very cause of research and ready to take-up the challenges of autonomy. If these aspects are not taken into consideration, the autonomy may prove to be disastrous. Autonomy gives us the necessary freedom to eliminate all the drawbacks of the University system. In fact, University being a big entity in itself, is not able to change the syllabus often and keep it updated keeping the system in tune with the recent developments in the field of technology. Institution being a smaller entity has the ability to implement all such changes as and when necessary.

For better learning, it is not necessary to define the syllabus at length. Nevertheless, the scope of the syllabus should be left to the course instructor. Let the course instructor define the syllabus as per his/her own expertise and only the broad outline be given by the academic cell of the institution.

Also, by appointing the Deans for different activities the growth of the institution can be brought about from all the directions. This requires that there should be a good research potential in the institute. Research potential of the institute is mainly decided by the quality of the teachers on roll.

No compromise, therefore, should be made on the quality of teachers as it is the teachers who are the backbone of the institution.

Reading and delivering is not the only job of a teacher but a good teacher understands that teaching is the best way of learning and therefore, the teachers should be allowed to do the work of imparting knowledge to their best possible efficiency. Let the best teacher come out of him.

The idea of supplying engineers to the world has shown its effects. It has really made it wither. We have to come out of this situation and create a new era where teachers will command the same respect not only from the students' fraternity but also from the entire society. Let the engineering education get back its old golden days.

SAY HELLO TO MACHINE LEARNING

Ms.Purnima Chandrasekar,
AP (EXTC)

The latest buzzword in the field of technology is 'Machine learning'. It's been researched upon before but has gathered momentum and curiosity among technocrats around the world only now. What is machine learning? In the year 1959, scientist Arthur Samuel defined machine learning as the ability of computers to learn without being explicitly programmed. How cool does it sound! A field of computer science, machine learning follows a model building approach from sample inputs that learns from and makes predictions on data by construing several algorithms based on varied concepts like computational statistics, mathematical optimization, data analytics etc. From a broader perspective, machine learning is typically divided into three categories- supervised, unsupervised and reinforcement learning.

On one hand, supervised learning deals with presenting the machine with example inputs and their desired outputs thereby making the machine learn a general rule that maps inputs to outputs while on the other hand, unsupervised learning helps in discovering hidden patterns in data, thereby allowing the machine find a structure in a given input on its own. Reinforcement learning blends in by making the machine perform a certain goal within a dynamic environment by constant provision of feedback while navigating through a problem.

Machine learning and artificial intelligence are often used interchangeably; however there is a thin line of difference between the two. As explained lucidly by the author of the article '5 Industries Machine Learning is Disrupting', artificial intelligence is that field that requires intervention of human intelligence to define a computer program for the machine with suitable steps, to make it capable of performing a given task while machine learning involves making a machine learn, improve and evolve when exposed to new and additional data such that the machine gets trained through tasks



Fig.1: Humorous depiction of Machine learning (source:<https://www.lexalytics.com/images/extras/machinelearning.png>)

like discerning new information from existing knowledge, making connections, combining ideas and following a train of 'thought' just as humans do.

Machine learning supports a variety of applications. Self-driven car is a hot topic trending right now. As an example, we have Waymo which is the brainchild of Google's parent company, Alphabet Inc. that prides in being "a self-driving tech company". With the aim of making driving safe and easy for people and promising to eliminate tired, distracted and drunk driving,

Waymo has created and designed vehicles having in-built sensors and software's that not only keeps the car informed about everything happening around it but also detects pedestrians, cyclists, vehicles, road work and more from a distance of up to two football fields away in all directions. That's a helluva technology!

Another application of machine learning can be found in healthcare. Traditional way of thinking may make one hesitant to trust a machine with one's health details; however a new approach of machine learning in healthcare is not only enabling machines provide diagnosis, prescription, treatment suggestions and even medical procedures but also determining the probability and most likely cause of a given disease in a patient through quick comparison of symptoms and genetic details against millions of possible diagnosis.

All in a fraction of time!!! Trust a doctor to do so? Impossible! A supporting example of machine learning in healthcare is Google's DeepMind Health. Revolving around a technique named deep learning (that blends supervised and unsupervised learning wherever needed), DeepMind Health have created algorithms that learn by interpreting visual information of head, eye and neck scans thereby enabling the machine help clinicians identify potential issues within these scans and recommend the right course of action.

Incorporating machine learning into education is also being experimented upon. Blending technology into classrooms is the need of the hour what with numerous facilities like Wi-Fi, multimedia presentations, interactive smart-boards etc. being available. Undoubtedly, nothing can replace the responsible role played by teachers in modeling social skills, confidence, proper behavior, self-esteem among students; however the argument doesn't lie in comparing teachers' role to that of machines, the onus lies in teachers embracing the potential of this technology to complement their teaching. In many ways, machine learning can be incorporated into education.

Designing study plans for students that address the learning style of students, identifying learning disabilities in students, generating tests and assignments by sifting through multiple sources and picking key questions and vocabulary that best demonstrate comprehension of any given subject are areas where machine learning can be used.

As an example of machine learning in education, we have AutoTutor. Helmed by A. Graesser & X. Hu, AutoTutor is an intelligent tutoring system that holds conversation with humans in natural language through human-inspired tutoring strategies, pedagogical agents and technology that supports natural language tutoring. Another example includes Carnegie Speech, a premier developer of software that assesses and teaches spoken language skills using state-of-the-art speech recognition and artificial recognition. Through the licensed use of artificial intelligence technologies from Carnegie Mellon University, Carnegie Speech has provided cost-effective, scalable and personalized spoken language instruction maximizing training effectiveness and minimizing training time.



Fig.2: Navigating real roads (source: <https://waymo.com/tech/>)

Machine learning definitely finds its name among the top 10 emerging trends in upcoming technology and according to the article 'Gartner's Top 10 strategic technology trends for 2017', "Creating intelligent systems that learn, adapt and potentially act autonomously rather than simply execute predefined instructions is primary battleground for technology vendors through at least 2020."

Top 10 Strategic Technology Trends 2017

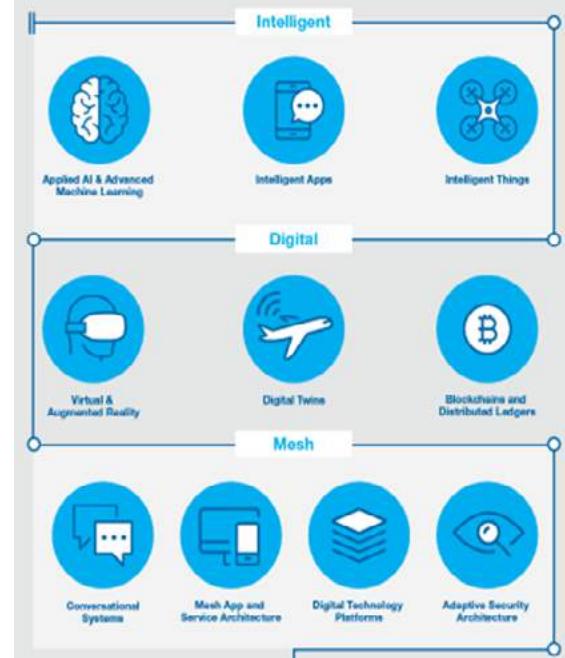


Fig.3: Machine learning as an emerging trend (source: <http://www.gartner.com/smarterwithgartner/gartners-top-10-technology-trends-2017/>)

Project Based Learning (PBL) and Mental Models: An Effective Way of Learning

MS. ARCHANA DESHPANDE, AP EXTC

The era of 21st century has a different set of skills and requirements which students must be able to master in order to be successful. While this is an exciting and challenging time, some institutes may not be preparing students for what lies before them. Can we afford to send students out of institute without the skills needed to be competitive in the global workplace?

Industry wants people who can communicate, collaborate, create, and function effectively as part of a team. In the past, the traditional teachers had kids sitting in "cemetery rows", told them to be quiet and do their own work. This may be no different today from the classrooms of the 20th century. Some schools are producing students who can bubble in an answer sheet and regurgitate enough information to pass a standardized test. Many students, though, walk across the graduation stage with little experience in producing products, minimal practice in collaboration with others, and no idea how to present information to a panel of colleagues.

One solution to this problem may be found through incorporating skills the corporate world desires into the curriculum we teach through project-based learning (PBL) and the use of mental models. In a PBL environment, students are asked to create a product based on a real-world scenario.

For example, rather than standing in front of the room and lecturing to students about the countries in geography class, students might be presented the following scenario (mental model):

Due to the failure of the monsoon, some parts of Bihar and Jharkhand along with Punjab and Haryana were also affected by drought. The war-torn region of Darfur is in turmoil. This western region of India has faced numerous issues that have caused economic chaos, drought, famine, and many other concerns. Your team has been hired by the consulting firm

Worldwide Solutions to provide information and recommendations to the Government of India. The Government wants to provide assistance to the area but needs a recommendation for how to provide resources that will have the greatest impact on the people of effected area. Your job is to produce a list of the issues and then provide a solution to the most pressing issue. Your team will present a final product to a panel of experts from the company.

This document serves as a mental model for the student task at hand. The scenario will provide a real-world framework for creation of the end product.

The final product for each student group will be different. This allows diversity for the learner and may be assessed by developing a rubric. One team may produce a water filtration device that will solve the problem of clean, potable water for a community; another may construct a model housing project to address the need for safe, affordable housing. Both groups addressed a problem the region is facing, both came up with a solution, but from different point of view. The mental model not only provides visual, but also stimulates the students to think outside of the model.

PBL truly is a constructivist approach to learning. What is needed in the 21st century is the ability for students to construct, build, and create their own learning. Mental models are the key to putting our thoughts and constructs into patterns for learning. Mental models may be stories, two-dimensional representations, metaphors, or analogies. Through the use of these mental models, people are able to make sense of their world and understand information better. Students coming out of a PBL environment are prepared to conduct research and create a product that is a viable solution to real-world problems. When these students are employed in the workforce, they will already have the experiences of collaborating with colleagues, creating solutions, and communicating results.

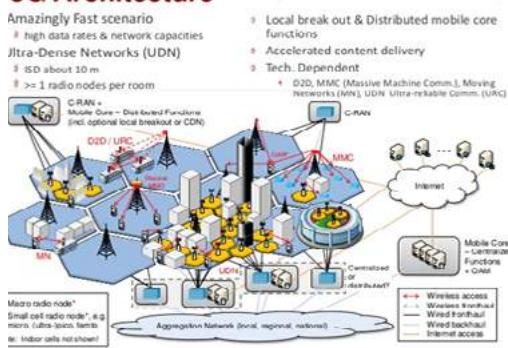
5th Generation Wireless Technology

INTRODUCTION

Many parts of the world are still using waiting for the launch of 4G networks, the telecom sector is looking forward to go ahead with 5G. It will be able to handle high traffic growth and exponentially increasing demand of bandwidth. It is also going to support a large number of connected devices in real time applications. 5G will provide connectivity for next gen applications which include wearables, traffic control & safety, smart grid, smart homes, industry processes and very high speed media delivery. As a result of this it is going to accelerate IOT (Internet of Things).

5G NETWORK ARCHITECTURE

5G Architecture



The 5G network architecture is mainly focused on three aspects:

1. Flexibility
2. Scalability
3. Service Oriented Management.

These three aspects are interlinked to each other to drive the 5G network technology in order to fulfill the various requirements. The architecture is flexible enough to handle the requirements of the use case service. The new generation of RAN (Radio Access Network) networks needs to be efficiently handled which is the very basic requirement of 5G network.

5G NETWORK COMPONENTS

1. **Phantom Cell:** The role of phantom cells will be to increase the density of the networks by using small cells with low power nodes.

Mr. Niket Amoda

This will result into an efficient solution to mobile traffic explosion, especially in high traffic area (hot spot area).

1. Phantom Cell: The role of phantom cells will be to increase the density of the networks by using small cells with low power nodes. This will result into an efficient solution to mobile traffic explosion, especially in high traffic area (hot spot area). These cells develop advanced centralized RAN (C-RAN) true for commercial use. Advanced C-RAN adopts the centralized network architecture with many branches of remote radio equipment (RRE) and utilizes LTE advanced carrier aggregation (CA) functionality between macro and small cell carrier.

2. Access Integration: Wireless-backhaul solutions typically operate under line-of-sight conditions using proprietary radio technology in higher frequency bands, including the millimeter wave (mmW) band. In the future, the access (base-station-to-device) link will also extend to higher frequencies. Low-power deployments, wireless backhaul will have to extend to cover non-line-of-sight conditions, similar to access links.

3. Device-To-Device Communication: The device-to-device (D2D) communication has been introduced as an extension to the LTE specifications. In the 5G network era, support for D2D as part of the overall wireless-access solution should be considered from the start. This includes peer-to-peer user data communication directly between devices, but also, for example, the use of mobile devices as relays to extend network coverage. D2D communication in the context of 5G should be an integral part of the overall wireless-access solution, rather than a stand-alone solution. Direct D2D communication can be used to offload traffic, extend capabilities and enhance the overall efficiency of the wireless-access network.

4. Flexible Duplex Communication Frequency Division Duplex (FDD): It has been the dominating feature of duplex arrangement since the beginning of the mobile communication era. In the 5G network era, FDD will remain the main duplex scheme for lower frequency bands. However, for higher frequency bands – especially above 10GHz – targeting very dense deployments.

Mr.Deepak Singh

Networking in Real World

Many who leave university discover that they don't possess the specific skill-set or certification required to start on the IT road. Many networking courses are available to bridge the gap, but now universities and the IT industry are also working together to meet workplace needs. In this article we will discuss some basic of Networking, how can we bridge gap in this rapidly growing digital world and secure ourselves also what are the latest and upcoming technology which we need to learn.

Networking is something which is everywhere networking bring the power of computation to another extent. Individual computer can provide tremendous productivity, but think what we can achieve if we connect them with each other giving them ability to share data and processing resources. Take an example with a network, five colleagues can read and edit an evolving document

from their own computer with minimal effort and coordination. Without a network, these colleagues have to share time on the same computer or work out a process for exchanging removable storage media. In a similar fashion, networks let us all realize economies of scale by running resource-hungry applications on high-power hardware.

A networking is a telecommunication network which allow us to share resources. In computer network, networked computing devices exchange data with each other using data link. The connection between nodes are established using either cable or wireless media.

Networking help us to realize the services which are provided at a remote place for example. If Cisco presales is giving some presentation to a university and the Dean's wants to share the presentation with the class so he will take the same link and present it in the university

with the help of 'Glass to Glass technology' the presentation which was being played in Dean's laptop now student can view same presentation with the help of this technology for this the network should be application aware and application should be network aware. Another great example is every organization and university have a server which help us to provide resources at a centralized place but having each server in every office may result in tremendous cost of maintenance and resources to manage them.

But with the help of networking we can have a server centrally located such as AWS(Amazon Web Services) and everyone can share resources leading in cost saving and resources.

Networking can be broken down into many sub-domain out of which Data, Voice and Security are the most important.

The Data include Routing, Switching, Virtualization, and Wireless. In Voice it include IP Phones and Video and Security it's consist of Firewall, Proxy, Pentesting and many more.

In real world things become much more complicated as they all work at a same time for example an SP(Service Provider) have many customer to which they provide services and these are very critical so to provide 99% availability of services the SP uses all above technology such as for providing services and connectivity they use Routing, Switching on an MPLS network and PRI lines for voice and video services and the most important as client depend their whole data on Service Provider hence it become most crucial to secure Customer with the help of Firewall and proxy and Virtualization for providing his services using SP resources.

When these all technology work together they become dependent on each other hence leading to complexity in network with right skill these can tackle when something goes wrong. As it is the backbone of whole world. Think what will happen if services or Networking devices fails of Stock Market leading to failure of economy. Industry not regularly patching there servers lead to WanaCry attack due to this hospital in Britain had to shut down, Cyclone in Tamil Nadu lead to services down of Google as Servers were damaged.

In today's world where there is WanaCry which is crippling the world economy, SDN(Software Defined Networking) which is defining Network at a new level and making it more intelligent and less complex. NFV (Network Function Virtualization) Network Functions Virtualization aims to address these problems by leveraging standard IT virtualization technology to consolidate many network equipment types onto industry standard high volume servers, switches and storage, which could be located in Datacenters, Network Nodes and in the end user premises. We believe Network Functions Virtualization is applicable to any data plane packet processing and control plane function in fixed and mobile network infrastructures. AI (Artificial Intelligence) as Elon Musk and Putin said one with Power of AI will win the World War 3, Ansible for automation making things easier for everything which was previously done by human.

Networking offers a variety of advantages for many non-profits, charities, and libraries student should take interest and attend workshop and take basic level learning such as CCNA aware about security so they it can help them to grow in this growing technology and get job.

VLSI Design through Nanotechnology: Stepping Into a New Era

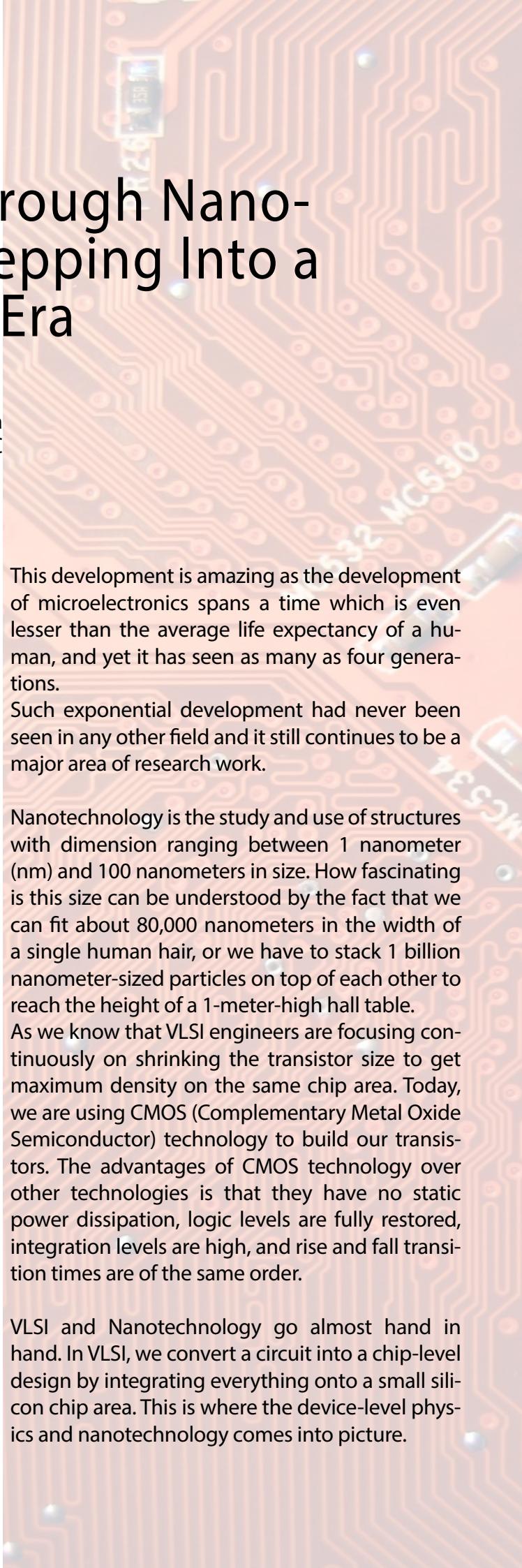
Deepak Kumar Sinha
Assistant Professor, EXTC

There was a time when huge computers made of vacuum tubes were set up in the dedicated rooms and doing 360 multiplications of 10 digit numbers in a second. But modern day computers are getting smaller, faster, and cheaper and more power efficient every progressing second.

It actually began with the advent of semiconductor transistor by J. Bardeen (1947-48) and then the Bipolar Transistor by Shockley (1949) in the Bell Laboratory. This fascinating journey got the breakthrough when the first IC (Integrated Circuit) was invented in the form of a Flip Flop by Jack Kilby in 1958. After this time our ability to pack more and more transistors onto a single chip has doubled roughly every 18 months, in accordance with the Moore's Law.

In the early 60s, the Small Scale Integration (SSI) in which transistor count was limited to about 10 on a single chip. Then in the late 60s, it provided the way to Medium Scale Integration (MSI) when around 100 transistors could be placed on a single chip.

Early seventies marked the growth of transistor using the TTL and ECL logic families improved the count to about 1000 per chip called the Large Scale Integration (LSI). By mid-eighties, the transistor count on a single chip had already exceeded 1000 and hence came the age of Very Large Scale Integration (VLSI).



This development is amazing as the development of microelectronics spans a time which is even lesser than the average life expectancy of a human, and yet it has seen as many as four generations.

Such exponential development had never been seen in any other field and it still continues to be a major area of research work.

Nanotechnology is the study and use of structures with dimension ranging between 1 nanometer (nm) and 100 nanometers in size. How fascinating is this size can be understood by the fact that we can fit about 80,000 nanometers in the width of a single human hair, or we have to stack 1 billion nanometer-sized particles on top of each other to reach the height of a 1-meter-high hall table.

As we know that VLSI engineers are focusing continuously on shrinking the transistor size to get maximum density on the same chip area. Today, we are using CMOS (Complementary Metal Oxide Semiconductor) technology to build our transistors. The advantages of CMOS technology over other technologies is that they have no static power dissipation, logic levels are fully restored, integration levels are high, and rise and fall transition times are of the same order.

VLSI and Nanotechnology go almost hand in hand. In VLSI, we convert a circuit into a chip-level design by integrating everything onto a small silicon chip area. This is where the device-level physics and nanotechnology comes into picture.

The device-level physics deals with what actually happens when we pass current through a material, its conductivity, electron mobility, behavior at different.

temperatures and other operating conditions. This branch also studies different materials for fabricating semiconductors. Now many materials such as GaAs, InGaP etc have been found which replaces Silicon and Germanium as the only option. All of these have their own advantages and disadvantages.

To support the ever-increasing density on the same chip area, the device physicists need to be thus, a few steps ahead of designers. They need to check (here's where Nanotechnology starts) what happens as you scale the dimensions of the circuits more and more. What should be the ideal bias voltages? How much power will it dissipate? Will the circuit become faster or slower? These are key metrics today, as all of us want smaller, low power and fast gadgets.

Actually now the VLSI design engineers are facing new problems as the integrated chips increase in density with the device size shrinking. For example, the electrons are jumping the gap between metal layers. One common solution is to introduce new types of metallic materials into the chip. However, this is not a sufficient and viable solution in the long term. Actual nanostructures, such as current carrying carbon nanotubes for wires, need to be introduced into the chip to handle the various problematic cases.

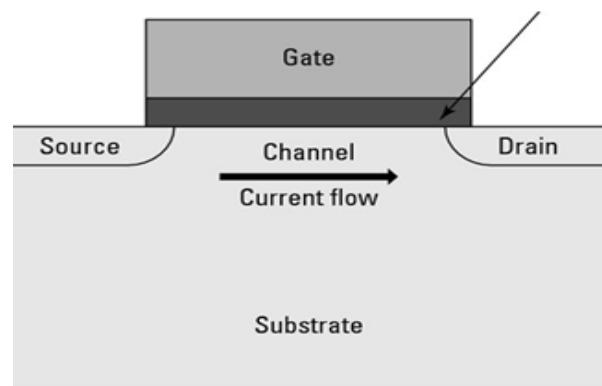
After more than three decades of research and experience in chip making, VLSI design engineers had developed certain DRC (Design Rule Checking) methods to confirm that a circuit will work with a certain technology. Software tools such as those of Cadence and Synopsis helped designers quickly establish the stability and correctness of a circuit design.

However, with nanotechnology this method of checking a circuit is no longer enough due to quantum effects such as tunneling from one metal layer to another.

Integration of nanostructures and CMOS technology

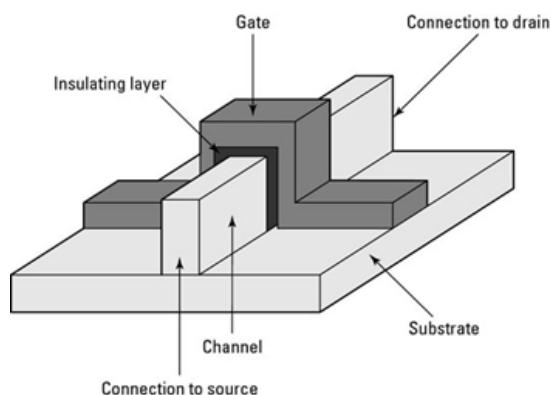
Nanotechnology researchers are continuously working for the improvements in nanolithography and changes in the Nano scale structure of the transistors that are increasing the density of transistors.

The structure of the type of transistors mostly used in VLSI design containing hundreds of millions of transistors on an integrated circuit is called a FET shown in figure1.



Placing voltage on the gate allows current to flow through the channel between the source and the drain. The transistor is therefore acting as a switch. The current flows when voltage is applied to the gate and stops flowing when there is no voltage. As the channel length gets smaller, however, the chance of current leakage through the channel between the source and the drain increases, even when no voltage is on the gate.

Integrated circuit manufacturers have now modified this structure for minimum feature sizes of about 14 nm and less to reduce the amount of leakage through the channel. This modified transistor is called a finFET because of the fin-shaped channel above the substrate shown in figure2.



With the gate on the top and two sides of the channel, the voltage applied to the gate has more effect on the channel than in the conventional FET, which has the gate only on the top surface of the channel. Recently, Intel has announced to implement finFET transistor structure called Tri-Gate on their 22-nm microprocessors. These transistors will provide either reduced power consumption at the same speeds or increased speeds with the same power consumption.

Using a nanowire as the channel of the FET is a method that researchers are exploring to make even more progress in reducing current leakage. A nanowire transistor consists of a nanowire made of semiconducting material connecting the source and drain of the transistor, with a gate controlling the current flow through the nanowire. The nanowire is vertical, like the fin, rising up from the substrate as shown in figure 3.

Using a nanowire as the channel allows us to completely wrap the gate around the channel. This should allow the voltage applied to the gate to have even more control over the channel than when using the finFET. This vertical structure also saves space, allowing a higher density of transistors on a chip. Millions or billions of vertical nanowires could be grown on a substrate.

Pack Transistors on to Integrated Circuits

Researchers are investigating other nano-material's to make smaller transistors and to pack them more tightly in integrated circuits. Two of the leading contenders are Quantum Dots and Carbon Nanotubes.

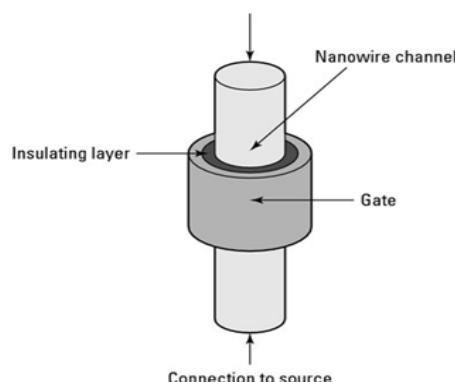
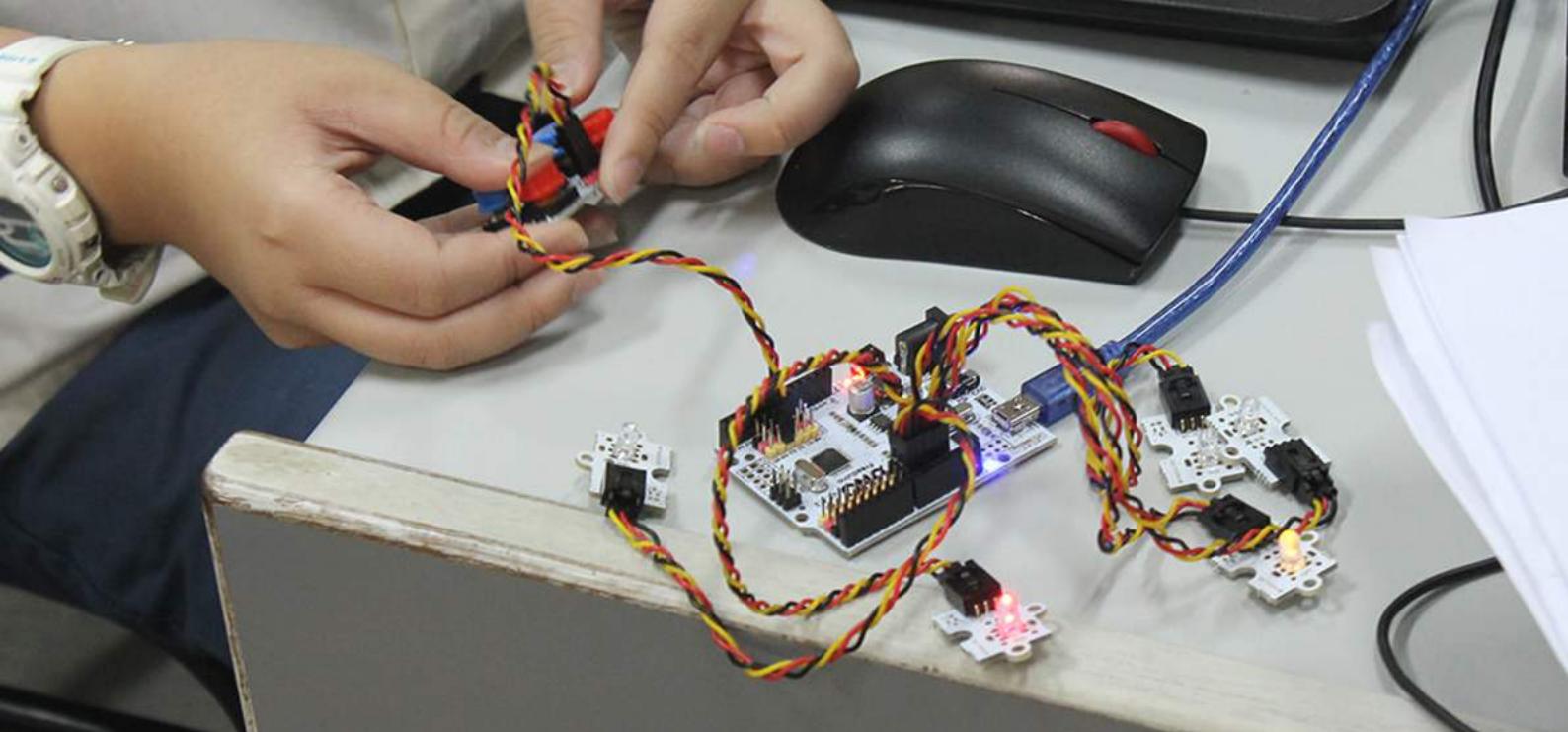


Figure3. The structure of a vertical nanowire FET



STUDENT CONTRIBUTION



Telepathy

Jay Sahasrabudhe
(BE EXTC A, Roll no: 60)

I'm sure you have experienced telepathy at some point or another. Maybe you were thinking of someone and you suddenly got a call from them. Or when two people are together, they might say the same thing at the same time. These are examples of spontaneous mind-to-mind communication. Such instances of telepathy tend to occur frequently between closely related individuals.

The word "Telepathy" has been derived from 'Tele' which means 'Distance' and 'Pathy' which means 'Feeling'. According to definition, telepathy refers to communication from one mind to another by extrasensory means. To elaborate, it is the communication between two individuals, separated over a distance, without the use of the five senses known to us.



Fig 1. Human Representation of Telepathy

There has been a lot of debate over telepathy and its scientific legitimacy. Until recently, telepathy - the direct communication between brains - was something reserved for sci-fi movies. A group of scientists from Harvard University conducted an experiment in 2014 to test the authenticity of telepathy, and to provide an answer to the question- Is telepathy Real?

What Was The Experiment?

The aim of the experiment was to demonstrate the conscious transmission of information between human brains without intervention of sensory systems. The development of brain-computer interfaces (BCI) and non-invasive computer-brain interfaces (CBI) has provided an important element for the creation of brain-to-brain communication systems. These technologies, BCI and CBI, were combined to bring about non-invasive, computer-mediated brain-to-brain (B2B) communication between subjects.

For the purpose of the experiment, four individuals were selected. One individual acted as the 'emitter' while the other three acted as 'receivers'. Computer mediated brain-to-brain transmission was carried out from Kerala, India (where the emitter was located) to Strasbourg, France (where the receivers were located). Participants were asked to focus on the data or words that they wished to send. The signals that their brains generated were then interpreted by electroencephalogram (EEG) devices and then the data was emailed.

Thus, an email containing streams of binary sequences which encoded the words, "hola" and "ciao" was sent from Kerala to Strasbourg, where the receiver was located.



Fig 2. Minion

On receiving the message, de-cyphering was used to decode the message. Transcranial magnetic stimulation (TMS) technology was then used to send signals through the scalp of the recipient. These signals looked like bright flashes of light in the recipient's vision, which was successfully interpreted by the participant like a mental Morse code.



Fig 4. Dog



Another experiment, conducted in 1971 showed distance is not a barrier when it comes to telepathy. The experiment was conducted by astronaut Dr. Edgar D. Mitchell during the Apollo 14 mission. This experiment was not authorized by NASA and was not made public till the mission was completed. The experiment was conducted with four recipients on Earth, 150,000 miles below.

Mitchell concentrated on sequences of twenty-five random numbers. He completed 200 such sequences. The mean chance of the recipients guessing the sequences correctly was 40. Two of the recipients guessed 51 correctly. This greatly exceeded Mitchell's expectations, but still was only moderately significant. Also, it did not have any scientific proof and hence could not be held noteworthy.

Telepathy often occurs in incidents of crisis where a relative or friend has been injured or killed in an accident. An individual seems to be aware of the danger to the other person from a distance. Such information seems to come in different forms; in dreams, visions, mental images, or in words that pop into the mind.

Some incidents involve apparent telepathy between humans and animals. Notice how your dog always seems to know when you are standing outside the door?

Now that we know what is shown in movies is not all fiction, we need to understand that some of it probably is. There's surely a lot more steps involved in real telepathic conversations compared to what we see on the television. Nevertheless, we should accept that the fact that this experiment worked is huge.

And who knows, someday we'll probably be living in a quiet world where people can chat away on headsets without having to say a thing; where telemarketers wouldn't have to get their throats all dried up because of all the talking; and where the whole scenario would be different because people would no longer require mobile phones to communicate.

Brain Chips: A Review

Chinmay Tompé
Dhairya Upadhyay
TE EXTC B

ABSTRACT

We have long used mechanical devices to compensate for physical disability. Soon, however, it may be possible to augment mental capacity-to add memory and upgrade processing power. It's only a matter of how soon will this technology roll out and what laws and protocols will have to be made.

General Terms

Brain chips or Brain implants or neural implants are technological devices that connect directly to a biological subject's brain – usually placed on the surface of the brain, or attached to the brain's cortex.

Keywords

Brain-Chip-interface;
EEG; Cyber kinetics; Hippocampus; MEMS (Micro Electrical Chemical System)

I.INTRODUCTION

The human brain continues to be widely undiscovered .Of all the objects in the universe, the human brain is the most complex: There are as many neurons in the brain as there are stars in the Milky Way galaxy .In an interview ,Stephen Hawking, the noted physicist recently fretted that, unless we start to genetically engineer ourselves, humans will not keep up with the evolving pace of computer intelligence. In this paper, we shall look at the advancements in Neuroscience so far and what the future holds for humanity.

II.TIMELINE

1875: Richard Canton first discovers electrical signals on surface of animal brains
1929: Hans Berger publishes his first paper on experiments with EEG waves in a human. With this, he establishes the brain's capacity for electric signaling
1950s: Dr. Jose Delgado, a neurosurgeon at Yale University, 1972: The cochlear implant, considered the first successful neuro motor prosthesis
1973: Jaques Vidal, an electrical engineer at UCLA, publishes one of the first papers examining the possibility of a brain-computer interface based on tapping into natural electrical signals (EEG), which he studied extensively
June 2004: The first human is implanted with a brain-computer interface, Cyberkinetic's Brain-Gate™.invents the Stimoceiver, an electrode device that can be controlled wirelessly by FM radio. He tests it in the brain of a bull and is able to make the animal charge and change direction by the pushing of different buttons.

III.CONCEPT OF BRAIN CHIPS

3.1 Brain chips are made with a view to enhance the memory of human beings, to help paralyzed patients, and are also intended to serve military purposes. It is likely that implantable computer chips acting as sensors, or actuators, may soon assist not only failing memory, but even bestow fluency in a new language, or enable recognition of previously unmet individuals. The progress already made in therapeutic devices, in prosthetics and in computer science indicates that it may well be feasible to develop direct interfaces between the brain and computers.

B. Should such a unit, referred to here as brain chip, exist, it is likely to have evolved as an improved version of its predecessor, the cerebellar chip. It is therefore useful to examine carefully the basic anatomical architecture of the cerebral cortex in context of the cerebellar chip. The hippocampus is a gateway to memories. Short term memories are stored in the frontal cortex and are eventually transferred to long term memory and this is where the hippocampus comes into picture .Placing the chip in the hippocampus can change the output of it and hence alter memory. This is achieved by accessing the electrical signals in the synapses of the neural network through BCI (Brain-Chip-Interface) s which are hybrid systems where brain cells and chip-based MEMS (micro electro mechanical systems) establish a close physical interaction allowing the transfer of information in one or both direction.

3.3 Neurons conduct information as electrical impulses, internal fluctuations in voltage. Normally they do this to communicate amongst themselves, however any electrical device can potentially 'speak' the language of a neuron if only it could listen closely enough. It is by listening closely that brain-computer interface technology is able to interpret the languages of our neurons.

Sensing devices for brain-computer interfaces come in two basic flavors, those internal to the skull, and those that are external. External devices sense electrical activity through the layers of skin, blood, connective tissue, and bone that separate them from their queries. However, single nerve pulses are too small and brief to be felt by a sensor outside of the head. As a result, external devices are limited to sensing whole areas of the brain at a time, limiting the usefulness of the data that they collect. Internal sensing devices, or brain chips, can listen much more closely. Placed into the brain itself, the electrode arrays of these chips come into direct contact with live neurons, and so can sense single neuron impulses. Current methods of direct neuron sensing being tested in humans use arrays of as many as 100 micro-electrodes, recording the electrical activities of up to 96 different neurons or small groups of neurons at a time.

4. APPLICATIONS

4.1 The ability to form direct, bi-directional links with the human brain will open up the potential for many new application areas. Scientists predict that within the next thirty years neural interfaces will be designed that will not only increase the dynamic range of senses, but will also enhance memory and enable "cyberthink" - invisible communication with others and technology . But are these claims realistic, and should they be taken seriously? Here we will look at how a fundamental shift in thinking may pave the way for greater developments in this field, and review the current state-of-the-art of implantable technology, its potential as an enhancement tool, and the likelihood that people would undergo implantation.

4.2

Medical Applications

Brain chip finds a major use in this industry. Strategically placed in the brain, that could prevent epileptic seizures or allow someone who has lost a limb to control an artificial arm just by thinking about it. It may sound like science fiction, but researchers are developing devices that can interpret signals in the brain and stimulate neurons to perform correctly, advances that might someday make it possible for a tiny computer to fix diseases or even allow a paralyzed person to control a prosthetic device with his thoughts. Further, it can cure diseases like Alzheimer's and Parkinson's.

4.3

Memory chips embedded in the brain can not only restore lost memory but when implanted in our brains that would use our neurons like a search engine and enhance human memory. This would allow humans to structure their memory and reach new heights of intelligence thus helping us take the next step in our evolution: cyborgs.

Telepathy-a thing from science fiction could be reality and our brains will be a part of the Internet of Things. This will lead us to the 'Neuro-Revolution'

4.4

Implantable chips are the penultimate identifier, next to DNA, which is what makes them scary. The technology isn't there yet, but it will be. Future proposals to use chips to track prisoners, implantable devices in the military to enhance the abilities of soldiers, and cyberimplants allowing information workers to communicate with machines will make current concerns about digital privacy and medical information seem trifling. The potential for totalitarian mind control may be farfetched, but future bio brain implants could be like today's digital cable--all those channels, but nothing on.

Further, such implants can help cure innumerable diseases like Parkinson's and Alzheimer's.

Field-In a tracking sensor application that could only have been developed by the generation raised on lemon-scented

Pledge commercials, the U.S. Defense Advanced Research Projects Agency is developing its own version of pixie dust for military applications, a tiny cloud of dust-mote sized sensors labeled Smart Dust.

Though faster data transmission technologies are currently being developed, the stream of data collected by brain chips reach at least 1MHz, or 1Mbps. That's a million pieces of information every second, which is as faster than most Cable and DSL internet connections! Transferring all of that data from inside the skull to out is currently the most dangerous aspect of having an output brain chip. Why? Because right now it's done by cable. Wires connect the brain chip to a metal data-jack that is screwed into the recipient's skull, stabilizing it. In order to interface with any computer, a recipient must physically attach a wire to the data-jack.

5. FUTURE

In standard computing, information is presented and transmitted using the binary system of one's and zeros. The recent emergence of quantum computing research, though currently in infancy, could potentially revolutionize speed, accuracy, and efficiency of computer technology. "Because [quantum computer technology] is not just a one or zero but can be both as well as all the states in between, it becomes an enormously powerful way to do parallel computing" (Walker). This advancement could help hone in on, and accurately transmit, the electrical signals of the brain.

VI. ACKNOWLEDGMENTS

Our thanks to the experts who have contributed towards development of this paper.

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AI & the future



Fig 1. AI representation

Artificial intelligence is a branch of computer science that work and react like humans and aims to create intelligent machines.

Some of the activities computers with artificial intelligence are designed for include:

- Knowledge
- Reasoning
- Problem solving
- Perception
- Learning
- Planning
- Ability to manipulate and move objects

High knowledge of engineering is the core part of artificial intelligence. Machines can act like humans only if they have abundant information relating to the topic in which they are used for. Artificial intelligence must have access to objects, categories, properties and relations between all of them to implement knowledge engineering. Initiating common sense, reasoning and problem-solving power in machines is a difficult and tedious approach.

One of the most important component of artificial intelligence is machine learning. Learning without any kind of supervision requires an ability to identify patterns in streams of inputs, whereas learning with adequate supervision involves classification and numerical regressions. Classification determines the category an object belongs to and regression deals with obtaining a set of numerical input or output examples. Machine learning has the capability to deduce different aspects of the world while the computer can be used to analyze certain sub problems like facial and gesture recognition.

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Robotics is a field where artificial intelligence will be used to a great extent in the near future. Many visionaries have predicted a future where advanced work like assembling of important machines, functioning of huge factories will be handled by such advanced robots. Robots require intelligence to handle tasks such as object manipulation and navigation, along with sub-problems of localization, motion planning and mapping.

Tasks which possess risk to human life or tasks which are too basic for humans can be done using the combination of robotics and artificial intelligence. This is about the advantage of artificial intelligence, but what if the artificial intelligence becomes so smart that it out smart's the humans itself? Sounds scary right?

One of the great visionary's i.e. Elon Musk has been working on artificial intelligence for a long time has come to a conclusion that more study must be done on A.I before its implementation because he fears that A.I will act as a threat to the human race and has made some valid points to prove his statement.

Facebook CEO Mark Zuckenberg has had a contrary view of artificial intelligence. He believes that artificial intelligence will help humans to a great extent and has already started a very high level of research at the headquarters. He says that he also has implemented A.I at his home and has had a great experience.

Recently certain researchers claimed that a robots with A.I created their own language with which they started their communication. This created a havoc amongst the researchers and they have claimed to stop the process for further research proving Elon right. So does this mean that future with artificial intelligence will make human life simple or will it be a threat to the human civilization? No one knows yet!

Capture The Moment

Riki Jha
SE EXTC A

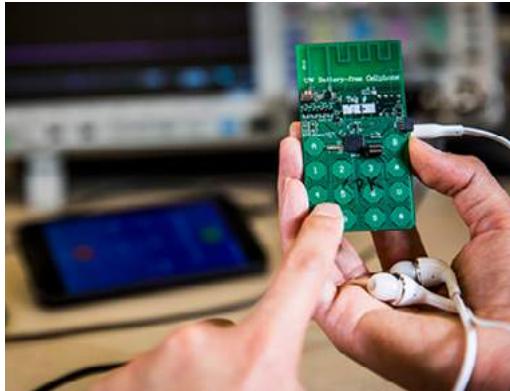


Fig 1. Photo: University of Washington

Batteries can be a real drag. They're expensive and must be constantly recharged. Though some battery-free sensors can transmit small amounts of data, but most consumer electronics today still rely on bulky batteries to store power.

A team from the University of Washington has built a battery-free cellphone that can harness power from radiofrequency (RF) waves sent to it from a nearby base station. The phone not only harnesses the power it needs to operate from those waves, but also can place a voice call by modifying and reflecting the same waves back to the base station, through a technique known as backscattering.

The UW team has shown their device (built from off-the-shelf components) which can use harvested power to place a call from a distance of 9.4 meters away from a customized base station. They also built a version outfitted with photodiodes that collect ambient light to power the device, allowing them to place a call from a distance of 15.2 meters.

To place or receive a call, the entire device consumes just 2 to 3 microwatts of power. The group's design supports only voice calls, there's no data plan, but its creators' say it would still prove quite useful in certain circumstances.

"Imagine a scenario where your phone died but you could at least have enough power to make a 9-1-1 call," says Vamsi Talla, who built the phone while a post-doc in electrical engineering at the University of Washington. "That could be a life-saver."

Many of today's passive sensors transmit data only occasionally—perhaps every minute or so, due to power constraints. In the case of RFID tags, some passive sensors must be very close to a reader to harness enough power to transmit a message.

In a conference paper published earlier this month; Talla, who now serves as chief technology officer of Jeeva Wireless, and his colleagues call their design "a major leap" towards the creation of battery-free devices. Ultimately, they want to build devices that can constantly transmit or receive data and voice calls over long distances without batteries.

"Now we're showing the world that a battery-free device doesn't have to be a sensor, but it can be a whole system where in real-time, you can actually do something useful," Talla says.

Raj Rajkumar, a professor in electrical engineering at Carnegie Mellon University, says the research is "another interesting step in the evolution of wireless power transmission." He also noted that follow-up studies would need to evaluate the safety of transmitting power to mobile devices in this way in the near future.

For now, the UW device only works with customized base stations within close range of the user. Being near a base station may not always be possible for users who need to place an urgent call. But Talla says this could change with the anticipated rollout of 5G networks, in which providers are expected to dramatically increase the density of base stations—at least in cities.

He also expects to achieve greater distances at other frequencies. In their initial tests, the base station broadcast a single tone on the 915 megahertz frequency band to the device.

To place a call, the battery-free phone uses an electret microphone to generate an analog signal which contains a diaphragm with a fixed electrostatic charge. Within the microphone, the diaphragm forms a capacitor with a metal plate. When a person speaks, mechanical vibrations from their voice cause the diaphragm to change shape relative to the metal plate. This affects the capacitance of the device and generates a small voltage.

The microphone connects to an antenna through a RF switch. The voltage from the microphone travels to the antenna, where it directly alters the amplitude of the single tone embedded in the RF wave. The altered signal is then reflected back to the base station using backscattering techniques. These methods reduce the phone's power consumption by three to four orders of magnitude in comparison to a traditional radio.

The phone's design was inspired in part by the Great Seal Bug, a passive surveillance device planted in the desk of the U.S. Ambassador to Moscow by Russian authorities in the late 1940s. The UW phone is also half-duplex, which means a user can either listen or talk, but can't do both at the same time. A microcontroller manages the RF switch, connecting the microphone to the antenna when a user presses a button to talk, and connecting the earphones when the user wants to listen.

To minimize power consumption, the team moved much of the processing that would typically be performed on a phone to their customized base station. Smartphones today contain components that convert analog sound to digital signals before transmission, and other components that convert the digital signals received from a base station to analog sound.

In the UW system, the base station performs these conversions and connects to the nationwide cellular network; forwarding calls or sending signals it receives back to the user. Talla says "the group will continue to refine the technology through a licensing agreement with Jeeva Wireless."

Reference-

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Capture The Moment

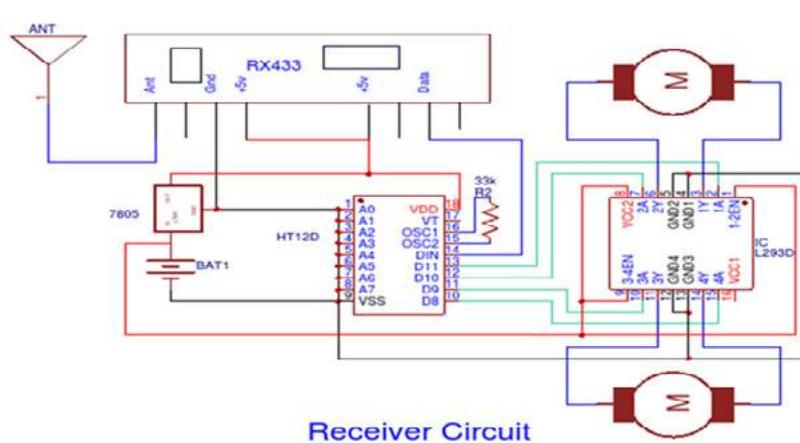
Ankesh Singh (TE B-81)
 Nikhil Vishwakarma (TE B-50)
 Vinodkumar Gupta (TE B-72)

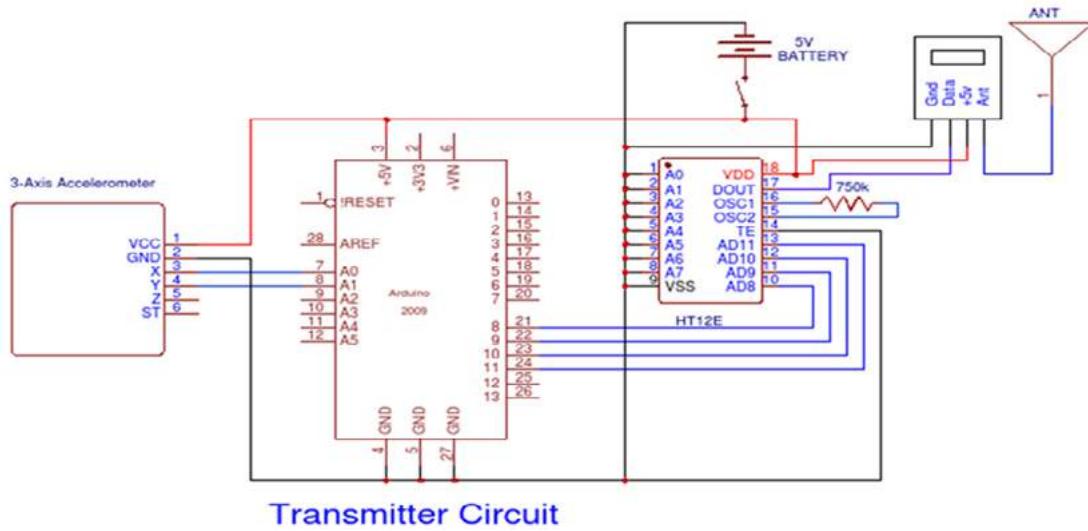
1. Introduction:-

In the existing system, human hand movements are sensed by the robot through sensors and it follows the same. As the person moves their hand, the accelerometer also moves accordingly sensor displaces and this sensor senses the parameter according to the position of hand. In this system, a gesture driven robotic vehicle is developed, in which the vehicle movements and manipulations i.e., handling and control depends on the gesture of the user. In this system, gesture is captured by accelerometer and it is processed by software namely, arduino lilypad and the parameters are sent to arduino lilypad and encoder circuit,

It is further transmitted (transmitter section) by RF433 MHZ transmitter. In the receiver section, the RF 433 MHZ receiver holds down the received parameters and process with microcontroller and gives those parameters to the robotic vehicle so that it acts accordingly to the gesture. By this system, it is possible to achieve processing of long distance. This system is knowingly developed to apply in medical field for nursing assistance to physicians and in surgeries.

2. Circuit Diagram:-





3. Working:-

In this project, a car robot that is controlled by the gestures made by the hand is designed. The working of the robot is explained here.

As mentioned earlier, the gesture controlled robot is a wireless operated robot and has two parts: Transmitter (figure 2), and Receiver (figure 1). When the robot is powered on, the transmitter part, which consists of Arduino, Accelerometer, Encoder and RF Transmitter, will continuously monitor the accelerometer sensor.

This data is captured by the Arduino, which transmits appropriate data to the Encoder, based on the orientation of the Accelerometer.

The parallel data received by the encoder is converted into serial data and this serial data is transmitted by the RF Transmitter.

At the receiver section, the RF Receiver (figure 1), receives the serial data and transmits to Decoder IC. The Decoder will convert the serial data to parallel data and this parallel data is given to the motor driver IC. Based on the data, the movement of the motors, and hence the movement of the robot is defined.

4. Application:-

- Wireless controlled robots are very useful in many applications like remote surveillance, military etc.
- Hand gesture controlled robot can be used by physically challenged in wheelchairs.
- Hand gesture controlled industrial grade robotic arms can be developed.
- These robots are used in medical applications for the purpose of surgery
- These robotics are used in the construction field
- These robotics are used in industries to control trolley and lift.

5. Advantages:-

- It is easy to design and manufacture as all the components are easily available.
- It is portable and hence can be placed anywhere.
- It has low cost of manufacturing.
- The arduino can be reprogrammed if any modification is required.
- Power consumption is less.

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Oreo, the next generation of Android

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BE EXTC

Ever since its release, the Android line of Operating systems has captured the market and is used in many of the Android powered Smartphone devices and watches produced by companies like Samsung, Motorola, Google, HTC, LG and many more. Android OS is preferred because it is not only user friendly but has a good efficiency and has made customization much easier.

So far, Google has played an important role in the development of almost all of the versions of Android Operating Systems. Google, during the solar eclipse unveiled the next version of the Android i.e. Android 8.

The trend of naming Android systems after some desert was continued and thus this new Android version was affectionately called as Android 'Oreo' or Android-O in short.

The developer previews for the Android O was made available to the users since months but the final draft has been released by Google recently. The Android O has a few minor changes and all of these will be mentioned in the article. Starting with the UI changes, well the main interface of the Android 8 systems hasn't changed much. The theme is still similar and moving around the UI is pretty much same as that of Android Nougat (Android 7). The app drawer still exists, the settings menu still occupies the same position and the quick settings work smoothly.

Those who are already habituated to the system won't have trouble using it. Although the settings menu has undergone the most noticeable changes, many of the settings have been moved around, renamed and consolidated to make things a little bit easier. For instance, connected devices are now a single item in the settings menu and the slide out drawer is gone as well.

In addition, many of the settings sub menu items have been redesigned, the apps and notifications settings have been vastly simplified as has the display settings. Most of the stuff can be seen in one sub menu instead of several sub menus and Google did particularly well at making the settings less intimidating. There are also some small UI changes including a slight font change, a design change on the lock screen and changes in the notifications. Several applications have new icons and the status bar is slightly altered.

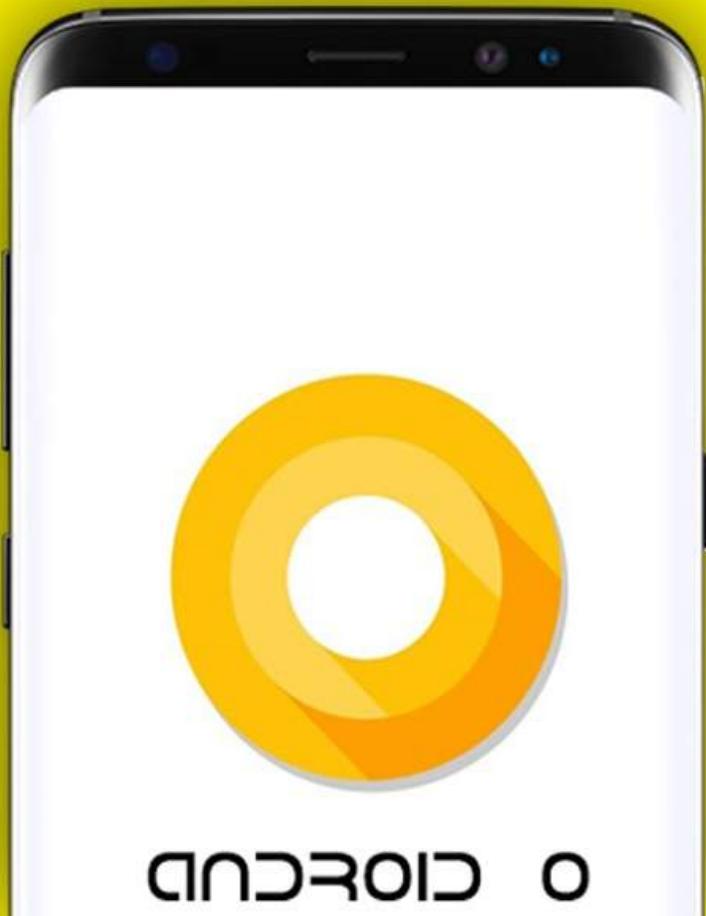
The media notifications will change color based on the thing one is listening to. The quick settings is now light grey colored which makes the UI look little bit cleaner and meshes slightly better with the color of the settings menu, notifications and the Google screen. The quick setting icons, edit buttons and the profile button now rests at the bottom of the click settings instead of at the top. People are although disappointed with the new emoji designs, gone are those popular blob designs in favor of the more colorful, rounder designs.

Another big change is adaptive icons, this is a customization feature that allows you to change the shape of all of your icons, there are five options right now but it is predicted that some are coming up soon. Android Oreo received plenty of new features and the most important one is the picture in picture mode. This puts whatever video one is watching into a window that can be moved around the screen. This feature will surely provide a good multitasking environment to the users. Before Android Oreo, this feature was only available in the Samsung line of smart phones. Notification dots and badges are the other features of Oreo.

Long press on a certain app icon allows us to see the notifications specifically for that app only. Also the option of snoozing notifications for a certain app is now made available. Android Oreo has notifications channels which will allow only certain notifications to be displayed while ignoring others, for instance in Google Allo one can turn on notifications for messages but turn off the notifications for new available features. Another new feature is called as Smart Text Selection, Android will now try to determine context of any text that one highlights.

If the highlighted text is an address then Google maps will open up or if it is phone number an option to call directly will be provided, unknown entries will get a general web search option. Android Oreo has also revamped installing APKs (Android Application Package) from unknown sources. Users will be able to give individual applications permissions to download APKs. The system will remember from where the user got the APK and it will only allow the APK's installation if it was downloaded from a trusted app. Another big feature of Android O is under the hood; There are tons of things a user can't see but they are there and weren't before, there are the usual array of performance improvements and bug fixes from Nougat. Android O now supports wide color gamut (HDR colors) for apps, this feature was available in some devices but it will be made available to all devices after Android Oreo, it is also easier to implement this feature with the help of Android Oreo. Although it is important to note that the screen of the device must be HDR compatible.

ANDROID OREO



There are also a bunch of Bluetooth Codecs in Android Oreo and this is one of the more under-rated features of the Android O. The new codecs include AAC, aptX, aptX HD and Sony's LDAC that means Android will be natively compatible with highest end Bluetooth headphones out there. Considering how many OMS (open mobile systems) are removing the headphone jack and pushing Bluetooth use, this update makes sense. Google has also re-optimized how background tasks operate, they will have less freedom to operate in the background than they had before.

Google play protect launched just before Android 8 was announced and this isn't an Android 8 specific feature but it will surely improve the security of the system. Finally these are few things app developers can do now, some of the options available were that of notification dots which was mentioned earlier.

The big feature people are talking about is the auto fill API, this will give password managers and other applications better access to login boxes and other inputs fields in order to automatically fill them with information. Another interesting feature is called as WI-FI aware, this allows Android Oreo users to communicate with each other without actually being connected to a similar network. This could be pretty useful in public. Most of the new API (application program interface) fall into three categories; it is either a new API that adds new features to apps, a new API to help developers play with the newly supported hardware or API improvements to make old stuff much easier. Examples of API are picture in picture mode, auto fill, notification channels, etc. A lot of these features have to be added into apps by developers before they work properly. A few of the hardware additions include better support for hardware keyboard and mice that includes navigation hotkeys for moving around apps that are designed for touch screens and this is especially important for Chrome books that support Android apps.



After all picture in picture mode was in Android Nougat as an Android TV feature so it is not actually new. Additionally, not all of the mentioned features work on all phones, for instance app decks and app decks HD won't be officially included in Nexus 5x or Nexus 6p. It is not a bad update by any stretch of imagination but it also wasn't that big.

Thankfully, most of the new features and background stuff should make it on most devices that managed to make it to Android Oreo.

In addition, Android Oreo will have better support for multiple displays, computer mice and a whole lot more. Most of the new features are just to make old stuff much easier. Google has provided APIs to make text size easier to code, adjust margins and padding along with things like advancements to media player, web view, animations, media recording and a lot more. This is definitely going to help small teams of developers and independent developer's code better apps.

Wrapping up things, it can be thus said that Android O is a pretty extensive update. It actually feels like a larger update coming to Android Oreo from Android Nougat than it was going to Android Nougat from Android Marshmallow. There is a lot of framework being put in Android O that is destined to provide a lot of fun stuff for the coming years. The new notification features, the Bluetooth codec support, the new adaptive icons and the support for all of the new hardware are the most popular features amongst masses. There seem to be heavier emphasis than usual on cleaning out the junk and smoothing out the rough edges. The quick settings colors put it more in line with the rest of the UI, the background task management has been shortened and tightened. Google Play protect helps with app security and all related stuff. There really isn't one feature or thing that stands out in particular but Android Oreo feels more cohesive than older versions of Android.

Though a lot of people don't like the new emoji's. There wasn't really a hallmark feature this year like multi-window last year or doze mode in marshmallow.

IOT Based Car System

Group Members:

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Chinmay Tompe-TE EXTCB-45
Pranay Vora-TE EXTCB-51

A PRODUCT TAILOR MADE FOR OUR CAR & FAMILY WITH A PERSONALIZED
'WATCHMAN'
INSTALLED IN OUR CAR TO KEEP OUR LOVED ONES SAFE

Introduction:

- 1)The government has been advising its citizens not to drink and drive for decades, but we are not following it properly and facing serious accident issues in the world.
- 2)Also when the car is handed over to a driver, car owners' are not paying attention towards cars different parameters and drivers habits of drinking alcohol.
- 3)Also for accident alert or for security from theft we can track our car's location.
- 4)So it will become important to track a real time location and different parameters of car, which can be easily implemented by IOT concept.
- 5)So, we are going to make a small prototype for tracking a real time location of car and alert system for verification of driver, whether he/she is drunken or not.

Block Diagram:

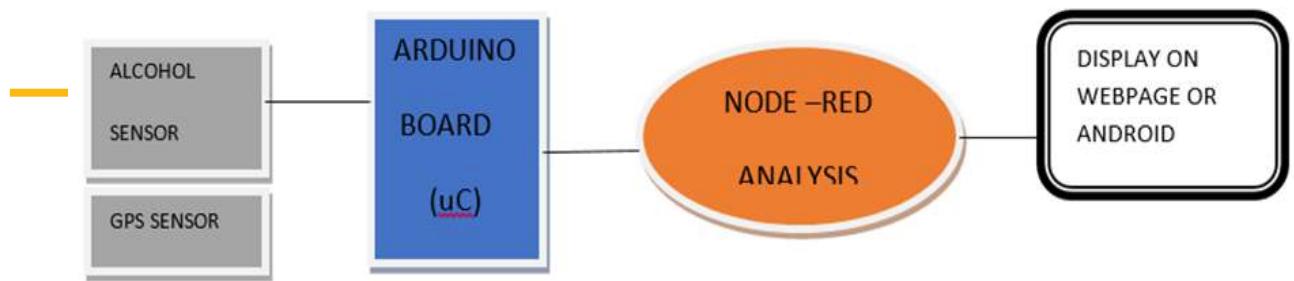


Fig 1. Block Diagram

Working:

- 1) First is a Breathalyzer system located either on the steering wheel or the driver's side door that is capable of detecting alcohol in the air particles around it. This means that even if the driver doesn't have the foresight to blow into the device, or doesn't want to, the system will still be able to determine how many drinks he or she has imbibed.
- 2) After sensing it will collect GPS parameters from sensor serially.
- 3) After sensing presence of alcohol it will send parameters to node red, where it will get processed and send the parameters to display on web page.

Applications:

- 1) Get real time updates on every moment of your car on android phone or web page.
- 2) We can find out our car easily in giant parking space.
- 3) We will get instant alert updates of whether driver is drunk or not.



Fig 2. Features for car security

Advantages:

- 1) We are using a node red which is a future of industrial IOT.
- 2) We can easily interface microcontroller with cloud and view on web page like freeboard or things speak.
- 3) Gather and make the data available in case of emergency.
- 4) This data can be shared with police and court in case of any emergency, etc.
- 5) This data can be used by the vehicle manufacturer to improve the safety and other design factors.
- 6) This can be used by the R&D engineers to understand the dynamics of vehicle in better ways.

Disadvantages:

- 1) We will need an internet connection for transmitting parameters.
- 2) Circuit component is very much costly for a single product, but for mass production SOC will reduce the cost effectively.

Future Scope:

- 1) We can add more sensors for analysis of temperature and humidity inside engine, speed of the car, level of petrol in the tank, etc.
- 2) We can create a virtual boundary i.e. Geo fence to protect our car from theft and get instant alerts.

Automatic Irrigation System

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TE EXTC-B

Introduction:

Irrigation is an artificial application of water to the soil, land. It is used to assist in growing of agricultural crops, maintaining of landscape and revelation of disturbed soil in dry areas and during period of inadequate rainfall.

Types of irrigation

- Surface Irrigation
- Drip irrigation
- Sprinkler Irrigation.

The problem caused by these traditional methods of irrigation are:

1. Over irrigation.
2. Lot of manpower is required.
3. Fields situated miles away from home require extensive travel time, sometimes several times in a day to start and stop the pump.

With the water requirements in irrigation being large, there is a need for a smart irrigation system that can save about 80% of the water. This prototype aims at saving time and avoiding problems like constant vigilance. It also helps in water conservation by automatically providing water to the plants/ gardens depending on their water requirements. It can also prove to be efficient in Agricultural fields, Lawns & Parks. As technology is advancing, there is always a chance of reducing risks and making work simpler. Embedded and micro controller systems provide solutions for many problems. This application precisely controls water system for gardens by using a sensor micro controller system. It is achieved by installing sensors in the field to monitor the soil temperature and soil moisture which transmits the data to the microcontroller for estimation of water demands of plants.

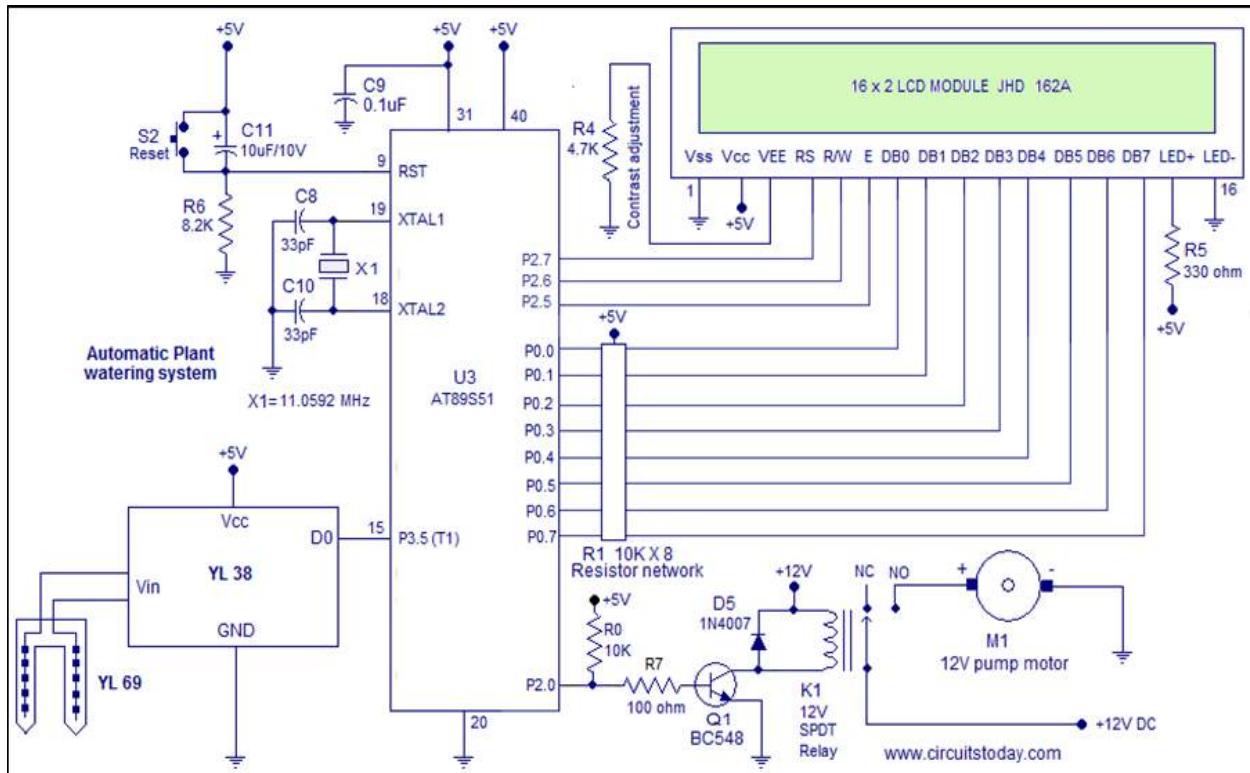


Figure 1. Soil moisture sensor and LCD interfacing Circuit

1. As a solution to the above problem we have our project which is about a moisture-sensing automatic plant watering system using 8051 microcontroller. The system simply senses the moisture level and switches on the irrigation pump when the moisture is below the set limit. The system switches off the pump when the moisture rises above the set point.

2. The status of the pump will be displayed on the 16x2 LCD and the system is connected to GSM module through which an SMS is sent to the farmer regarding the status of the pump.

3. Our project helps to reduce the manpower along with this it will also help to reduce the travel time to turn on/off the pump, i.e., increasing the mobility of the system by using the GSM Module.

4. Another feature of this project is that we can turn on/off the pump by just sending a SMS.

5. The interfacing of GSM module with 8051 is done through the MAX 232 IC. Here both the devices are communicating serially.

6. The MAX232 IC is used because RS232 port of GSM module will have RS232 logic level but 8051 can have only TTL logic as input/output, then operation of conversion of RS232 logic to TTL logic and vice-versa is done by this MAX232 IC.

The circuit can work on both dc as well as ac power supply. For AC supply we will use a 12V step down transformer then a rectifier circuit along with a voltage regulator LM7805 for 5 V to drive a relay of 5V to control the pump.

For dc supply of 9V we will use a relay of 9V to drive the pump.

Application:

The project help to reduce the manpower required for irrigation of the field.

The field can be monitored from far distance due SMS Systems.

Also pump can be operated from far distance which reduces the time required for going to the field and turn on/off the pump.

The wastage of water due to traditional methods of irrigation is also reduced to greater extent by this project

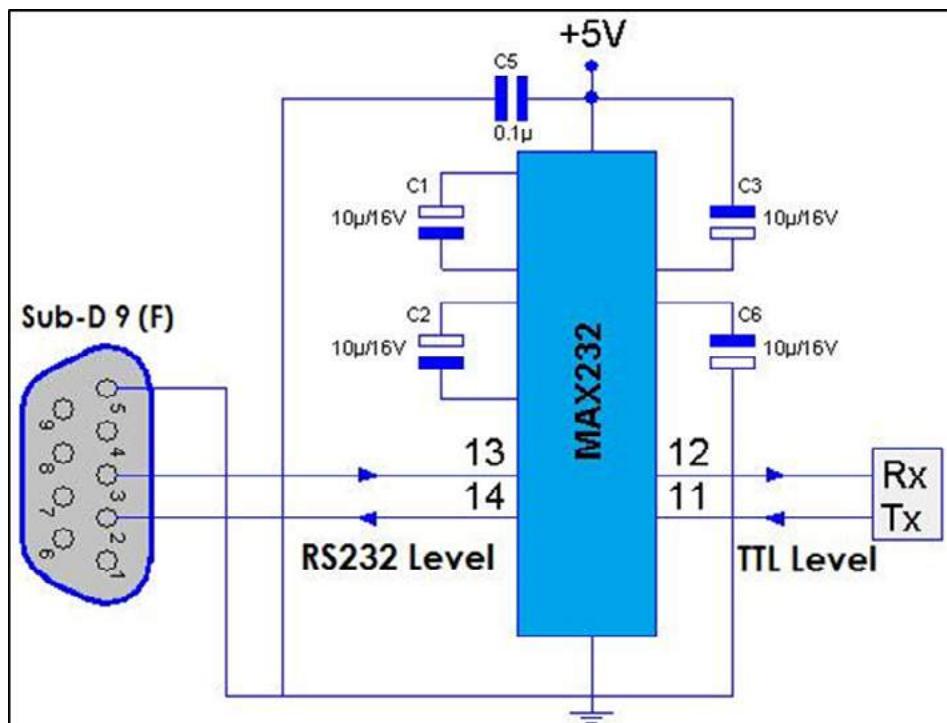


Figure 2: interface daigram

Advantages:

The project help to reduce the manpower required for irrigation of the field.

The field can be monitored from far distance due SMS Systems.

Also pump can be operated from far distance which reduces the time required for going to the field and turn on/off the pump.

The wastage of water due to traditional methods of irrigation is also reduced to greater extent by this project

Disadvantages:

- The system can be very expensive for large fields.
- Self-help compatibility is very low with very big scale systems, which are very complex.
- System needs continuous power supply or frequently rechargeable batteries are used.

Stress meter

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 URJA TIWARI (48) - SE EXTC B
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Introduction:

Stress meter lets us access our emotional pain in an electronic format. With the help of this device one can know stress levels of the human body. If the stress is very high, the stress meter gives a visual indication through a Light Emitting Diode(LED) display along with a warning beep. The gadget is small enough to be worn around the wrist.

The gadget is based on the principle that the resistance of the skin varies in accordance with your emotional states. If the stress level is high the skin offers less resistance, and if the body is relaxed the skin resistance is high. The low resistance of the skin during high stress is due to an increase in the blood supply to the skin. This increases the permeability of the skin and hence the conductivity for electric current.

This property of the skin is used here to measure the stress level. The touch pads of the stress meter sense the voltage variations across the touch pads and convey the same to the circuit. The circuit is very sensitive and detects even a minute voltage variation across the touch pads.

Working:

The circuit can be assembled on a small piece of perforated board. Use transparent 3mm LEDs and a small piezobuzzer for audio-visual indications. Enclose the circuit in a small plastic case with touch pads on the back side. Two self-locking straps can be used to tie the unit around your wrist.

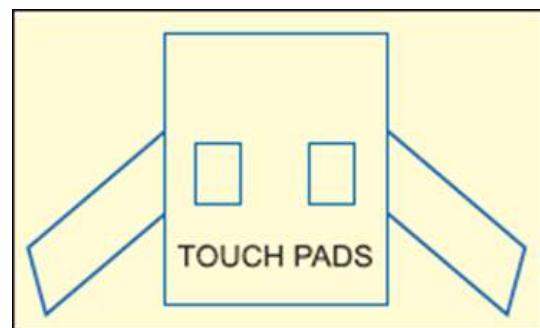


Fig 1: Self-locking straps

After tying the unit around your wrist (with touch pads in contact with the skin), slowly vary VR1 until LED1 glows (assuming that you are in relaxed state). Adjust VR2 if the sensitivity of IC1 is very high. The gadget is now ready for use.

Circuit Diagram:

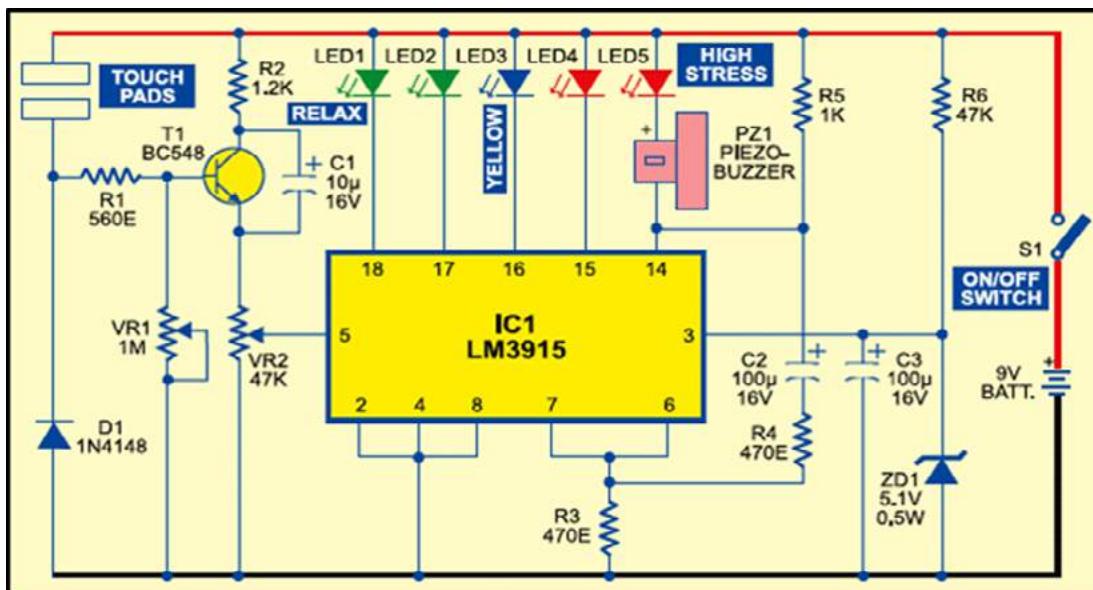


Figure 2: complete circuit diagram

The circuit comprises signal amplifier and analogue display sections. Voltage variations from the sensing pads are amplified by transistor BC548 (T1), which is configured as a common-emitter amplifier. The base of T1 is connected to one of the touch pads through resistor R1 and to the ground rail through potmeter VR1. By varying VR1, the sensitivity of T1 can be adjusted to the desired level. Diode D1 maintains proper biasing of T1 and capacitor C1 keeps the voltage from the emitter of T1 steady.

The amplified signal from transistor T1 is given to the input of IC LM3915 (IC1) through VR2. IC LM3915 is a monolithic integrated circuit that senses analogue voltage levels at its pin 5 and displays them through LEDs providing a logarithmic analogue display. It can drive up to ten LEDs one by one in the dot/bar mode for each increment of 125 mV in the input.

Here, we've used only five LEDs connected at pins 14 through 18 of IC1. LED1 glows when input pin 5 of IC1 receives 150 mV. LED5 glows when the voltage rises to 650 mV and LED5 flashes and piezobuzzer PZ1 beeps when the stress level is high. Resistors R4 and R5 and capacitor C2 form the flashing elements. Resistor R3 maintains the LED current at around 20 mA. Capacitor C3 should be placed close to pin 3 for proper functioning of the IC. Zener diode ZD1 in series with resistor R6 provides regulated 5V to the circuit.

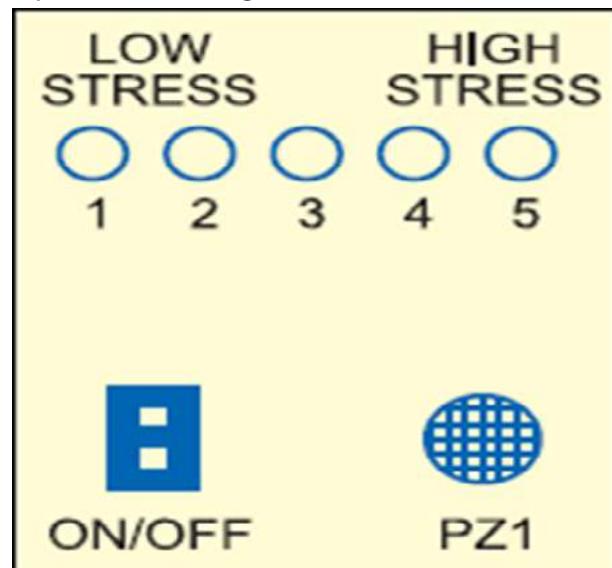


Figure 3: Display panel

ADVANTAGES:

4. Portable
5. Low cost
6. Low power consumption
7. Highly sensitive to small currents

DISADVANTAGES:

1. Less accuracy
2. Output is not measurable

APPLICATIONS:

- 1.Stress level indicator
- 2.For measuring resistance of skin.
- 3.To know mental state of person.
- 4.In diagnosis of excessive sweating (Hyperhydrosis).
- 5.It can also be used as a lie detector.

FUTURE SCOPE:

Stress meter can be further developed to design equipment like lie detectors,skin response meters,skin resistance meters,fitness meters,grip scopes etc..therefore this model if further developed can be used in medical field,forensic department and it even helps in improving the body fitness.

REFERENCE:

<http://electronicsforu.com/electronics-projects/hardware-diy/stress-meter-circuit>

Microcontroller based alcohol detector

Harish Chaurasiy (76)
Pratiksha Gore (69)
Ayush Jaiswal (68)

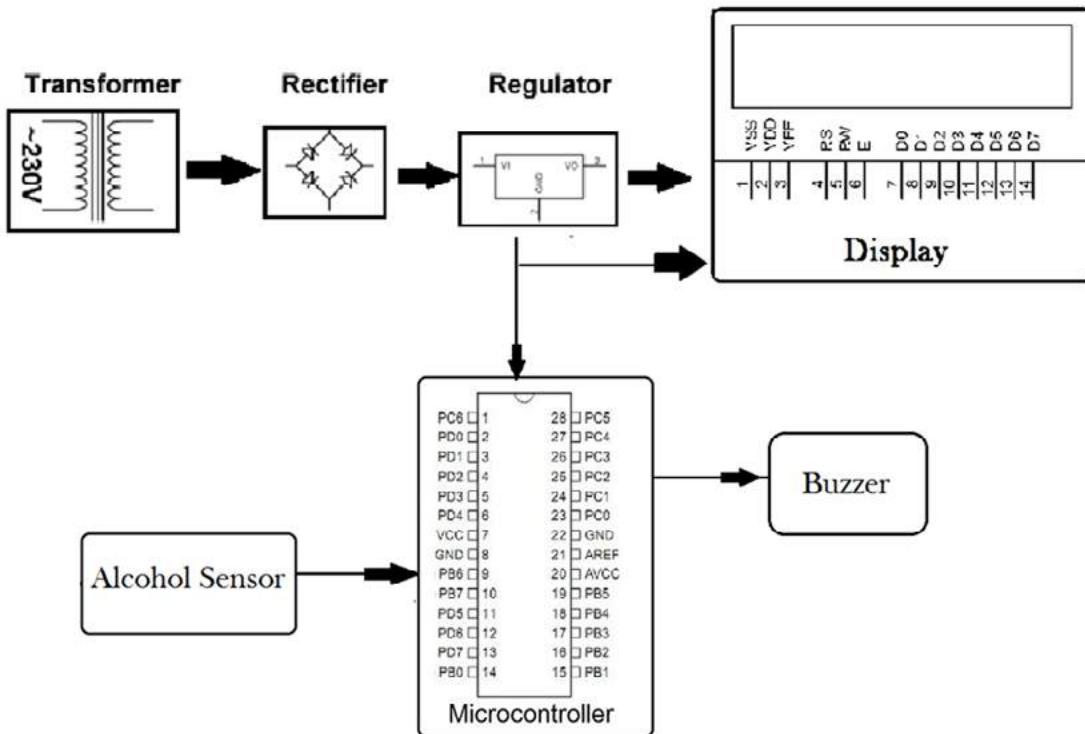
Introduction:

We usually come across drink and driving cases where drunk drivers crash their cars under the influence of alcohol causing damage to property and life. So here we propose an innovative system to eliminate such cases. Our proposed system would be constantly monitoring the driver breath by placing it on the driver wheel or somewhere the driver's breath can be constantly monitored by it.

So if a driver is drunk and tries to drive the system detects alcohol presence in his/her breathe and locks the engine so that the vehicle fails to start. In another case if the driver is not drunk while he starts the vehicle and engine is started but he/she drinks while driving the sensor still detects alcohol in his breath and stops the engine so that the car would not accelerate any further and driver can steer it to roadside.

In this system we use an AVR family microcontroller interfaced with an alcohol sensor along with an LCD screen and a dc motor to demonstrate the concept. So here the alcohol sensor is used to monitor user's breath and constantly sends signals to the microcontroller

The microcontroller on encountering high alcohol signal from the alcohol sensor displays alcohol detection note on LCD screen and also stops the dc motor to demonstrate as engine locking. The system needs a push button to start the engine. If alcohol is detected at the time of starting the engine the engine does not start at all. If alcohol is detected after engine starting, the system locks the engine at that time.



Advantages and disadvantages: Application:

- This method of analyzing or detecting the presence of alcohol in breath is relatively a quick analysis as compared to other techniques.
- The sensor used in this project are small in size not so bulky hence the system can be carried.
- The system isn't police dependent.
- This sensor is partial pressure sensitive and therefore may change sensitivity with change in altitude and elevation.
- The system cannot prevent accidents due to other fault however if any mishap happens the system sends a message to family member.

- It can be used in various vehicles for detecting whether the driver has consumed alcohol or not.
- This project can also be used in various companies or organization to detect alcohol consumption of employees.

THIS IS WHAT YOU can do!

FOR GRE PREPARATION



GRE

There is no time too soon to start your exam preparations. So it will bode well if you start off as early as possible.

The exam is about 4 hours long. So it is necessary to inculcate in yourself the patience that is required to sit in a place and give the test. Giving mock tests is an excellent way of doing this.

Make use of various software like Magoosh Flashcards, Ready for GRE, etc. These prove as useful tools in learning process.

There is no limit on the number of words that you learn however, make it a point to get familiar with at least 600-700 words before appearing for the exam.

Hello future GRE aspirant. First off I would like to congratulate you for taking this bold decision to pursue your post-graduation and that too in a foreign country away from the warm shelter of your parents and family. As commendable a step it is, the road to see it through is not going to be very easy. Right from your GRE's to SOP's to college applications it is going to be a long road. But let's take it one step at a time and the first step is the GRE exam. Following are certain pointers that I can highlight that will help in your preparations:

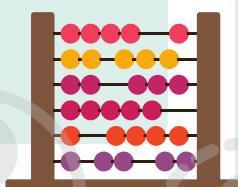
Before attempting the exam try to get familiar with the exam format and the structure of the exam. Visit the ETS site and read all the related information about the exam.

You need to be really quick when it comes to solving the questions. You get just about a minute to read, understand and answer any question. Though it seems daunting but practicing regularly will definitely improve your speed. Also making use of a timer or taking timed tests proves quite beneficial.

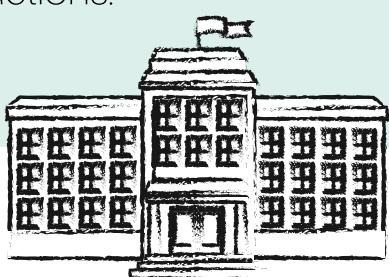




For Quantitative Analysis, the questions are based on topics that were part of our secondary school curriculum. Therefore the questions are pretty straight forward. Brush up on the topics and basic formulas. Work on areas that you find difficult and keep solving different type of problems.



Special attention should be given to the preparation of Verbal Reasoning as that section proves to be quite difficult. Your vocabulary needs to be very strong to tackle these questions. Start off with learning 10-20 new words every day with their meanings. To increase the efficiency of learning, practice writing these words along with their meaning and a self-formed sentence. This will help you in learning the word faster as well as aid you in implementing these words in essays and even verbal interactions.



As mentioned earlier just knowing the words is not enough. You should also learn how and where to apply these words. This is especially needed in the Sentence Equivalence and Text Completion questions.

Practice is the key to cracking these questions. Try to solve as many questions as possible.

Don't get discouraged if you get a lot of them wrong in the initial tries. Just keep working on them and you will eventually get better at it.

Something that I have observed is people generally neglect the Analytical Writing segment (AWA) of the exam. Mandatorily, the first section is always AWA and you have to write 2 essays, one argument and one issue essay. Sharing my experience, the essay writing segment takes a lot out of you. It becomes difficult to concentrate on the following sections hence it is very important that you practice writing essays. Do not skip the AWA part when you are solving practice papers and when giving mock tests.



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