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Livewire!

A bi-annual newsletter

BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

**DEPARTMENT OF ELECTRICAL &
ELECTRONICS ENGINEERING**

We are glad to present Volume 3, Issue 4 of Livewire!, the Electrical and Electronics department newsletter. This issue contains reports regarding departmental advisory board meeting as well as reports on the various activities conducted with the objective of overall student development by the EEE department, BMSIT&M. This issue also consists of technical, non-technical articles and other creative work by the students of the department.

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Vision of the Department

To emerge as one of the finest Electrical & Electronics Engineering Departments facilitating the development of competent professionals, contributing to the betterment of society.

Mission of the Department

Create a motivating environment for learning Electrical Sciences through teaching, research, effective use of state-of-the-art facilities and outreach activities.

Program Educational Objectives (PEOs)

Graduates of the program will,

PEO1	Have successful professional careers in Electrical Sciences, and Information Technology enabled areas and be able to pursue higher education.
PEO2	Demonstrate ability to work in multidisciplinary teams and engage in lifelong learning.
PEO3	Exhibit concern for environment and sustainable development.

After the successful completion of the Program, the graduate will be able to,

PO1	Apply knowledge of mathematics, science and engineering principles to the solution of engineering problems in electrical and IT enabled areas.
PO2	Identify and solve complex engineering problems using first principles of mathematics and engineering sciences.
PO3	Design system components and solve complex engineering problems that meet specific societal and environmental needs.
PO4	Conduct experiments, analyze and interpret data to provide valid conclusion
PO5	Apply appropriate modern engineering tools to complex engineering activities with an understanding of the limitations.
PO6	Demonstrate understanding of societal health, safety, legal and consequent responsibilities relevant to the professional engineering practice.
PO7	Understand the impact of engineering solutions in a societal context and demonstrate the knowledge of and need for sustainable development.
PO8	Understand social issues and ethical principles of electrical engineering practice.
PO9	Function effectively as an individual and as a member or leader in diverse teams to accomplish a common goal.
PO10	Communicate effectively with diverse audiences and be able to prepare effective reports and design documentation.
PO11	Demonstrate knowledge and understanding of engineering and management principles and apply these as a member and leader in a team to manage projects in multi-disciplinary environments.
PO12	Recognize the need to engage in independent and lifelong learning in the context of technological change.

Program Specific Outcomes:

The Graduates of the Program will be able to

PSO1:	Analyze and design electrical power systems.
PSO2:	Analyze and design electrical machines.
PSO3:	Analyze and design power electronic controllers for industrial drives.
PSO4:	Analyze and design analog and digital electronic systems.

The Advisory Board Members of the Electrical and Electronics Engineering Department:

Sl.No	Name of the Member	Representing the following stakeholder
1.	Dr N. Ramarao HoD, Department of EEE BMS Institute of Technology and Management Bengaluru	Faculty
2.	Dr Uday Kumar Professor, Department of Electrical Engineering IISc, Bengaluru – 560 012	Academics
3.	Sri B. M. Hiremani Manager/MM, BHEL – EPD Bengaluru – 560 012	Industry
4.	Sri B. N. Ramakrishna Dy. Manager, Spacecraft Ops & Control MOHA Group ISRO Telemetry, Tracking & Command Network	Industry
5.	Sri S S Badiger Engineer SO/D TMS Tarapur Atomic Power Station Thane Maharashtra – 401504	Parent
6.	Sri Kiran Noolvi Quality Associate SAP Labs India Ltd.	Alumni
7.	Sri Suresh Ayyanna Software Developer Accenture	Alumni
8.	Ms Haripriya	Final Year Student
9.	Mr Rohan Chinni	Pre-Final Year Student

Open Courses 1: C programming for Embedded Systems

An open course on C programming for Embedded Systems was organized in the Department of Electrical and Electronics Engineering by Dr Narapareddy Ramarao from 02-08-2018 to 07-08-2018. This open course is designed for 25 hours includes both theoretical and hands on sessions and covered all the basics of C programming language, microcontrollers programming, interfacing various sensors and actuators. Overall 35 students attended this course and learned developing embedded system programs for ATmega microcontrollers to interface with sensors and actuators along with basic concepts of C programming and errors debugging.

Open Courses 2: Applications of PSPICE for the Analysis of Electric and Electronic circuits

An Open course titled "Applications of PSPICE for the Analysis of Electric and Electronic circuits" was conducted on 2nd August 2018(5day course). This course was attended by a total of 17 students. This course is planned to expose the students to develop and analyse electrical and electronic circuits. This course helps the students in analysing challenging problems which are beyond the curriculum and also helps in solving complex circuits. This tool allows the student to compare the results which are obtained in classroom environment with the simple circuit models of devices, to those obtained by using complex SPICE models



Session under progress



Participants

A technical talk was organized by department of EEE on 28.08.2018. Mr. Bhanu Chandar.P, Area Product Owner, Nokia Networks, Bangalore delivered an informative talk on "Telecom Network Evolution & 4G Core" on 28th August, 2018. This talk was delivered to 5th semester EEE students. He began his speech by giving introduction to wireless internet access history in India and First generation (1G) technology and its drawbacks. Speaker explained about different Generation of technologies implemented till date and the research work going on the 5G.



Technical talk

To enhance the student knowledge in the field of higher education, an Alumni talk was organized on 25.08.2018. Mr. Arvind of 2015 graduating batch, delivered an informative talk on "How to plan your higher education aspiration in Europe". This talk was aimed at 5th semester EEE students. Mr. Arvind began his speech by sharing his UG program experience with the audience. He stressed upon the application part of programming language, as the world is turning towards automation, he felt that knowing a programming language is must and should.



Alumni talk

An invited talk was organised by Department of Electrical and Electronics Engineering on "Career Guidance" on 20th August, 2018. A speaker from BYJUS, addressed the 5th semester students. He started by giving the figures for statistics like how many graduates there are every

year, how many jobs and positions for higher studies in NITs, IITs and IISc. He pointed out that initial salaries are low after UG, and due to inflation, it is a raw deal. Giving examples, he points out that going abroad for higher studies, based on GRE scores, yields the highest returns and more quickly. Some sample passages from GRE were distributed and techniques for understanding the passage and answering the questions were discussed. The company basically gives training to students taking the GRE and thus shape their career.

Dr. Madhu Palati delivered a guest Lecture on "Electrical Safety & Product Safety" on 17th September 2018 at department of civil Engineering, BMSIT&M.

Parent – Teacher Meeting:

Parent – Teacher Meeting (PTM) was organized on 29 September, 2018, from 11.00am to 1.00 pm in the department of Electrical and Electronics Engineering. The parents of all the students were informed regarding the PTM well in advance by the respective proctors through e-mails, BMS System and personal calls. HOD, EEE welcomed the Parents and briefed about the department activities and development process. After HOD address Parents' met proctors of their wards and discussed the performance and academic status of their wards and gave the feedback to the department. Many parents expressed thankfulness to the institution and the department for providing excellent facilities and good support to the students of BMSIT&M.



A technical talk was organized by department of EEE on 25.09.2018. Dr. G.R.Nagabhushana, Former Chairman, High Voltage Engineering, IISc delivered an expert talk on "Basics of Lightning & Lightning Protection for Buildings". This talk was delivered to 3rd and 7th semester EEE students. He began his speech by giving Introduction to Lightning, formation of thunder cloud. Mechanisms of charge generation was explained by Simpson's Theory. Wilson's Theory and Mason's Theory. he spoke about the building protection, lightning striking points on the building, mostly corners and wedges are more prone to lightning. Photographs of different houses, transformers and factories subjected to lightning were shown and its impact was explained. Real time examples and protection of airplanes from Lightning was emphasised during the presentation. The talk was well appreciated by the student community and there was good interaction with students as well as with EEE faculty.





An industrial visit was organised by Dept. of Electrical and Electronics to Power System Training Institute, Bangalore on 26th October 2018 for 7th semester students. Power Systems Training Institute (PSTI) is conducting high quality training courses in various facets of power systems since 1972. The visit to PSTI was mainly focused on high voltage testing lab. The High Voltage laboratory was filled with testing equipment which are industry grade and are used to the test various parts of the industrial machinery that are being used to protect the transmission lines and high voltage equipment.

Mr. Manjunath Babu P, Assistant Professor, Dept. of EEE was the resource person for the one day workshop on "Electrical AutoCAD" organized by REVA School of EEE on 23rd November, 2018 for B.Tech final year students. Dr. Rajashekar P Mandi, Director, School of EEE, REVA inaugurated the workshop by stressing the importance and hands on training using AutoCAD and opportunities in this field.



Project Based Learning:

Project Based Learning of 3rd and 5th Sem students was held in the Department of Electrical and Electronics on 4th November, 2018. Mr. M V Kumar Das and Prof Mohan C N from Sir MVIT were invited as the judges for the event. Around 50 projects were displayed on the day. Best 2 projects were chosen by the evaluators for each of the semester.



TechTransform-2018:

Three events under TechTransform - 2018 were held in E&EE Department. Circuit Debugging, FIFA Gaming, Drinkathon were organized by the students of the EEE Department, on 2nd and 3rd November, 2018. The events saw good response from the participants.



FIFA Gaming



Drinkathon

An Industrial Visit was organised for 5th semester EEE students to Kaiga Nuclear Power Station operated by Nuclear Power Corporation of India Limited (NPCIL) on 3rd November, 2018. A total of 38 students have taken part in this visit. Dr. Sanjay Lakshminarayanan, Mr. Babu Naik G and Mrs. Shilpa G from EEE Dept. accompanied the students. The Kaiga Atomic Power Station has an installed capacity of 880 MW with four units of 220MW capacity. The staff of NPCIL explained the working of Pressurized Heavy Water Reactor and Turbine–Generator unit with the help of demo model. Later the students were allowed to visit the simulation centre (Control Unit-SCADA). The students of EEE were given an opportunity to understand the theoretical concepts of Nuclear power generation.

Mrs. Shilpa G and Mr. Babu Naik G, Assistant Professors, Dept. of EEE successfully completed the NPTEL Online Certification Course on "Recent Advances in Transmission Insulators" from Sept 2018 to Oct 2018, Indian Institute of Science, Bangalore.

Dr. Madhu Palati, Assistant Professor, Dept. of EEE successfully completed the NPTEL Online Certification Course on "Design of Photovoltaic System" from Jul 2018 to Oct 2018, Indian Institute of Technology, Madras.

Mr. Prashanth A.A, Assistant Professor, Mr. H.D. Kattimani, Associate Professor, Dept. of EEE presented a paper on 'Segmentation of the Lungs from Chest X-Rays: A Simplified Computer Aided Approach' in International Conference on Emerging Trends on Engineering Science, Technology and Management (ICETESTM-2018) Organized by Aditya Institute of Technology and Management, Srikakulam, Andhra Pradesh on 29th & 30th November, 2018.

Vidyut 2018 report:

Vidyut 4.0, annual inter-college technical and non-technical fest organised by Department of Electrical and Electronics Engineering in BMS Institute of Technology, was conducted on 6th October, 2018. It was extremely successful with about 220 participants from all the departments. The interest and curiosity were mixed with the right proportion of fun, and the fest was made successful by all the organizers and volunteers that coordinated extremely well. Events such as circuit Debugging, Treasure Hunt, Filmy Dangal, Table Tennis, Carrom and PUBG

Glimpses of Vidyut, 2018







ARTICLE SECTION

LIVEWIRE



BETTER THAN THE BOOKS

Quantum Computing

Author: Sayan Ghosh, 1BY18EE050

Assumption - You guys know how a basic computer system works on a hardware level, and what encryption is.

Let's start with the very definition - Quantum Computing is a computing paradigm that uses subatomic inter-state variations to process data, such as superposition, entanglement and even huge charge distribution. The most basic way it differs from the common binary computers is that, it can even retain a data with both binary values. It's mostly owing to the integration of phosphorus in Silicon chips (designed as qubits) that result in superposition hence allowing the computer to read data simultaneously. Tiny particles, such as electrons or photons, can simultaneously take on states that we would normally deem mutually exclusive.

When we consider a bit, we anticipate a pulse retaining either false (0) or true (1) values. However, qubit argues to differ by adding an extra state of superposition where it holds both the values without a probability factor.

Moving on to the Quantum Entanglement part, the whole concept of Quantum Entanglement is about correlation. The system thus uses the data stream from one of the two Entangled particles to calculate results for the remaining one. Let's break it down a notch. Let's assume there are two qubits holding a specific value. We can't be sure as both are supposed to have the value of false (0) as well as true (1) at the same time. What Quantum Entanglement has to offer is that, if one of them enters a binary stage of let's say true (1), then the other one will definitely be in the false (0) stage. This is a very correct assertion in the Quantum World and the Quantum Computer makes use of it for determining logic.

Moving on to the current world applications, the cryptographic encryption algorithms have always proved to be a real pain as they used block cipher based symmetric/asymmetric key encryption algorithm. Given that they tend to resist quantum computers, however if quantum computers are made so big enough to have gates in the numbers of hundreds of thousands with a large number of qubits, cracking either AES (Advanced Encryption System) or RSA (Rivest - Shamir - Adleman) won't be a problem. The problem being RSA uses an asymmetric algorithmic approach - public key for cryptographic encryption and requires a differentiable decryption key unlike the wide encryption approach. However, by estimation, if a quantum computer were to be made with gates in the power factor of 10^6 and qubits over 4000, a 2048-bit RSA encryption could easily be broken.

All the encryption standards and their decrypting key breaks sound fascinating, however that's not the purpose of a quantum computer build with such sophisticated and expensive components that requires sub-zero cooling for ideal performance and uses neodymium core to prevent any sort of temperature spike. The real applications of quantum computers in real world mostly comprise of Machine Learning (adding the advantage of reasoning), and large-scale financial data analysis.

Currently D-Wave is the largest commercial manufacturer of Quantum Computers. For example, the D-Wave 2000Q, a quantum annealing system with 2000 qubits and advanced feature controls.

After reading this you may have some basic doubts, like what OS does a Quantum Computer uses? The answer is data is feeded through gates and via Quantum Tunnelling where the stream surpasses potential barrier. You may also have this question in your head that what is the difference between super computers and quantum computers? Well, Super computers perform operations in the same generic way, while quantum computers have an added

advantage of retaining a logical answer. Hence, you can get an answer from supercomputer just by executing a code once, however in case of quantum computers, you should re-execute the commands several times for better accuracy. Also, it should be noted that the processing rate of a supercomputer is way faster than quantum computers.

Making your own Lithium Ion (18650) Battery Packs for low cost, for various DIY projects

Author: Rohan Chinni C L, 1BY16EE041

Lithium ion batteries are getting very common these days due to their huge production and using them in a wide variety of electrical and electronic devices like, cell phones, emergency torch lights, electric vehicles, hand held drill and many more.

Now, more than 90% of the battery powered devices uses the battery type lithium ion. These lithium batteries are so widely used over other battery types due to their huge advantages as, higher energy density, long life, maintenance free, higher efficiency. There are many types of lithium ion batteries like, Lithium-Polymer (LI-PO), lithium Iron Phosphate (LIFEPO4), Lithium-Titanate battery etc. each type having their own advantages and disadvantages.

There are many shapes of the lithium batteries which are used based on their target devices, over these, 18650 form factor type of lithium battery is the most widely used, because of their mass production, low cost, flexibility, safety and their ruggedness.

Due to their mass production, the availability of these batteries is more, and thus here, we will be making our battery packs using 18650 batteries. One of the most economic ways to get these batteries is by salvaging them from old electronic devices like, old laptop batteries, medical battery packs, hand drill battery packs etc.

The steps involved in building the lithium battery packs:

Step 1- Taking apart old laptop batteries safely, without damaging the 18650 cells inside. We can get 6 to 9 cells per laptop battery pack based on their Watt-Hours. This is how a common



laptop battery looks, this battery contains 6- individual 18650 cells inside.

Now we have to open the plastic case safely using tools such as screwdriver, cutting pliers, bench-vice etc.

After opening the case, separate the batteries from the case and this is how it looks. The next step is to cut the nickel strip which is spot welded to separate the 18650 cells individually. Now we should have individual 18650 cells.



Step 2- Check the individual cell for their voltage using multi-meter to determine the condition of cells. If the voltage of a cell is below 2.5 volts, then we should not use this and dispose it for recycle because the cell has been dead and trying to charge it would be dangerous. We must use chargers specified for lithium batteries to charge them.

By charging and discharging, we can get to know the usable capacity of these cells. We can use these types of chargers which are available at low cost, and these has been designed only for 18650 cells and has various protection features. The capacity in MAH can be measured by using these types of chargers, which charges the cell to its full voltage and then discharges it to the cut off limit and thus measures the capacity of the cell.



Now we can sort the cells into various groups according to their capacities, which makes easier to choose them for any particular application.

Step 3- Building the custom battery packs for various applications and projects. The main things that we must take into consideration are, the voltage of the pack and the capacity of the pack, these are the two main points which decides the size of the battery pack. In layman's terms, for more voltage connect the cells in series and for more capacity connect the cells in parallel. Hence for a required battery pack of certain voltage and capacity the cells are

connected in group of series and parallel, for example, for the required battery pack of 12 volts and capacity of 10,000mah, we use 3 cells in series and 5 in parallel of each of capacity of 2000mah, so total cells would be $3 \times 5 = 15$ cells.

As we are using lithium ion cells, we must add some protection features like overcharge limit, over-discharge limit, short circuit protection, over temperature protection etc. to avoid any damage to the cells and the surrounding environment.

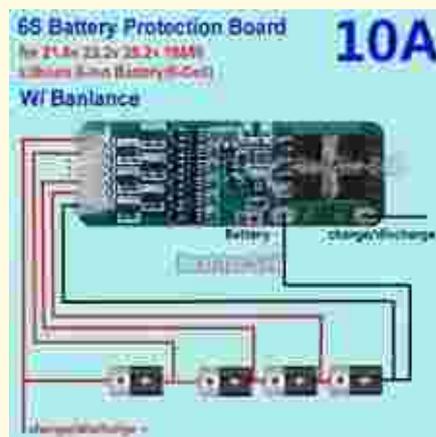
These various protection features can be implemented very easily by using the readily available BMS (Battery Management System) Boards which are specified for the battery pack voltage ratings like, 3S BMS board- its means that 3 cells are in series and the battery pack voltage range is form 9 Volts (fully discharged) to 12.6 Volts (fully charged).

This is an example for readily available, low cost BMS board. Here this board is for 6S, that means this is only for battery packs in which 6 cells are connected in series, however there in no limit for cells connected in parallel.

And this board is rated for 10A, this implies we can use this for a continuous discharge current of 10 amps.

So, after deciding the voltage rating of the battery pack, we need to calculate the capacity of the battery pack, this determines the total energy stored in the pack and how long the battery pack can drive the load, smaller the capacity of the pack, smaller is the run time of it with respect to the power consumed by the load.

Now after calculating the number of cells to be connected in series and parallel, we need some case to hold the cells for the connection, one very crude approach is to group the cells in a certain shape and use the electrical tape to hold them together.



But this method is not recommended when the battery pack is subjected to high discharge currents, as there is no air flow between the batteries to cool down, and hence the batteries becomes hotter very fast and the life of the pack decreases greatly.

And also, during the run time, if any cell gets damaged, replacing it becomes very hard as we have to dismantle the entire battery pack.

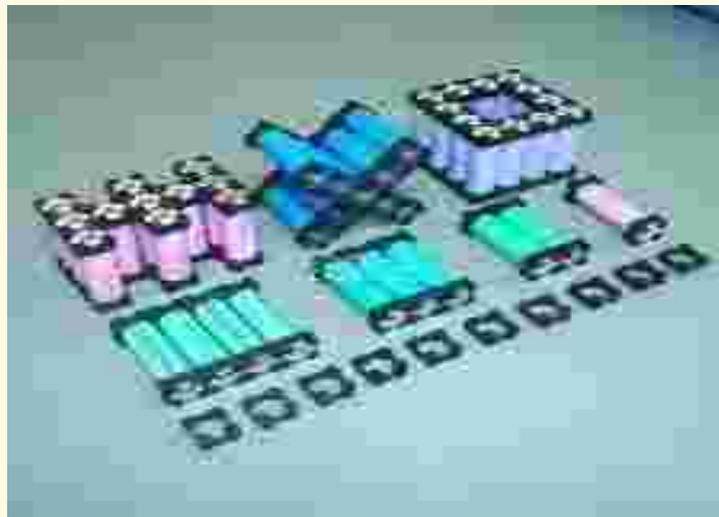


The recommended way to build the packs is by using the 18650 battery holders which are also available at low cost.

here is the image of the 18650 battery holders, we can easily create packs of various sizes and shapes according to our requirement as these holders are easily stackable.

This method of building the packs is recommended because there is good space between each cell and thus there is good airflow between individual cells for effective natural cooling, and also replacing a damaged cell is easy in this type of pack.

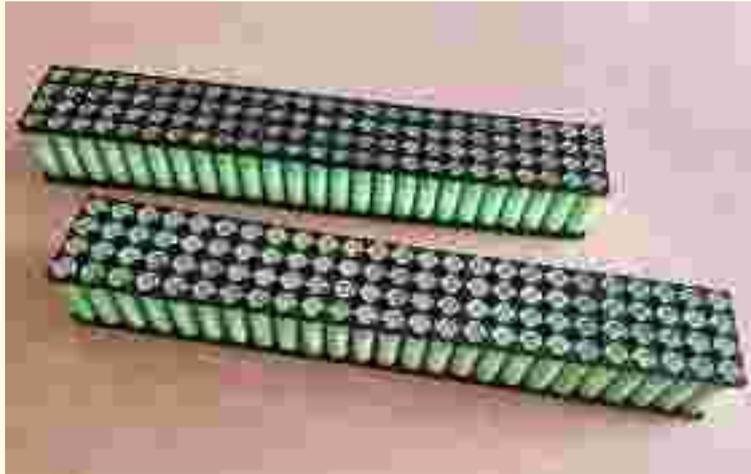
We must also use fuses for individual cells to provide cell level safety, as in the runtime if any cell gets shorted internally due to various reasons, it gets separated from the entire battery pack as the fuse blows. If there was no fuse provided, then the cell would increase its temperature rapidly leading to exploding of the cells.



Providing the cell level fuse protection is not necessary if we are using the cells which are new and are from the same batch manufactured as they would be having same characteristics and provided the battery pack is small, but if the size of the battery pack is large, then we must use cell level fuse.

Here as we use recycled cells, we cannot know when the cells get damaged as they are already been used, hence we must compulsorily use fuses for each individual cell.

Here is an example of the battery pack made by using the 18650 cell holders.



Here we can see the thin wire which connects the individual cells to the main copper bus bar acts as a fuse. This is the custom battery pack with the installed BMS board.



This is the tesla battery pack with cell level individual fuse for more protection



We can see the batteries which are used in the tesla pure electric cars in the pictures below.

We come to an end of a brief discussion of building custom battery packs using 18650 cells from old or recycled laptop batteries.



ECG using an Oscilloscope

AUTHOR: Dr. Sanjay Lakshminarayanan

The heart is a marvellous organ, electrical signals control the movements of the muscle fibres in the chambers and valves. The beats of the heart are not controlled much by the brain. The electrical signals originate from the heart itself. Heartbeat and breathing are regulated by the level of exercise of the muscles and do involve neurons in the brain.

While working with the oscilloscope in the electronics lab, I was wondering why we can't get an ECG like waveform by touching the probes. The obvious reason is there is not enough amplification. The lowest voltage signal that an oscilloscope can show is about 0.5 millivolt which is not enough to catch the voltages present in the body due to the electrical activity in the heart, which are in microvolts. Also, the input impedance of the oscilloscope should match the large output impedance of the body, the probe needs to have an input impedance of at least 100 Megaohms, Otherwise the potential divider like action will attenuate the signal transmitted to the oscilloscope.

The ECG signals may be seen using an oscilloscope by introducing an 'instrumentation amplifier' as a preamplifier and also followed by an active filter, followed by another amplifier. The filter is designed to let through signals with the frequency of heart beats. An instrumentation amplifier such as the Texas Instruments INA 118 may be used. It has an input impedance of 1 Gigaohms, which is ideal for the purpose. Also, the input offset voltage is a maximum of 50 microvolts. The input offset voltage of a 741 OpAmp for comparison is in millivolts. The gain of the preamplifier may be set by an external resistance. A resistance of 50 ohms, sets the gain of the preamplifier to 1000. The INA 118 can work from supply voltages as low as +/- 1.35 V to +/- 18 V.

If you leave the probes of an oscilloscope open, one can see the power line interference at 50 Hz. In an ECG arrangement, the effect of this can be nullified by using shielded cables to connect the probes from the human body to the preamplifier and oscilloscope. Historically, the first ECG was done using a ballistic galvanometer. Today ECG is normally plotted on graph paper and also on a display screen.

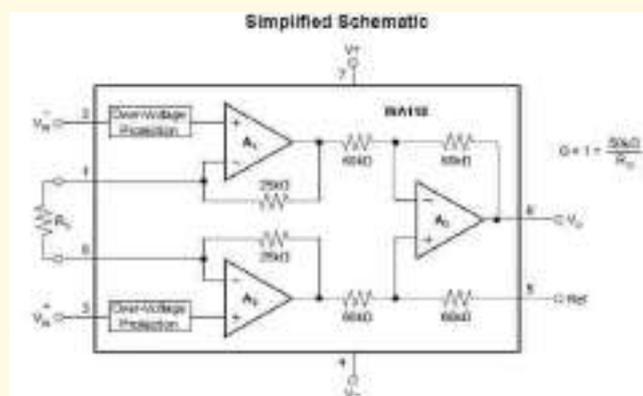


Figure showing the block diagram of an instrumentation amplifier such as the Texas instruments INA 118, which can be used as a preamplifier to observe ECG using an oscilloscope.

Innovations In Agriculture

AUTHOR: Abdul Azeez Khan, 1BY15EE001

Agriculture today is about so much more than a farmer simply planting a seed, rearing a cow or catching a fish. It takes a whole ecosystem and a host of actors to work together to produce the food we need for a population of more than seven billion people.

With the increase in the number of people day by day, the need for more produce from the agriculture sector all over the world has increased as well.

To cope with this hike, the need for new innovations and ideas play an important role.

This complex agricultural production system has evolved over time through scientific discoveries and other innovations. It is this dynamic nature that will equip agriculture to cope

with the competing challenges of addressing food and nutrition security, improving livelihoods, combating climate change and sustainably managing natural resources.

Innovation is not only driven by technological advances, but also through novel ways of organizing farmers and connecting them to the information they need.

Many smallholder farmers around the world (Especially in India) still farm the same way their ancestors did thousands of years ago. Traditional farming approaches may continue to work for some, but new practices can help many to substantially improve yields, soil quality and natural capital as well as food and nutrition security.

Some of the Innovations being used in Indian Agriculture are:

1. TRACTORS

Powerful engines and innovative design allow for cultivation, Ploughing, tillage and whatever else your farming operations call for.

2. HARVESTING

Harvesting machines are innovatively designed in a range of sizes and capacities, harvesters offer advanced cutting, threshing, separation, cleaning and delivery.

3. GRAIN STORAGE

Whether it's for food, feed or fuel, farms need to store and move grain more efficiently than ever. A full-scale, forward-thinking solution for grain that is designed to boost overall performance and productivity is needed.

IMPORTANCE OF AGRICULTURAL TECHNOLOGY

Farmers no longer have to apply water, fertilizers, and pesticides uniformly across entire fields. Instead, they can use the minimum quantities required and target very specific areas, or even treat individual plants differently. Benefits include:

- Higher crop productivity

Decreased use of water, fertilizer, and pesticides, which in turn keeps food prices down.

- Reduced impact on natural ecosystems.

- Less runoff of chemicals into rivers and groundwater.

- Increased Worker Safety

In addition, robotic technologies enable more reliable monitoring and management of natural resources, such as air and water quality. It also gives producers greater control over plant and animal production, processing, distribution, and storage, which results in:

- Greater efficiencies and lower prices.

- Safer growing conditions and safer foods.

- Reduced environmental and ecological impact.

Now let us take a look at some new innovative products that have a prospect of being used in coming years:

1. MITRA

A Nashik-based start-up, MITRA (Machines, Information, Technology, Resources for Agriculture) aims to improve mechanization at horticulture farms with the use of R&D and high-quality farm equipment.

Product: Air blast sprayers developed for fruits and vegetables in general, and grapes and pomegranates in particular, the sprayers, used to add hormones that help the growth of crops, reduce the expenditure on manual labour and are less time-consuming.

2. ERUVAKA TECHNOLOGIES

An organisation based in Vijayawada, Andhra Pradesh, its mission is to accelerate the use of technology in aquaculture, an area where farmers face problems due to unavailability of adequate technology to measure and control water health.

Product: Eruvaka Technologies, to help farmers monitor aquaculture ponds, develops solar-powered floating buoys that measure different water parameters, such as oxygen levels, temperature and pH range, crucial for the growth and survival of fish and shrimp. The collected information is uploaded on the cloud and transmitted to individual customers through an Android app, SMS, voice call or the internet. Farmers can also remotely control automated equipment such as aerators and feeders.

3. ANULEKH AGROTECH

Set up by Mumbai-based entrepreneurs, Anulekh focuses on increasing soil fertility to achieve higher agricultural productivity and crop yield with lower resource use.

Product: BIOSAT

(Biochar based organic Soil Amendment Technology), a soil additive, is made of biochar mixed with different organic nutrients. The product preserves soil fertility, traps carbon emissions, maintains the topsoil strength and increases crop production, thus reducing dependency on chemical fertilisers.

CONCLUSION

To conclude I would say that the rapid technological advances are radically reshaping agriculture from automated robots being able to weed vegetable crops, to computer operated gates, virtual fencing, and grain storage. This shows that in coming years by bringing together innovations and expertise from different disciplines, new insights, approaches and solutions to the challenges faced by farmers has now become feasible. We now have an unprecedented opportunity to bring about change.

Game Changing Innovation in Education

AUTHOR: Abdul Azeez Khan, 1BY15EE001

“Change is the only thing Permanent in the World”. In this changing world Innovations comes up everywhere, also in Education. Some innovations contribute less to the change / Development and some Innovations have huge contributions, among them few Innovations are the Game changing innovations in Education.

The way to teaching is based on major educational goals that affect teaching strategies. In one view the goal of education is the transmission of knowledge by the teachers to the students. In another view the goal of education is facilitating students for Self- learning and Develop Capabilities of students.

1. Tablet Computing

Tablets are electronic devices which replaces the books, using them Students can access textbook and other course material as needed, the schools and universities are need the computer labs or even personal laptops. A student's choice of apps makes it easy to build a personalized learning environment, with all the applications and tools they need on a single device. With their growing number of features, tablets give a room to other educational technologies and Apps— from offering a more of game-based learning apps. And also supports learning process.

2. 3D Printing

3D printing is not used in all Schools and Colleges right now, but some of the schools and colleges uses this Technology for Projects, Assignments and Analysis etc., it is easy to pinpoint the practical applications that will take hold. Geology and anthropology students, for instance, can make and interact with models of fossils and other artifacts, and organic chemistry students can print out models of complex proteins and other molecules through rapid prototyping and production tools. Even more compelling are institutions that are using 3D technology to develop brand new tools. 3D printing enables students to understand the models easily.

3. VIRTUAL AND REMOTE LABORATORIES

Virtual and remote laboratories reflect the current trend in online education. Though technology is four to five years away from mainstream use in schools and colleges, the benefits of implementation are already clear. Virtual and remote labs offer flexibility, as students can run experiments as many as they like, both in and out of school (from any place). Because these labs are designed to allow for easy repetition of experiments, students feel less pressure to execute perfectly the first time. In the controlled environments of these labs, students are safe, even if they make an error.

It enables students to try and learn by self, it helps students to improve their Innovative skills and self-confidence.

4. WEARABLE TECHNOLOGY (4-5 YEARS)

Google's —Project Glass is one of the most promising potential outcomes of wearable technology in higher education is productivity. It provides the tools that could automatically send information via text, e-mail, and social networks on behalf of the user—based on voice commands, gestures, and other indicators— that would help students and educators communicate with one another, keep track of updates, planning the future events, and better organize notifications.

Within 4-5 years this Technology is going to be adopted by Schools and Colleges to enable the students for Self-management and to be punctual in Day-to-Day activities.

5. MOOCs and other online learning options will impact secondary education

Students will feel less inclined to spend 4 years in high school learning the basics, plus another 4 years in college, especially when the first two years is simply covering the basics yet again. Today, a thirteen year old with an email address and access to the internet can sign up at Khan Academy and complete courses of study in a variety of academic disciplines, all for free. They can sign up for free classes designed and taught by professors at prestigious universities that are created and distributed using MOOC. In the time that it takes to finish high school, a student who is particularly motivated could have mastered multiple technologies; learned as much about history, business, mathematics, science, economy, etc. as a college graduate, and earned industry recognized certifications.

5. NANO SCIENCE LAB

A Portable cabinet on wheels with which a science teacher can walk enters into the classroom. Usually in colleges students gets a chance to visit a lab for 5-6 times a year (or a semester). This NANO Science lab gives them 50 visits in one academic year and 250 visits during a student's high school. This Innovation leads the students to understand the complex science concepts with ease and increase the interest and productivity of the younger generation (students) to 10 times more than the usual.

Latest innovation to prevent Air pollution: Roosegaard's tower

AUTHOR: Skanda Prasad, 1BY15EE056

The latest technology invention in environmental pollution is a tower that cleans outdoor air.

The Tower is a seven-meter (23 feet) high structure that removes ultra-fine particles from the air using a patented ion-technology developed by scientists at Delft University of Technology. According to the World Health

Organization, air pollution causes the greatest environmental threat to our health.

Air pollution causes respiratory and cardiovascular disease and accounts for over 7 million premature deaths every year and that death toll is rising at an alarming rate.

In California, where residents suffer from the worst health impacts of dirty air in the United States, air pollution causes premature death for 53,000 residents every year. In London, England, dirty air accounts for one out of every twelve deaths.

In Delhi, India, the average life expectancy is shortened by 6.3 years due to air pollution. China has the worst air in the world. Beijing recently recorded pollution levels that were 17 times greater than the acceptable levels recommended by the World Health Organization.

Air pollution causes 1.6 million deaths every year in China - approximately 17% of all deaths. For most countries, the deadliest form of air pollution is a fine particle known as "PM 2.5" (particulate matter 2.5). It is so named because it is a fine particle that is only 2.5 micrometers in diameter.

Unlike larger air-borne particles that settle to the ground, PM 2.5 particles can float in the air for weeks.

When you breathe these particles into your lungs, they penetrate your lung tissue and get absorbed unfiltered into your bloodstream - causing damage to your body. The problem with current air pollution control systems is that they reduce but do not eliminate pollution.

Dutch innovator Daan Roosegaarde, in collaboration with ENS Technology and the Delft University of Technology, developed large scalable towers that remove pollution emitted into the air. This technology was originally developed to remove MRSA bacteria (a type of bacteria resistant to antibiotics) from dust particles. The bacteria would spread from human to human by traveling in the air on dust. The air ionizer prevented the bacteria from spreading in this way.

Roosegaard's Tower cleans 30,000 cubic meters of air per hour without using ozone and uses about 1,400 Watts of electricity - less than a desk-top air purifier. Air from the area surrounding the Tower is drawn into the structure. All airborne particles receive an electric charge. The charged particles are captured and accumulate on large collector plates that have an opposite electric charge. The clean air is then blown from the Tower back into the environment.

"Basically, it's like when you have a plastic balloon, and you polish it with your hand, it becomes static, electrically charged, and it attracts your hair," explains Roosegaarde.

The invention won the German Design Award for Excellent Product Design awarded by the German Ministry for Economics and Technology.

—We're working now on the calculation: how many towers do we actually need to place in a city like Beijing. It shouldn't be thousands of towers, it should be hundreds. We can make larger versions as well, the size of buildings, says Roosegaarde.

The Tower is currently being tested in Beijing by the Chinese Ministry of Environmental Protection.

A visit to the nuclear power plant in Kaiga

Author: Navedya Ojha, 1BY16EE035

Since the start of the first nuclear power plant in Tarapur, Maharashtra in 1960, India's dependency on nuclear power has increased. Nuclear is the fifth-largest source of electricity in India after coal, gas, hydro and wind. There are currently 22 nuclear reactors in 7 nuclear power plants in India. One such power plant is the Kaiga Atomic Power Plant. The Kaiga Atomic Power Station is located in the North Kannada district of Karnataka. It provides power to 5 states (Karnataka, Andhra Pradesh, Tamil Nadu, Kerala and Pondicherry). The plant (as of release of article) has 4 reactors of 220MW generating capacity each. The total of 880MW generating capacity makes the Kaiga atomic station the third largest nuclear power plant in India (in terms of generation), after Tarapur and Rawatbhata. The 4 nuclear reactors in Kaiga uses the Pressurized Heavy Water Reactor (PHWR), which utilizes natural Uranium as the fuel and Heavy water (Deuterium Oxide – D₂O) as coolant and neutron moderator. Like any other nuclear reactor there is high investment and maintenance cost.

The main concern however in all nuclear power plants around the world is safety and effect on the environment. Since the atomic power plant in Kaiga is surrounded by forest, they have worked with the forest department to create the most effective environment and minimize the loss of trees as well as not affect the habitat around the power plant. The AERB (Atomic Energy Regulatory Board) has also played an important role to ensure the standards were met and maintained, regarding the safety of workers as well as population surrounding the plant. The regulations are continuously monitored on a daily to weekly basis. The reactors are well protected with 2 linings of concrete which can withstand 1.75Kg/cm² (171616.375 Pa). The core reactor has 3 layers, namely the Inaccessible layer, the Shutdown accessible and the Accessible layer. The repair and maintenance are done via sophisticated mechanisms, including removing the utilized fuel rods. The utilized fuel rods are not stored in Kaiga, but transported to the Kalpakkam plant in Tamil Nadu for processing and re-use (Involves a three-stage process of utilization of the fuel rods (Plutonium)). A standard and protocol is used even for the transport of the utilized fuel rods to prevent any leakage of harmful radiations of Plutonium (formed after the fission process from Uranium). The nuclear products after the fission, generally Cesium is what the Kaiga power plant deals with for disposal. Their solution is to store the radioactive waste in a matrix contained in a concrete lined, mild steel container buried underground (about 4 meters deep) for the half-life of the radioactive waste (in terms of years).

Keeping in mind the recent disasters and accidents regarding nuclear power plants (the Fukushima disaster, Japan in 2011), the AERB officials along with the officials of Kaiga's site selection committee built the plant to withstand an earthquake of 6.5 on the Richter Scale. They also work hand-in-hand with the forest and fire department to prevent and neutralize forest fires and have the necessary structure to avoid damage. Since the start of its operation in 2000, Kaiga atomic station has continued to evolve and incorporate new techniques to run

the reactors smoothly and efficiently also minimizing man made errors. There is continuous development and planning, as they plan to build 2 more nuclear reactors with higher generating capacity (around 700MW each) in the near future. The officials also describe their role in the development of the ecosystem around them, and conduct research on aquatic life as well as land surveys for the growth of flora and fauna in the forest area surrounding the nuclear plant. The discharged coolant water has a variation of 5 degrees Celsius and does not affect the aquatic life on a large scale. Radiations around the plant are in the range of MicroSieverts (unit used to measure radiation), and do not affect individuals to a large extent. The officials do believe that the main challenge they face is with the disposal of nuclear waste with shorter half-lives and managing them is always a task that requires thoroughness and concentration. However, they boast that, there have not been any problems in Reactor 1 and Reactor 2 for more than 900 days and 500 days respectively. This is a huge feat and their effort deserves recognition.

With the rapid decrease in Coal and Gas reserves in India and the massive increase in energy demands, Nuclear power plants are poised to play a major role in the supply of energy to the Power grid sooner than we anticipate. With high initial investments and strict regulations as well as skilled labour being some of the pre-requisites along with the safety of population, availability of land and the disposal of nuclear waste, the establishment of nuclear power plant faces a lot of challenges, however like in the case of Kaiga, it shows that these hurdles can be overcome and with proper planning and resource management. It will be fascinating to see how the story of Nuclear Power in India unfolds further in the future.

The Use of Technology in Football

Author: Navedya Ojha, 1BY16EE035

The rapid expansion in the field of technology has given man the necessary tools to improve and implement various ideas in numerous fields. Automobile, Communication, Medicine are just some of the industries that have incorporated technology and have reaped the benefits of the same. One such field which is starting to indulge and make use of tech is Sports. Sports such as cricket, tennis, athletics, swimming, baseball, basketball and football are starting to use and come up with ideas, as to how to improve their respective sport. This article will deal with the incorporation of technology in football, the advantages and its scope.

The most common use of technology in all the sports is for analysis. From match and player analysis to financial strength of the club, analysis is one department where the use of technology is inevitable. However, the sophisticated tools used now, were not available to the coaches and physios before. Thus, we come across the type of technology that was prevalent back then and how it has evolved, along with the changes in the field of physiotherapy and refereeing.

The key area where technology has evolved is in training which includes the match and player analysis. Initially "scouts" were sent out to watch a particular team, or the coach himself would visit the team, his team were to play next. These techniques are still prevalent, however with the improvement and incorporation of video as feedback, many analysts find it easy to breakdown the opposition's style of play and come up with suitable counter measures for the opponent from the comfort of their own workspace. Keeping track of the player's nutrition as well as maintaining a standard schedule for each player's fitness is easier, thereby helping the football club focus on the development of the footballer. Using the game-stats coaches can

see what part of their team's game needs to be improved. Physios have also incorporated tech into their program to test and keep record of various parameters of the player, be it endurance, heart rate, distance covered, BP etc. During Sir Alex Ferguson's era as Manchester United manager, he felt it necessary to incorporate a rehabilitation facility for his players which had to be of the highest standard, with all the necessary tools required by the staff for the proper functioning. This included Scan machines, Cryogenic chambers (for fatigued or injured players), and various other tools. Manchester City, under the new ownership, back in 2008 also decided to remodel the training facilities and invested a lot in order to create a top training facility for the club. This helps in the overall recuperation of players as well as improves their morale, seeing the owners as well as the coaches put in effort to provide them with the best that they possibly can. This also attracts players and coaches from other clubs which may not have the resources to move to clubs with the "top" level facilities. Tottenham too decided to remodel their stadium (to increase capacity) as well as improve their training facilities under Mauricio Pochettino.

Furthermore, the use of game footage has also improved the game massively, with coaches trying to exploit the weaknesses of various teams, we as spectators are shown various tactics that the team uses in order to win. Tactics such as "Gegen-Pressing" or Counter pressing (where the players mark the space between player and not the man) is only possible through match footage. Nowadays managers choose certain player that can not only adapt to their philosophy of playing but can cause problems for the opponent's system as well. Its easier for coaches to target the players weaknesses via footage of their previous games, at the same time players get to work on their skills due top previous game footage. Thus the clubs now rely heavily on technology for training, recuperation and even recruitment of new players.

The recent implementation of Goal-line technology and VAR (Virtual Assistant Referee) has shown the strides the football community/organizations are taking to improve the sport of football. With the players and coaches complaining about a referee's decision to call a player offside or to disallow a goal or to not award a penalty, the use of VAR makes things much easier for the match officials and even the players remain satisfied. The FIFA World Cup was the perfect stage to test this tech and the results were more than satisfactory. The famous Frank Lampard's disallowed goal against Germany at the World Cup in 2010, is something that can be easily revoked thanks to implementation of Goal-line technology. These tools have been used by the referees in the past couple of years and have always ended up being the right decision.

There are debates however, that the use of these mentioned tools by the referee slows down the pace of the game, as the referee has to pause the game to make a decision and that effects the atmosphere as well as the tide of the game. Many have their opinion on the use of technology for refereeing and there are few who believe that with ever changing times, the game has to evolve. That's why kit manufacturers such as Puma, Nike and Adidas have even modernized the kits of recent times to suit to the fast-flowing football that clubs play nowadays (it has become more 'light and breathable'), or else who wants to run with the cotton polo-shirts and shorts that were worn two- three decades ago. For 90 minutes!

THE REPLACEMENTS – STEM CELLS

Author: Navedya Ojha, 1BY16EE035

Even though the title sounds a bit confusing, the fact is that stem cells are often used for replacement of specialized cells which cannot be replaced naturally or are lost due to some disease. But unlike the boom in the field of AI over the last decade or so, stem cell research has been predominant for quite some time. In 1989, scientists found out about the relation of genes with diseases, while performing experiments on mice ("Knockout" Mouse) – this discovery proved to be vital for understanding genes related to Coronary Heart Disease (CHD – when the coronary arteries carrying oxygen – rich blood to the heart muscles, becomes narrow due to fat deposition on the inner linings of the artery).

The understanding of stem cells began with embryonic stem cells. They come from a ball of cells called the blastocyst, which is formed five days after an egg is fertilized and develops into an embryo. Embryonic stem cells were isolated from mice in 1981. The embryonic stem cells have the potential to develop into any part of the body such as Red Blood Cells (RBCs), liver cells, heart muscle cells, etc. The human heart when damaged cannot regenerate as compared to the epidermis cells (skin cells), and the genetic disorders related to the heart are another hurdle which many stem cell researchers have tried to tackle. Their hard work has not been in vain, because many researchers were able to make breakthroughs – in 2003, Prof. Antonio Beltrami at the University of Udine, Italy discovered a small population of stem cells in the heart – this would mean that these cells can be 'instructed' to form new heart muscles – thereby allowing the heart to repair itself. The primary reason for a heart attack is the lack of oxygen, which causes the heart cells to die – these can be replaced by stem cells. In 2010, Dr. Nicola Smart at the University of Oxford conducted tests in order to activate the stem cells in the heart - her research led her to a protein called thymosin beta-4 which encourages the stem cells to move towards the damaged tissue and help form new muscles or blood vessels.

Other than the embryonic stem cells, there are another set of stem cells found in the adult body. The adult stem cells (also called the Somatic stem cells) are unspecialized cells that are used for repairing the damaged cells, by transforming into the specific cell required. They are generally found in the intestines and the bone marrow. Bone Marrow transplant is a form of stem cell treatment that has been used for many years. The use of stem cell therapy is also being investigated for treating diseases and conditions such as Parkinson's disease, Diabetes, Spinal cord injury repair, baldness removal, anti - cancer treatments etc.

The cost of such treatments is very high and even the research for various conditions has a lot of time and cost constraints. However, it is imperative that we as a country began investing into its research and make use of the advancement in technology and implement the same in the medical sector, for this will massively benefit those who are in dire need of treatment, thereby replacing a distraught face with a happy one.

Green Innovation

Author: L Henry Ruben, 1BY15EE028

Green growth means fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies. Increasing concern about the future sustainability of economic growth patterns underpin the demand for a greener model of growth. Existing production technology and consumer behavior can only be expected to produce positive outcomes up to a point; a frontier, beyond which depleting natural capital has negative consequences for overall growth. By pushing the frontier outward, innovation can help to decouple growth from natural capital depletion.

Innovation and the related process of creative destruction will also lead to new ideas, new entrepreneur and new business models, thus contributing to the establishment of new markets and eventually to the creation of new jobs. Green innovation is therefore the key in enabling environmentally sustainable growth.

Through the recent analysis suggests that without intensified policy action, global greenhouse gas emissions are likely to increase by 70% by 2050. Other environmental and social challenges are equally demanding, including improving the quality and availability of water, dealing with the use and disposal of toxic products and maintaining or increasing biodiversity. Green growth implies policies that either reduce resource use per unit of value added incrementally or keep resource use and environmental impacts stable or declining while the overall economy is growing. Public governance plays an important role in transitioning to green technology and innovation.

A country's capacity to innovate is to extent determined by the quality of the governance. Policy instruments can help encourage an optimal level of innovation in view of market and systemic failures for green innovation. Supply –side innovation policies play an important role in orienting innovation efforts to help address green growth challenges. However, innovative solutions to meet the green growth challenge are hampered not only by technological barriers but also by the lack of supporting market conditions. The context of developing countries requires special considerations for policy design and implementation. Technology transfer and adaptive R&D aimed at building local capacities may be more effective for boosting the use of environmental invention.

PHOTOGRAPHY SECTION

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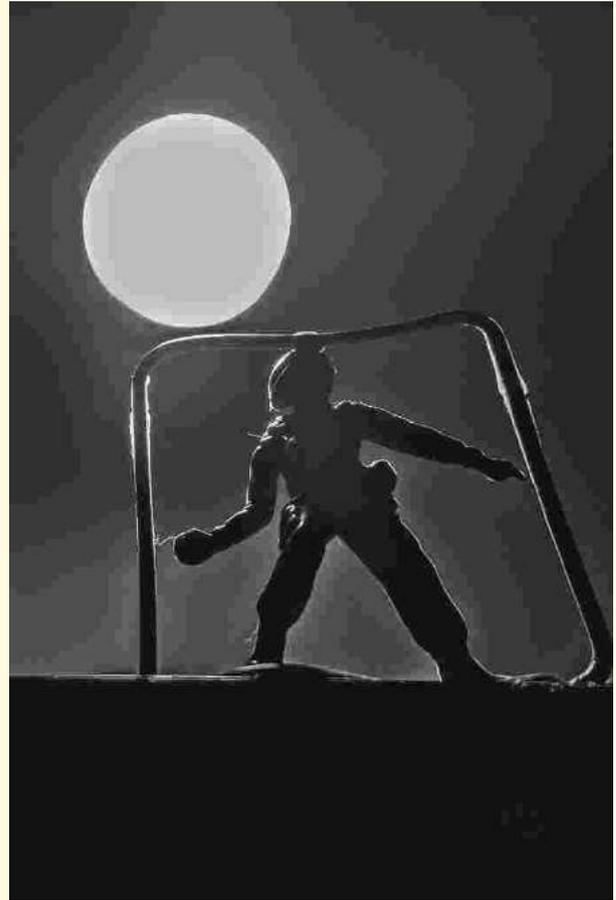
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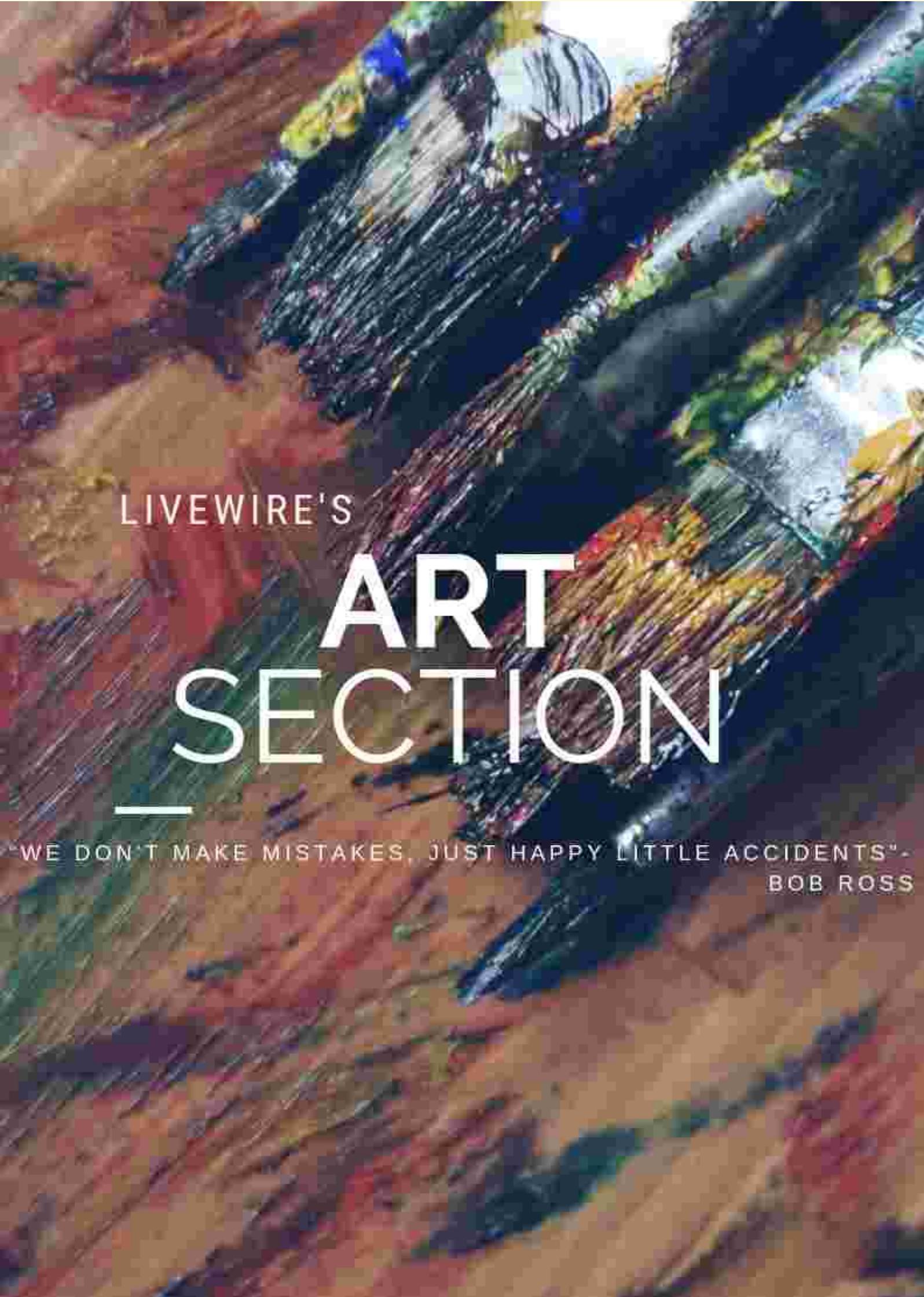
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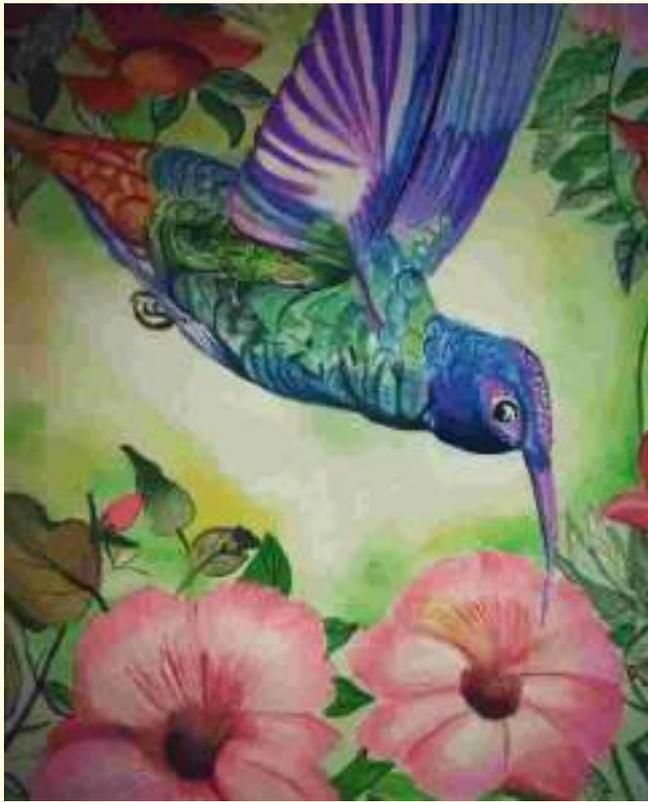


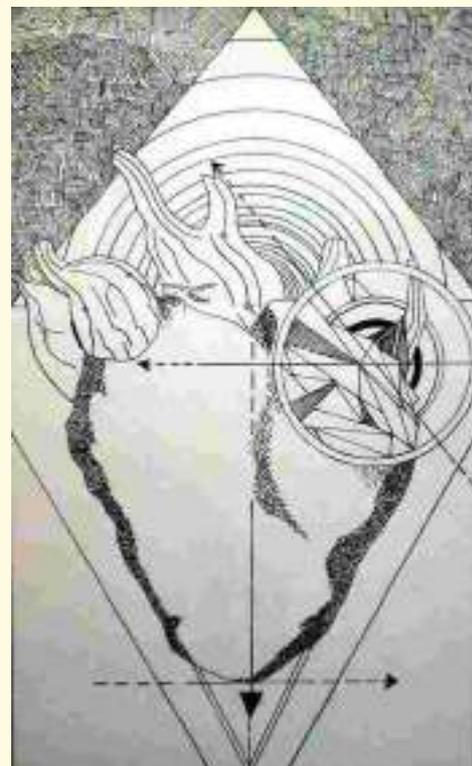
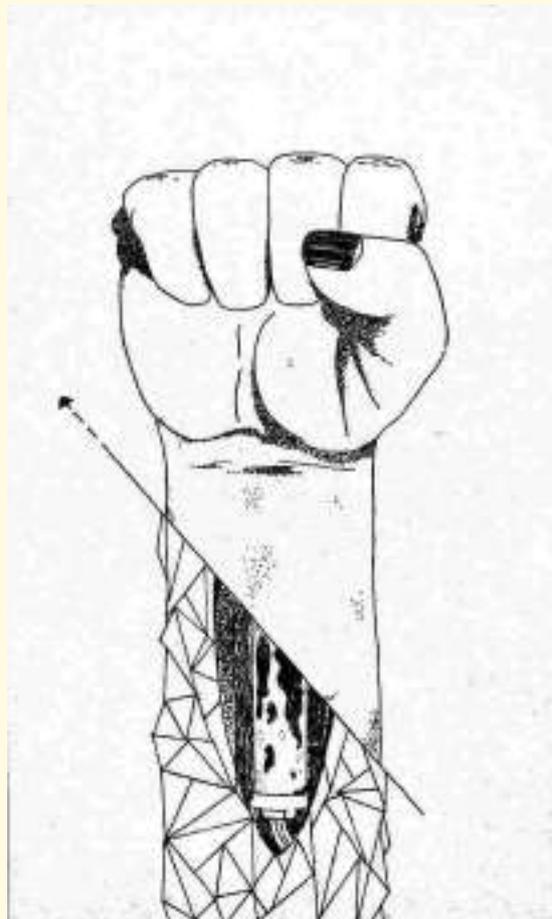
LIVEWIRE'S

ART
SECTION

"WE DON'T MAKE MISTAKES, JUST HAPPY LITTLE ACCIDENTS" -
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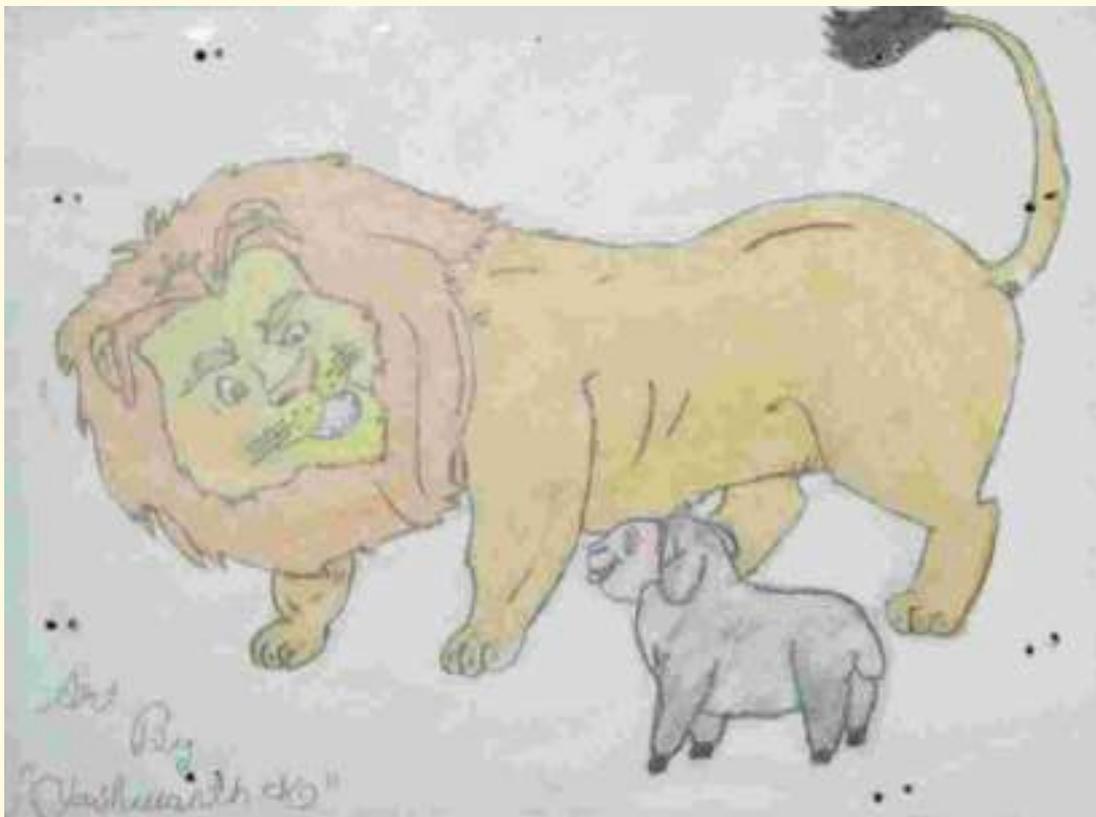




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