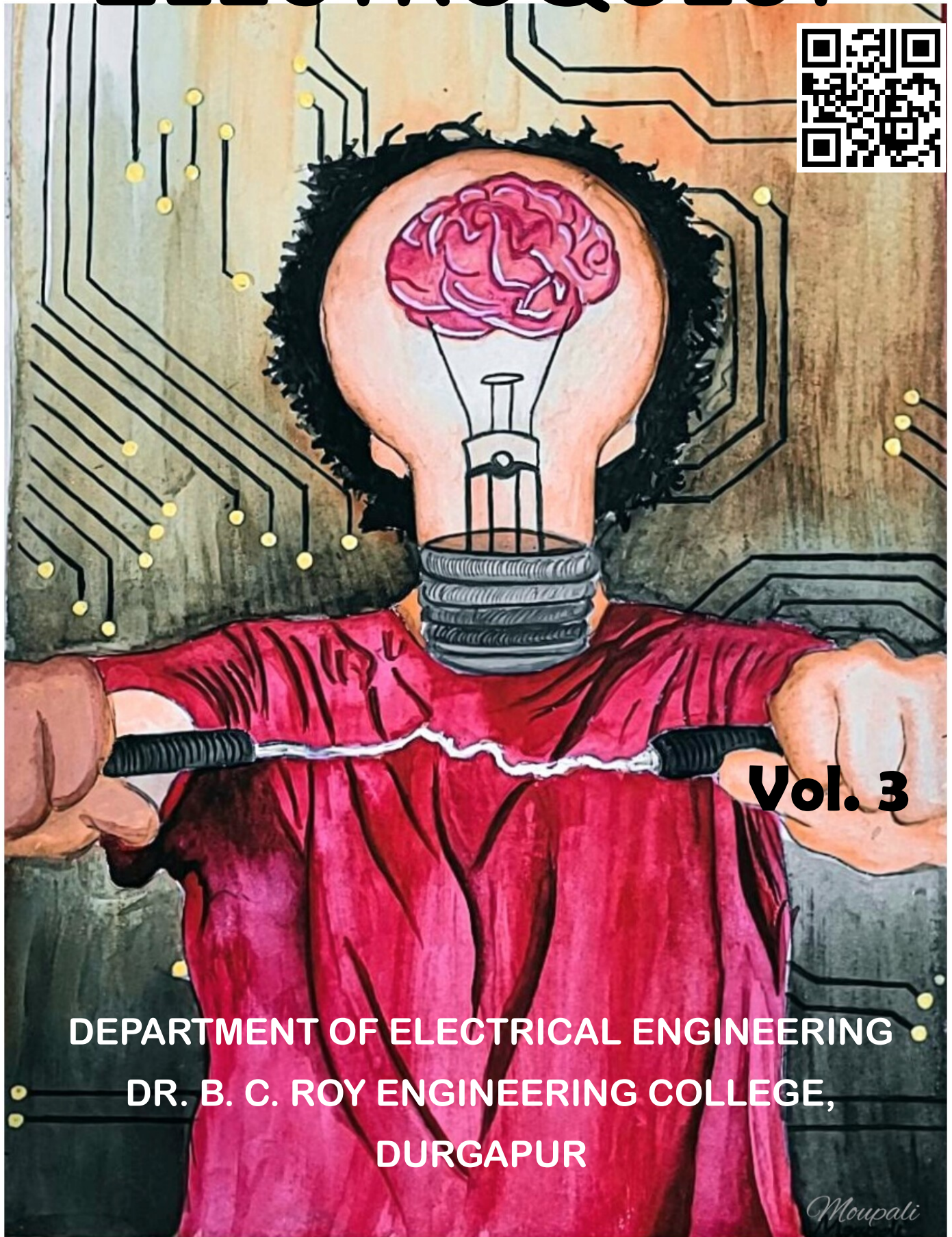# ElectroQuest

Vol. 3

DEPARTMENT OF ELECTRICAL ENGINEERING
DR. B. C. ROY ENGINEERING COLLEGE,
DURGAPUR

DECEMBER, 2022

Vision

To create a strong teaching, learning, innovation and research environment with inclusive improvement of students and global participation so that the institute is regarded as global center of learning through meaningful, devoted and determined efforts of all stakeholders.

Mission

Excelling in professional career and/or higher education and research in developing innovative technologies by acquiring sound knowledge in basic sciences, professional cores and interdisciplinary subjects of electrical engineering.

Imparting meaningful learning centric education in both professional core and inter disciplinary subjects with latest advancement to bridge the gap between industry and academia.

Inculcating a deep sense of organizational behavior, financial management, values, ethics, societal responsibilities and environmental awareness.

Developing communication skills in the students to help them adopt and contribute more under diverse and dynamic working climates.

Program Outputs (POs) of the course

PO	Graduate Attribute	Description of PO
PO1	Engineering knowledge	An ability to apply knowledge of mathematics, science, engineering and humanities for solving Engineering problems.
PO2	Problem analysis	An ability to define problems and provide solutions by designing and conducting experiments, interpreting and analyzing data and reporting the results
PO3	Design / development of solutions	An ability to design manufacturing systems that would encompass system design requirements as demanded by the Industry/customer
PO4	Conduct investigations of complex problems	An ability to identify, comprehend, analyze, design and synthesis of the information to solve complex engineering problems with proper validation.
PO5	Modern tool usage	An ability to develop skills and techniques to handle state art engineering tools necessary for engineering applications.
PO6	The engineer and society	An understanding of professional, health, safety, legal, cultural and social responsibilities.
PO7	Environment and sustainability	An ability to practice impact engineering solutions for economic, environmental and global development.
PO8	Ethics	An ability to apply ethical principles, responsibility and norms of the engineering practice
PO9	Individual and team work	An ability to function and lead a group of members for multi-disciplinary projects.
PO10	Communication	An ability to communicate, represent problem related to engineering society.
PO11	Project management and finance	An ability to use the modern engineering tools, techniques, financial skills and management principles to function as a member and leader in a

		team, to manage projects in multi-disciplinary environments.
PO12	Life-long learning	An ability to engage for resolving engineering problems and contemporary issues to acquire lifelong learning.

Program Specific Outputs (PSOs) of the course

PSO	Description of PSO
PSO1	Indentify, formulate and solve various real time problems of Electrical Machines, Power System, Control System, Power Electronics and Electrical Drives, Microprocessor, Digital Signal Processing and other interdisciplinary subjects with the knowledge of basic science and engineering science as prerequisites, design various types of machine and power system components with cost minimisation, explain Indian Electricity Rules, Energy Acts for safety of society, tariff and energy savings.
PSO2	Perform laboratory experiment in a group using various electrical technologies, both modern hardware and software tools like MATLAB, Mi-Power used in industry and prepare reports tabulating & analyzing the results/ data, drawing the circuit diagram & graphs to enable the documentation capability and solve engineering problems using programming languages like C, C++, JAVA which will help them in being recruited by software industries.
PSO3	Carry out project on new age technologies like renewable energy sources, power quality, energy management/savings, smart grid, wireless system, automatic control system, embedded systems based on modern technologies like IoT and defend their project work in front of experts which help in developing the capability of doing team work, satisfying the requirement of the present day working environment.
PSO4	Communicate; write term paper integrating various information in standard format to that of a research paper for effective & life-long learning, present seminar on recent developments in engineering & technology, fulfilling social, behavioural, managerial, ethical & cultural requirements.

From the Desk of Principal, BCREC

Prof. Dr. Sanjay S. Power

Dear Friends,

I have immense pleasure for writing to you through "ElectroQuest" a Magazine of Electrical Engineering. I first of all congratulate the team for coming up with the publication to showcase the writing skills of the engineers present in the Department and Institute. I look forwarding in reading the news and technical write-ups from all the authors to showcase their own studies, research and a reviews of the technical fields of their interest. As the years are passed we look forward in improve the qualify of writing, technical and informative content, so it will be used not only by our students but also by others. This can also be a platform looked by young researchers faculties and students to show case their findings. Congratulations to team for the publication and best wishes for future to reach for an international standard.

From the desk of the Head of the Department

Dr. Susanta Dutta, Associate Professor

I am delighted to know that EE department is going ahead with the publication of 3rd issue of e-magazine ElectroQuest. The magazine is an ideal platform for exchange of thought provoking ideas among students, alumni, staff and faculty members. I congratulate the editorial Board for their Endeavour and hope their initiative will help in a long way to enrich the technical and general knowledge of the members of the department. I am glad to inform you that we have made steady progress in all fields since publication of the previous issue. The department has got accreditation from National Board of Accreditation. Our college has now attained NIRF ranking. These are great achievements for the institute and the department.

Other noteworthy achievements made by the department are listed below:

During 2022-23 EE Department organized 2 nos. FDPS, 2 nos. Webinars and 2 nos. workshops.

EE Department secured a grant of 8 lacks on Multipurpose Solar Agro Bot by Dr. Dola Sinha, Dr. Chaity Sarkar and Prof Kingsuk Majumdar from RKVY RAFTAAR Ministry of Agriculture.

A patent application filed on 08.12.2022 Indian Patent file ref no. 202231070943 for ' A Fuzzy Logic operated egg incubator ' by Dr. Dola Sinha and Prof Kingsuk Majumdar.

Faculty members of the department authored 15 research papers in peer reviewed journals.

18 nos. papers were presented in national and international conferences.

Prof Chandan Paul and Prof Soumen Biswas were awarded Doctorate degree by IIT Dhanbad.

Prof Sibendu Mahato got PhD degree from NIT Durgapur.

Prof Riturani De (Maiti) obtained her doctoral degree from NIT Durgapur.

Dr. Dola Sinha has successfully completed the sponsored project granted by DSIR/PRISM.

The overall academic performance of the department is quite impressive. Let us hope that the department keeps up its good performance.

I wish all success to the magazine and hope that it is welcomed by the readers.

EDITORIAL

Dear Readers,

We are delighted to bring out this third issue of 'ElectroQuest' by the Electrical Engineering Department. We have triumphantly overcome the challenges of the lockdown period due to COVID -19. Pandemic is on its last legs. The students have returned to campus. The campus has regained its typical hustle and bustle. Students are active with their curricular and extracurricular activities. The vibrant ambience of campus life is visible in all spheres of activities. All annual events like tech fests, cultural fests, annual sports, freshers welcome, adieu to final year students, football and cricket tournaments are being held in college campus. The college successfully organized Smart India Hackathon - 2022. The Prime Minister Shri Narendra Modi interacted (via video conferencing) and congratulated the students and all teams. Meanwhile, the EE department has made great strides in acquiring NBA accreditation from the National Board of Accreditation, along with ME and IT departments. The institute added feather to its cap by successfully figuring in NIRF ranking. These milestones were reached with concerted efforts of all members of the BCREC family. This confirms the saying, "Nothing stops a man who desires to achieve." So these achievements give us a sense of confidence and encouragement.

The current issue of ElectroQuest consists of technical and literary contributions from students, alumni, staff and faculty members of the department. This time we have included different flavours of technical and inspirational writing i.e., technical write up, Fun with science, Science fiction, drawings by students etc. Our sincere thanks to college authorities for their constant encouragement, cooperation on all fronts and providing a suitable environment conducive to academic growth. We are thankful to   Debadrita Roy, Moupali Mukherjee for their creative painting. We also thank to Ms. Sohini Ghosh, Dr. Chandan Bandyopadhyay, Mr. Sovan Bhattacharya, 1st year CSE student Varad Pawar for sharing their write ups for this issue. Special thanks to our Principal Prof. Dr. Sanjay S Pawar for sharing his technical thought with us. We would like to thank all those who contributed for the successful publication of the current issue of the ElectroQuest.

Dr. Dola Sinha

Prof. Anupam Sinha

Prof. Kingsuk Majumdar

Technology use for Future

Prof. Dr. Sanjay S Pawar, Principal, BCREC

We are in the era of rapid change in the technology and its use. The country which will use technology for its use will surely govern the world in future. In previous era we have observed the power was with those which has a huge army and manpower. But today that is not the case. You can see an example of the country like Israel, which is one of the smallest country but has marked its presence in terms of defense and technology and it ruling and dictating its terms and conditions to its neighbors. Off course US and western is leading in technology and it considered to the dream destination to almost all. China is not far behind and has been rapidly catching up with the US and western world. Due to multipolar world to create its own identity is its youth should spend much time on research and development. India has a vast population second to only china in world, but has to go long in terms of many parameters. The thought process has to be built in the mind of the almost all the necessity and priorities for the country. That's where the education system and policy of the country plays a major role. National Education Policy 2020 has been drafted to achieve these goals for the society and people of India. It's the role of the education organizations like us to dig into the detail of NEP2020 and look forward for what we want and what we can do.

One of the largest contributor to the development of the nation is its engineering colleges and institutes. The student, staff and institute has to play a significant role in the future development. The target is to have a correct vision of next future 5, 10, 20, 30 years and prepare a plan for it. Usually and engineering education is classified into a core domain such as Civil, Mechanical and Electrical engineering, a Technology based domain such as Electronics and Communication, Information Technology, Computer Science and Engineering and Information Technology, and the emerging technologies such as Cyber Security, Computer Based Design, Artificial Intelligence and Machine Learning, Quantum Computing, Additive Manufacturing, etc. Each has its own role and importance in building the society. The importance also lies in the collaboration and coordination between each of them. Today we observe that the technology domain such as AI ML, Block Chain, Cloud, 5G/6G, Quantum Computing, etc plays and important role in the development. We can also see the leading multinationals are extensively using these technologies in practice to ensure efficiency, optimization, Automation, and other aspects. We have been observing some of the examples of companies such as Amazon, Google, IBM, Microsoft the way they are leading their technology domain. It's really necessary for all of us to understand what they are doing, how they are doing and how can we use these technology for myself. To know the effective way of using these technology it is necessary to understand it. Rather than that, it should understood and practice at the pace of the world. It you are late then, catching up with them will really be difficult in in future you may lose the race. That is the reason why todays staff students need to understand the terminologies, logics, its basics and built upon the applications around this. There was an era where it was been said that when the computer is used the humans will not have any work. But today we observe that we use computer as well as humans have infinite work.

Similar will be the case with emerging technologies such as AIML, Cloud, Quantum Computing, Digital Twin, Additive Manufacturing, etc. It should not be looked to the replacement of humans but should be looked such that humans can concentrate on future development. That is the reason the early you mature in these technology early you will be master and will start leading and governing. If you fail to mature in right time someone else will take the position and dictate the terms. We have seen the examples today for not considering the priority in this area. There is an infinite opportunity for all of us to excel in future. Only need to identify the path, the target and achieve the goals.

এবার পুজোয় GPS শু

ডঃ দোলা সিনহা

সপ্তমীর সকাল । মুখার্জিদের বনেদি বাড়ির দূর্গা পূজায় এবার আমার নিমন্ত্রণ ছিল। বনেদি বাড়ির সাবেকিআনার পুজো প্রায় একশো বছরের পুরনো। ইংরেজ আমলে তৈরি মোটা থামের পাথরের দালান বাড়ি। যদিও মুখার্জিরা এখন রেনোভেট করে প্রায় সবই মার্বেলের করেছে কিন্তু সেই পুরনো দিনের আভিজাত্যের আভা ছড়িয়ে আছে স্থান বিশেষে। চওড়া উঠোন। সেখানে বেশ বড় করে আলপনা দেওয়া আর তার চার দিকে ঘিরে প্রায় খান পনের ঢাকি ঢাক নিয়ে প্রস্তুত। দূর্গা মন্দিরের প্রবেশ দ্বারটিও বেশ প্রশস্ত। বিশালাকার দুইস্তম্ভ দুই দিকে আর তাদের গম্বুজাকৃতি মাথায় দূর্গামায়ের ত্রিশূল যেন অতন্দ্রপ্রহরীর মতো জেগে আছে নিরন্তর। সেই বিশাল প্রবেশ দ্বারের সামনে জুতো খোলার সময় দেখা হয়ে গেল বুল্টুর সাথে। জুতো খুলছিল। জুতোটা বেশ ভালো, মোটা সোলের, আর বেশ দামী মনে হল। নিজেই বলল, রকার্স শু। আর ওর মধ্যে নাকি অনেক ফেসিলিটি ইম্প্রোভাইজ করেছে। আমি জিজ্ঞেস করতে গেলাম কি রকম? কিন্তু তখনই আরতি শুরু হল আর ঢাকের শব্দে বাকি শব্দ সব চাপা পড়ে গেল। ইশারা করে "পরে শুনবো" বলে এগিয়ে গেলাম প্রতিমার দিকে। আরতির পর প্রসাদ খেয়ে বের হলাম প্রায় ঘন্টাখানেক পর। বুল্টু কিছু একটা ডকুমেন্টারি বানাবে তারই কিছু ভিডিও রেকর্ডিং করছিল। বেরোনোর সময় প্রবেশ দ্বারে পৌঁছে দেখি বুল্টুর ওই সুন্দর জুতো জোড়া আর নেই। যাহ, মনটা খারাপ হয়ে গেল, নতুন কি সব ইম্প্রভাইজ করেছে সেটা আর দেখা হল না। মনে ভাবলাম বুল্টুর নিশ্চয়ই খুব খারাপ লাগছে। কিন্তু বুল্টুর দিকে তাকাতেই দেখি ও বেশ নিশ্চিন্ত হয়েই ফোনটা বের করছে। ভাবখানা এমন যে ফোন করলেই যেন জুতো জোড়া নিজের থেকেই এসে হাজির হবে। আমার দিকে এগিয়ে এসে বলল "তোমাকে তখন বলা হলো না, এটা একটা আমাদের Experimental শু" ।

-----"কিসের এক্সপেরিমেন্ট?" ;

----- "এই দেখো আমার জুতোটা এখন কোথায় আছে সেটা তোমাকে দেখাচ্ছি",

বলেই Google map খুলে ওখানে my shoe টাইপ করতেই একটা location দেখাল। তারপর direction from current location দিতেই পথটাও ম্যাপে দেখাতে লাগলো। আমার স্কুটিতে বুল্টু উঠে বসে বলল, "চলো জুতোটা উদ্ধার করে আনি"। তারপর সেই ম্যাপ মতো গিয়ে পৌঁছালাম একটা ভিড় জায়গাতে। এখানেই সেই জুতোচোর আছে কিন্তু এতো ভিড়ে খুঁজবো কি করে?

বুল্টু বলল, "কুছ পরোয়া নেই এবার দেখ ---"।

বলেই পকেট থেকে একটা transmeter বের করে সেটা অন করতেই দেখি কিছু দূরে একজনের জুতোর তলা থেকে চাকা বেরচ্ছে, ঠিক যেমন করে প্লেনের পেট থেকে চাকা বেরোয় ল্যান্ডিয়ের সময়। আর তারপর হ্যান্ড gesture চেঞ্জ করতেই লোকটা ওর পেছনের দিকে মানে আমাদের দিকে আসতে লাগল। এরকম আচম্বিতে একটা সাধারণ জুতো Roller skating হয়ে যাবে লোকটা বুঝতে পারেনি, তাই টাল সামলাতে না পেরে দুম করে পড়ে গেল। আর তারপর আমরা লোকটার কাছে গিয়ে শুধু জুতো জোড়া খুলে নিলাম। পুজোর দিনে আর মারধর কেন। ফেরার সময় বুল্টু ওর GPS শু তে বাড়ির ঠিকানা সেট করে roller skating auto mode অন করে দিল আর জুতো নিজের থেকে চলতে লাগল ট্রাফিক আর ওয়ান ওয়ের ঝামেলা সামলাতে সামলাতে। আর আমি চললাম স্কুটি নিয়ে জুতো কে ফলো করতে করতে।

বুল্টুর কাছেই শুনলাম ওর সঞ্জুদা নাকি বানিয়েছে এটা... GPS শু। আসলে পুজোর সময় জুতো চুরি অনেক বেড়ে যায়। তাই এই ব্যবস্থা আর বাকিটা ওদের রিসার্চ। বুল্টুর প্রিয় সঞ্জুদা ডঃ বি সি রয় ইঞ্জিনিয়ারিং কলেজে ইলেকট্রিকাল এর থার্ড ইয়ারে পড়লেও ক্লাসের বাইরে সারাক্ষণ সে চিপের ভেতরেই ঢুকে থাকে আর অদ্ভুত অদ্ভুত সব জিনিস বানায়। মাঝে মধ্যে চিপের বাইরে মুখ বের করে থাবার থায় শুধু। বুল্টু তার ডান হাত। সামনের বছর 12th দেবে। বুল্টুরও ইচ্ছে ওই কলেজে পড়ার। সঞ্জুদার সাথে নতুন কিছু ইনোভেশনের মস্তস্বপ্ন তার দু'চোখ জুড়ে।

Controlling Flexible Link Using Network (Robotic Hand Manipulator)

Srijan Banerjee, Ranjan Kumar Jha, Gyan Prakash , Student

   Controlling flexible link by using neural network is so much efficient now a day to make a suitable robotic hand. By using neural network we can control that link to move in a particular angle with minimum error. Basically in this model neural network toolbox is used to control the link.

      In this project presents an approach for dynamic modelling of flexible-link using artificial neural networks. Control Systems has made giant leaps in the last few decades but the theoretical promises of control systems are not always tested on physical systems. The present work is one attempt to bridge one such gap. This study is made on a laboratory apparatus known as the Rotary Servo Workstation. A Flexible Link is also attached to the Servo in enhance the complexity of the system. Fig. 1 and Fig. 2 show the Rotary Servo and the Flexible Link. The Rotary Servo Base Unit is the fundamental element of the Rotary Control experiments. It is ideally suited to introduce basic control concepts and theories on an easy-to-use and intuitive platform.
The Rotary Flexible Link module is designed to help perform flexible link control experiments. The module is designed to be mounted on the Rotary Servo Base Unit.
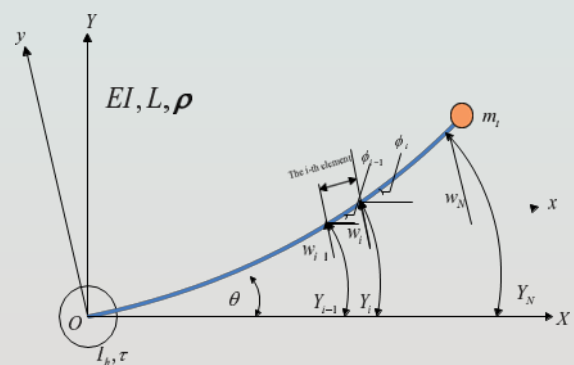

Fig. 1: Rotary Servo system


Fig. 2: Flexible Link mechanism

DYNAMIC MODEL OF LUMPED SINGLE-LINK FLEXIBLE ROBOTIC MANIPULATOR

In this section, the flexible robot is going to be considered into a concise spring-mass system in which a flexible beam is lumped into several rigid elements by fictitious joints. The diagram of the flexible robotic system is depicted in Fig. 1. The flexible link is regarded as an Euler–Bernoulli

  beam. In this paper, we assume that the flexible robotic system is moved in the horizontal plane, thus the impact of gravity is:-

1. Studying the physical laws of the Rotary Servo and Flexible Link apparatus

2. Deriving a mathematical model in the Form of a State Variable Model for the above system.
3. Analyzing the open loop model and simulating the Open loop response
4. Designing a Linear State Variable Feedback controller for the system.
5. Comparing the closed loop response with the open loop one.
6. Design flexible link manipulator using MATLAB neural network toolbox.
7. Observe the graphs of from MATLAB neural network toolbox.
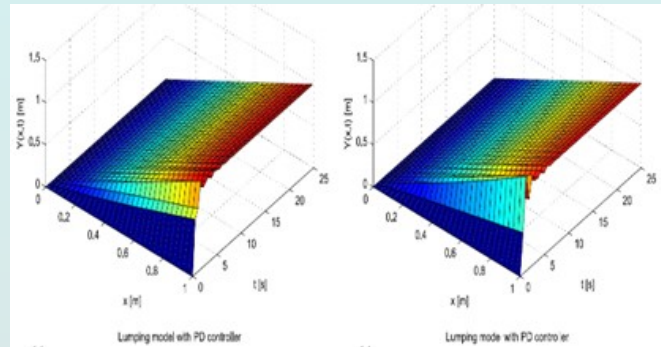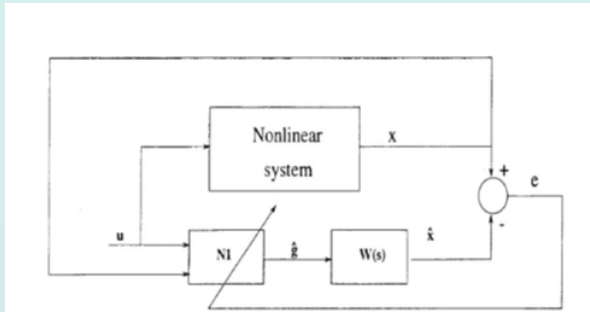

Neural Network Configuring:

a general recurrent network configuration was constructed by combination of feedforward network architectures with dynamical elements in the form of stable filters. However, in deriving the weight adjustment law, it was assumed that the nonlinear system is linear in parameters, an assumption that limits the use of neural networks especially for identification of the dynamics of highly nonlinear systems such as the SSRMS. In this section, the structure introduced in reference. adopted and a different learning rule is introduced to identify the dynamics of flexible link manipulators. To guarantee the boundedness of the states, a joint PD control is introduced in the system. Consider the nonlinear system:

x = f(x, u) ……….(1)

where u ∈ Rm is the input and u ∈ Rn is the state vector of the system. Now, by adding and subtracting Ax where A is a Hurwitz matrix, (1) becomes:

x= Ax + g(x, u) …….(2)

where g(x, u) = f(x, u) − Ax. Based on (2) a recurrent network model is constructed by parameterizing the mapping g by feedforward (static) neural network architectures, denoted by N1. Therefore, the following model is considered for identifica x = Ax + g(x, u,w) (2) where w is the weight matrix. The structure of the identifier is shown in 6.1. In this figure denotes the state of the recurrent model . Corresponding to the Hurwitz matrix A, W(s) = (sI − A)−1 is also shown which is a n· matrix whose elements are stable transfer functions. Note that the identification scheme is based on the series-parallel configuration as the states of the actual system are fed to the input.
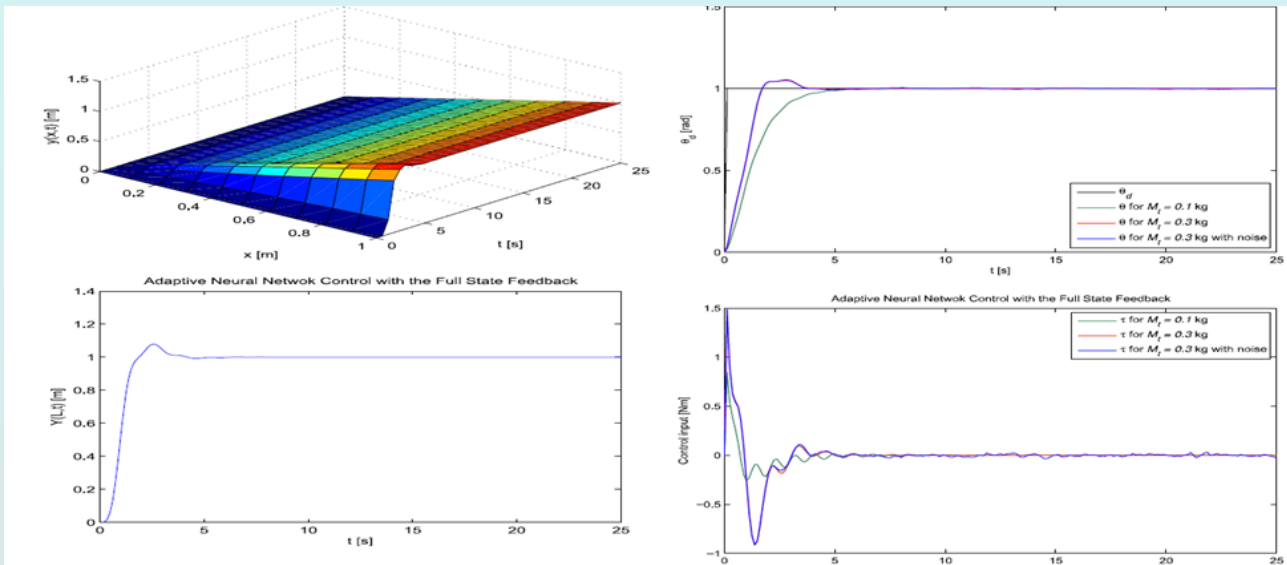
We have derived the model for a flexible manipulator system by employing the lumped spring-mass method. Adaptive NNs have been developed to resolve problems of unknown dynamics of the flexible manipulator. The stability of two different control systems has been proven rigorously via the proper Lyapunov functions. Both the simulation and experimental results have illustrated that the proposed control has the outstanding ability to track the desired rotary angle θ and the desired vibration angle of the tip position of the flexible link can eventually converge to a small neighbour hood of zero. In this paper, the input nonlinearities are not taken into consideration in the control design. In the future work, we will design the NN control for a flexible manipulator with the input saturation.

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How The Future Might Look Like

Baidehi Bhattacharya (Student), Dr. Sneha Sultana

Science Fiction has been defined in numerous ways over the years, though no concrete definition has been chalked out. The most popular and recognizable keywords associated with it are: science, technology, time travel, scientific methods, different worlds (multiverse!), and catastrophe. Incorporation of these elements helps the reader to identify a work of science fiction. Because science fiction's pivotal focus is science, it naturally grabs the spotlight in a story. The way an author decides to use the topic might vary from story to story. Some may choose to portray science in a good manner, while others might hold up the shady side of science.

While the future might look like a cakewalk considering how terrific the world looks right now, remember, "All that glitters is not Gold." But, let's not fret about this. Not only are some major breakthroughs anticipated but also several changes are in development as you're reading this now. There are literally thousands of developments occurring in the world of tech almost every month. Thinking about the future, we are inclined towards asking a very common question:

What's on your bucket list? The future can be quite scary but a leap of faith doesn't really hurt anyone, does it? It might prove to be in your favour. Afterall, fortune favours the brave!

Well, in my opinion, virtual assistants are going to be inevitable. They will be kicked up a notch in the years to come. Until now, Amazon Alexa, Apple Siri or Google Home devices were an exclusive luxury limited to the elite classes of the society. But that might be transitory. AI is the new future. It will be the one stop solution to a child's unending curiosity, your go-to aide for new project ideas or just an amateur therapist for you.

Nuclear power will gain momentum. As claimed by many energy scientists, it will be the most powerful, cheapest and one of the cleanest energy resources one can use. But we haven't really tapped the power to its full potential. That would be definitely achieved one day and you will see a reduction in the cost of your power bill. Every area will have its own nuclear energy grid, owned by a particular city, state, province or village. Since nuclear energy is a relatively new concept, it will take time but is expected to emerge out as one of the leading energy producers in the next 20 to 30 years.

We have seen the birth of Augmented Reality (AR) and Virtual Reality (VR) and its steady growth too. When we tend to think about how the future might look, we stumble upon the thought who's going to get to use the revolutionized technology first? The armed forces. As a result, they will get to use AR/VR for their tactical military operations. It will assist them in their practical training for real combat situations. Usage of AR/VR in 3D mapping will also

escalate. In-depth scans will be possible in video games, making the software more interactive than ever. Some of you might have seen such AR/VR gaming videos on YouTube too.

We are slowly but gradually stepping towards a world full of automation, a world of logistics. We have already enjoyed some benefits of automation in the last few years. Big technological companies have their own warehouses and in order to keep a track of all the important information, automation becomes an indispensable tool. Yet a lot of labour falls upon the employees too. This might not be the case in future. There will be a paradigm shift from manual, human labour to automated operations - definitely a huge setback for the human race in terms of job opportunities. But then, humans are always trying to sharpen their skills, hone their capabilities in order to sustain at workplace.

Needless to say, the future is going to be heavily tech-reliant. Since most of this technology will require internet connection, we cannot expect people to live their lives paying a bizarre amount for their internet services. Use of internet will increase manifold, making it a basic necessity. Government might start offering public internet services free of cost. Private companies will join this cut-throat competition and reduce their prices. Private net connections might still continue to charge a nominal fee as they will help with certain issues which the public net won't.

Gene editing is something I guess, most of us are not acquainted with. For the first time ever, gene editing will make it possible to spot and remove minor issues from a child even before they are born. But this is accompanied by a major dark side: "designer babies." The changes made before birth might lead to certain modifications in their eye colour, skin colour, even hair colour. It could be due to melanin change. When thinking about how the future might look, this could be a bit frightening; we don't want giants roaming around us all the time!

Our oceans are accepted to be clean of trash and plastics, a herculean and impossible task for humans. Certain plastic-consuming bacteria have been discovered, but many believe that nano-bots are the ultimate solution.

Lab-grown food is a concept limited to the beau monde. Plant based products and vegan food supplements are gradually gaining impetus as they are becoming affordable and might continue to further drop down in cost, leading to their huge popularity.

EVs are nothing new for electrical engineers. We are quite familiar with their applications and more or less, all of us have a basic idea about them and how they are going to be available commercially for the mass very soon. Commercial space travel is going to happen, as stated by people like Elon Musk. 'Smart needles' will be available to speed up diagnostic procedures and subsequent treatment.

Programmable Clothing. Perhaps, assume the clothing that we adorn can be customised then and there itself according to our desire. We can change the colour, maybe even the style! Many feel this would be absolutely awesome as it would ensure a proper fit. But this size change tech is not something that can be expected to be seen immediately. Maybe in the next 20 years, you never know!

Organ development might become possible in labs, rather than being transplanted from other humans. The list is endless! Lastly, our DNAs might be the storehouse of data, yes you read that right, our DNAs will be capable of storing data. No hard disc, no flash drive, not even a memory card, and the cherry on the top? Hack proof.

We could see all this and lot more in the years to come! The future is, indeed, exhilarating!

Electrical Engineering - The fascinating branch

Prof.   Anupam Sinha

Electrical engineering is really a fascinating branch of engineering. It is enthralling to have the feeling of invisible electrons flowing through conductors and performing gigantic tasks.

Power is the catchword. So you can expect to be involved with generation, transmission, distribution and utilization of electrical power. Modern civilization is heavily dependent on electrical power. As an electrical engineer you can specialize in core electrical engineering spheres, control system, instrumentation , power electronics, electronic control of drives, bio-medical instrumentation etc. Practically the EE branch encompasses a wide range of engineering subjects. In fact it can be termed as mother branch. Electronics, Instrumentation, Telecommunication and even Computer science engineering are offshoots of the above branch and fall under the ambit of circuital branches.

 The advent of smart grinds, wireless power transmission, interconnected grids, flexible AC Transmission systems, precise electronic control of drives etc have revolutionized the Power sector. New avenues of research have opened up.

Prospects : The EE department of the college boasts of a highly qualified and experienced team of faculty members with post graduate and majority of them having doctorate degrees, highly experienced technical assistants, fully equipped software and hardware Labs, high tech smart class rooms, Tesla Project Lab for design and fabrication of innovative projects, departmental library etc. Students get all modern facilities for technical learning. Many faculty members have vast experience in industry and are aware of ever changing demands of industry. Recently an industry oriented course is introduced by department for 3rd year students to bridge the gap between the course curriculum and industrial requirements. Experts from industry are invited to groom the students. Workshops and seminars are regularly organized and experts from industry, educational and research institutes participate in them. GATE examination preparatory classes are also taken up for aspiring students. Industrial visits are arranged..

The vibrant campus life with excellent co curricular and extracurricular facilities is an ideal place to have an all round personality development. Beyond regular academic experiences, these facilities increase the competencies and capabilities of the students. Students also get excellent career guidance support. Top notch placement training is provided by the institute. In-house training comprises technical training as well as soft skill training. Institute has collaboration with leading industrial groups. Campus interviews are organized under annual placement drives. Students of the department have scope to get absorbed by core sector, software companies, research institutes and higher study centers. The students of EE department can expect exciting careers with excellent growth prospects.

How Will Education Inflation Impact In Coming Years.

Prof. Dr. Sanjay Saha

"Education is the most powerful weapon which you can use to change the world"- Nelson Mandela

As your child grows, so do their demands—from purchasing toys to receiving a new phone. By putting aside your demands, you meet their needs. You make sure to provide them with the best and highest-quality education when it comes to education.

However, with education inflation reaching its peak, somehow finances become a barrier. To beat such a situation, you cautious your child education.

However, if in the later stage, say for college education you require money, you could always go for a child education loan.

"A good education is the foundation of a better future"- Elizabeth Warren

Everything's getting more expensive due to inflation, from vegetable price increases to gasoline. You can be so preoccupied with the everyday increase in pricing that you fail to take other sectors, like education, into account.

The education sector has seen a quantum leap in terms of inflation. This situation is worrisome for both parents and students as it impacts dreams & aspirations to enter a good college. Even the pandemic couldn't stop education inflation from rising. How?

Well, for example, the Indian Institute of Technology (IIT) doubled its fee from 90,000 to 2 lakhs for an undergraduate course in 2021.

Most unprepared parents experienced financial challenges. Even parents who had a strategy for their child's schooling ran into trouble. However, if inflation was taken into account while providing a child with an education, those parents were exonerated!
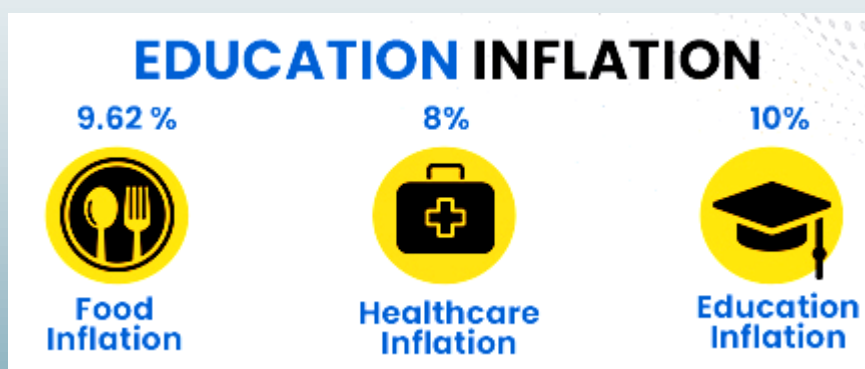
There are several reasons why education has advanced significantly. These variables range from an increase in the cost of living to increasing tuition rates, from administrative expenses to infrastructure and technology

costs, etc. Not only that, but hidden expenses like exam registration fees, travel expenses, lodging prices, and food costs come on top of all of this.

Increase in Tuition Fees

There has been an increase in tuition costs over time. There are certain complete courses whose prices have increased. In addition, the courses listed below are anticipated to increase based on their increase in prior years.

Having an education plan will help you to manage the coming inflation

EXPECTED RISE IN TUITION FEES IN INDIA
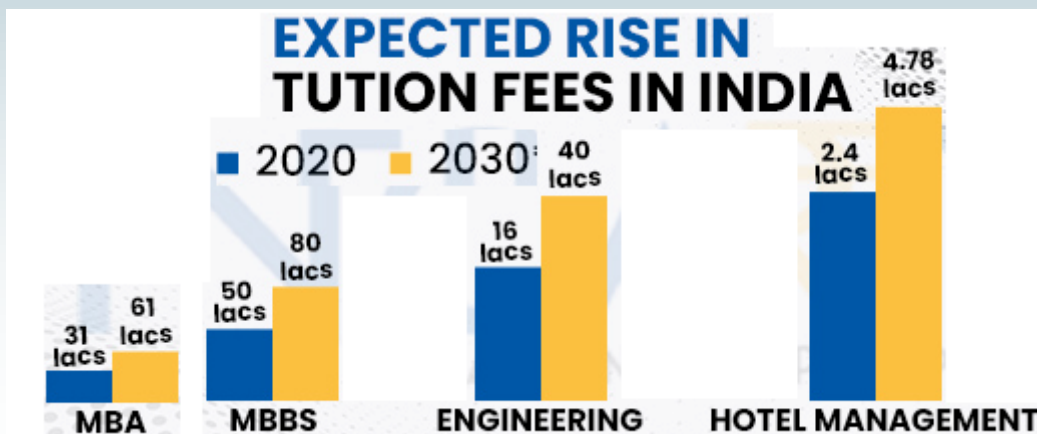
Rise in Abroad Education

Students who want to study abroad are having their aspirations dashed by rising inflation and the declining value of the rupee. The cost of everything is going up, from education to living expenditures. Many students have part-time jobs as a result to cover the costs there.

Imagine how expensive education would be when it reaches its height in India. Therefore, a sizable sum of money is needed for schooling abroad.

Did you know that the total cost of an undergraduate program at Harvard University for the academic year 2022-2023 has risen to 2.7% as compared to previous years?

According to The Hindu, "Last year, including visa, college fee, and other charges, a student would spend around ₹20 to ₹25 lakh per annum. This year, it will cost around ₹25 to ₹40 lakh per annum."

BOTTOM LINE:

Inflation is a silent killer that will kill you if not taken into consideration. When YOU CONSIDER YOURS child education, you must factor inflation into your ACCOUNT.

VIRTUAL REALITY HEADSET - A PROMISE TO CHANGE THE LEARNIG ENVIRONMENT

MRIGANKO SARKAR, Student

A virtual reality headset is a heads-up display (HUD) that allows users to interact with simulated environments and experience a first-person view (FPV). VR headsets replace the user's natural environment with virtual reality content, such as a movie, a game or a prerecorded 360-degree VR environment that allows the user to turn and look around, just as in the physical world. VR headsets typically include a stereoscopic display (providing separate images for each eye), stereo sound, and sensors like accelerometers and gyroscopes for tracking the pose of the user's head to match the orientation of the virtual camera with the user's eye positions in the real world. Today, mobile VR headsets, which are basically goggles that will hold a smartphone, have allowed VR apps to spread into the consumer market as well as they are also used in other applications, including simulators and trainers.

Uses in various fields

- **Medical training and Diagnostics**

Virtual reality headsets are being currently used as a means to train medical students for surgery. It allows them to perform essential procedures in a virtual, controlled environment. Students perform surgeries on virtual patients, which allows them to acquire the skills needed to perform surgeries on real patients. They also can perfect their techniques in a real-time simulation in a risk-free environment than traditionally, where students had to participate in surgeries and often they would miss essential parts.
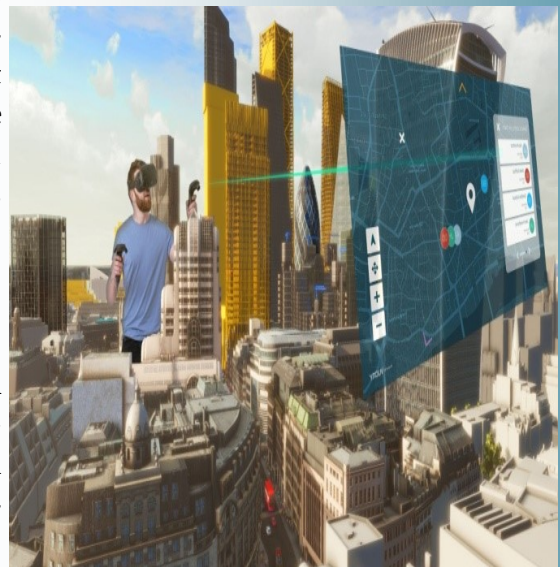
- **Military training**

Virtual reality headsets can be used by the Armed Forces. It is a particularly useful tool for training military personnel without harming themself. The virtual reality headset allows the military personnel to interact with virtual reality people to make it feel real. They can talk to one another and do varying actions to make the virtual reality world feel like they are actually in that situation. The advantages consist of repeating the situations multiple times and the cost of having the headset is less, due to which no military equipment being needed.

Criticism

Virtual reality headsets have been linked to rising cases of <u>rashes</u>, <u>swelling</u>, <u>burning</u>, <u>itching</u>, <u>hives</u>, and bumps. So at present it can be used in limited areas.

Conclusion

The goal of each type of VR headset is to provide the viewer with an experience that is so real, that the headset itself is forgotten. This technology with more advancement and upgradation can also change the training modes in every sector like education sector etc, and in future eliminating latency it can reduce viewer disorientation, headache and nausea.

A benison on modern technology: Magnetic Levitation System

Prof. Soham Dey

Modern-day's science and technology have been continuously enriched by the rigorous and tireless efforts from the research scientist all around the globe. As a result of their fertile mind and brain a brand new technology known as the Magnetic Levitation System has come to serve the human civilization. Just imagine, you are sitting inside a train and travelling at a speed of 350 Km/hr without having a slightest of idea that the train hasn't even touched the railway tracks. The entire vehicle is complete suspended in the air and it is almost 5 centimetre above the ground level. Well, it is like a flying train. This not an imagination or a scene from Hollywood science fiction film right now.

Maglev Trains are running in various countries even in India as experimental produce. All of these have been possible due to Magnetic Levitation System. So what is Magnetic Levitation System? Let's have a brief idea about it. Electromagnetic Levitation system (EMLS) is basically a physical phenomenon which describes the levitation and suspension of metallic objects made up of ferromagnetic materials with the help of magnetic force. The EMLS has the following fascinating features:

• No mechanical support is required to levitate the object.

• To overcome the effect of gravitational force the magnetic attractive or repulsive force is used.

• When the gravitational force is completely counter-balanced by magnetic force the ferromagnetic material is stably levitated and suspended in the within the magnetic field.

• To maintain the equilibrium between the oppositely acting gravitational force and magnetic

force is the main challenging task as magnetic charge cannot have stable equilibrium position when a static force is applied following the inverse square law.

Feedback Instruments Ltd (UK) has built a complete setup of magnetic levitation system for-conducting control experiments in laboratory which is used to carry out experimental works in this research. The entire Maglev setup is an electro-mechanical device comprising of an electrical sub-unit and a mechanical sub-unit and is shown in figure 1. The whole physical setup is then interfaced with a PC via PCI 1711 Analogue/Digital I/O card. This I/O card is manufactured by Advantech technologies. The MAGLEV setup is made up of the following main submodules: Solenoidal coils, IR optical sensors, Ferromagnetic object, Analogue/Digital interfacing board and the computer. The coils of the electromagnet get energized by passing current through it, and produce a magnetic field in the vicinity of the coil. This magnetic field exerts an

The magnetic force has to counteract the gravitational force which tries to pull the ball down to the earth. At a stable equilibrium condition between the two oppositely acting forces i.e. the electromagnetic force and the gravitational force, the ball freely suspends in the air. IR sensors detect the ball position and provide it as the feedback signal for closed-loop control. The voltage in the electromagnetic coil is controlled by a PWM controlled power amplifier to produce required lifting force. To achieve necessary controlling action a controller needs to be put in action. Here, the desired controller is designed in MATLAB/Simulink software installed in the PC and interfaced to the hardware through MATLAB real-time interface feature.

Figure 1: EMLS setup by Feedback Instruments Ltd (UK)
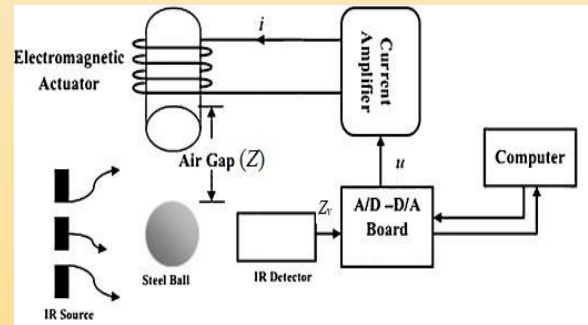
Figure 2: Block diagram of EMLS

When dc current 'i' flows through the coils of the electromagnet, it gets energized and attracts the ball of mass 'm' in the vertically upward direction. The gravitational force acts on the opposite direction. These two forces has to counterbalance each other for stable levitation of the ball. If the vertical displacement of the ball is symbolized by 'z', gravitational acceleration by 'g', then one can have the following ball dynamics in the vertical axis,

$$m\frac{d^2z}{dt^2} = mg - k\left(\frac{i}{z}\right)^2 \tag{1}$$

here 'k' is the proportionality constant. Equation (1) signifies that it is a nonlinear equation which needs to be linearized for implication of linear controllers. The Taylor series expansion formulae applied to (1) for a small perturbation of current (Δi) and position (Δz) from equilibrium point (i_0, z_0) which will produce the following equation [27],

$$m\ddot{\Delta z} = -\frac{\partial}{\partial i}\left\{k\left(\frac{i}{z}\right)^2\right\}\Bigg|_{i_0,z_0}\Delta i - \frac{\partial}{\partial z}\left\{k\left(\frac{i}{z}\right)^2\right\}\Bigg|_{i_0,z_0}\Delta z$$

$$= -2k\left(\frac{i_0}{z_0^2}\right)\Delta i + 2k\left(\frac{i_0^2}{z_0^3}\right)\Delta z \tag{2}$$

$$\ddot{\Delta z} = -\frac{K_i}{m}\Delta i + \frac{K_z}{m}\Delta z$$

hence,

$$\tag{3}$$

here, the two force constants K_i and K_z calculated from equilibrium points are given as follows,

$$K_i = \frac{2mg}{i_0} \quad ; \quad K_z = \frac{2mg}{z_0} \qquad \text{where} \qquad g = k\left(\frac{i_0}{z_0}\right)^2 \tag{4}$$

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$$G(s) = \frac{\Delta z(s)}{\Delta I(s)} = -\frac{\left(\dfrac{K_i}{m}\right)}{s^2 - \left(\dfrac{K_z}{m}\right)}$$

(5)

The Maglev system's parameter values are given as: Mass of the suspended ball (m) = 210^{-2} Kg; equilibrium position of the object (z_0) = 0.009 m (9 mm); equilibrium coil current (i_0) = 0.8A and gravitational acceleration (g) = 9.81 m/s^2.

With the above mentioned values, the transfer function is calculated as,

$$G_p(s) = \frac{-24.525}{s^2 - 2180} = \frac{-24.525}{(s+46.69)(s-46.69)}$$

(6)

Just by looking at the open-loop transfer function (6) of the system, it can be easily conferred that the Maglev system is a 2nd order type-0 system. It has one pole at right-half of s-plane and another pole at left-half of s-plane. Due to the presence of the right-half pole the system becomes highly unstable.

The main challenge associated with the Magnetic Levitation System is that it is highly non-linear and inherently unstable. The controlling of such unstable system is very difficult. That's why researchers have proposed various control strategy to overcome the difficulties associated with the system. Some of them have used advanced linear control techniques, some of them have used fractional order calculus. The most commonly and widely used controllers are:

1. Integer order PID (IOPID) controller

$$G_c(s) = \frac{U(s)}{E(s)} = K_P + \frac{K_p}{T_i s} + K_p T_d s$$

(7)

The transfer function of IOPID controller is give as
2. Integer order PID with first order derivative filter (IOPID-F) controller
3. The transfer function of IOPID-F controller is give as

$$G_c(s) = \frac{K_p T_i (T_d + T_f)s^2 + K_p(T_i + T_f)s + K_p}{T_i T_f s^2 + T_i s}$$

(8)

3. Fractional order PID (FOPID) controller: Fractional order calculus involves integrals and derivatives of any arbitrary real orders. It possesses both short-term and long term-memories corresponding to time constant distribution. The fractional orders of integral and derivative operators are symbolized by λ and δ respectively. The FOPID controller's transfer function is given as

$$G_c(s) = \frac{U(s)}{E(s)} = K_p\left(1 + \frac{1}{T_i}s^{-\lambda} + T_d s^{\delta}\right) = \frac{K_p T_i T_d s^{\lambda+\delta} + K_p T_i s^{\lambda} + K_p}{T_i s^{\lambda}}$$

(9)

4. Fractional order PID with fractional order filter (FOPID-F) Controller

A fractional order filter is added in cascade with the derivative term of the FOPID controller to improve the controller performance and to suppress the high frequency noise present in the control signal. The derivative filter not only reduces the noises in the control signal but also makes the improper controller transfer function a proper one which makes it easily physically realizable for practical purposes

$$G_c(s) = \frac{U(s)}{E(s)} = K_p \left(1 + \frac{1}{T_i} s^{-\lambda} + T_d \frac{s^\delta}{1 + s^\delta T_f} \right) = \frac{K_p T_i (T_d + T_f) s^{\lambda+\delta} + K_p (T_i s^\lambda + T_f s^\delta) + K_p}{T_i T_f s^{\lambda+\delta} + T_i s^\lambda}$$

Some Hardware responses captured with the Magnetic Levitation System
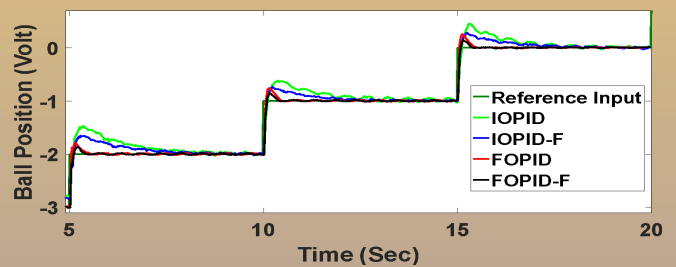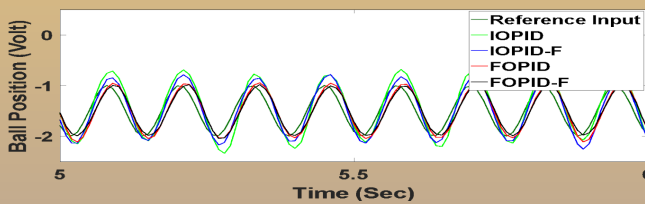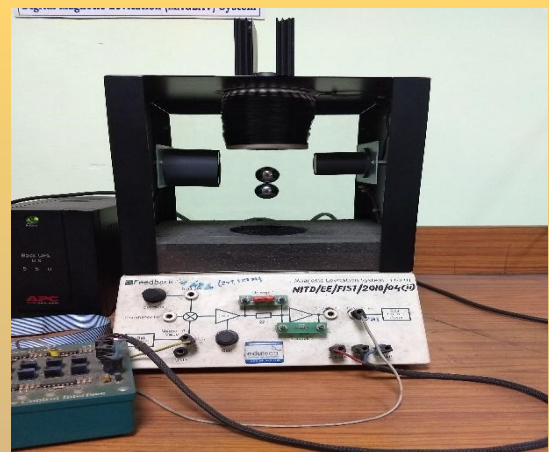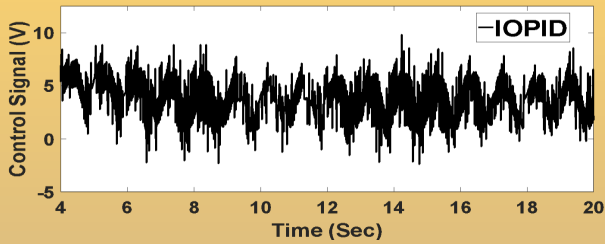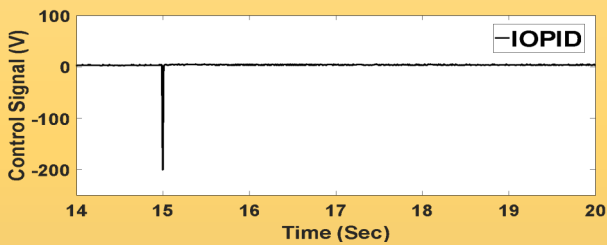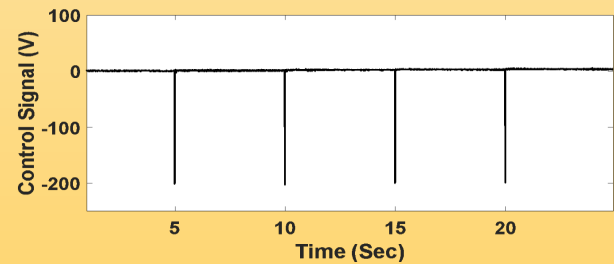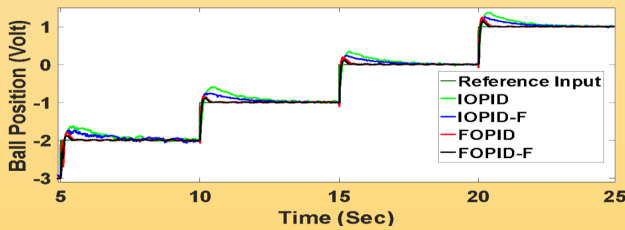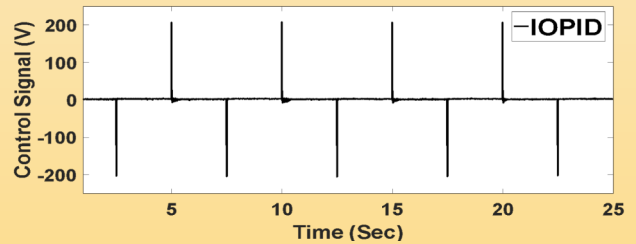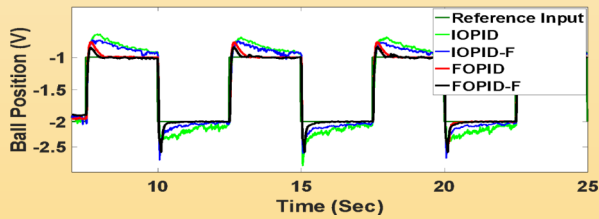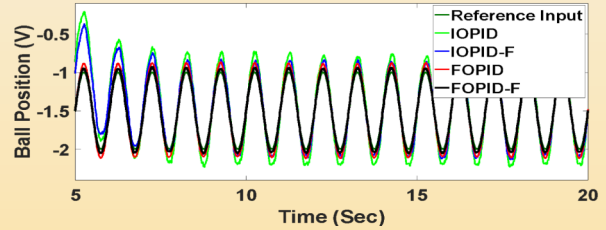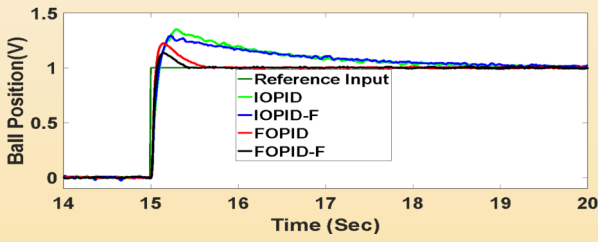
- **Magnetic Levitation train:** Magnetic Levitation (MagLev) train has been the most important usages of magnetic levitation technology. The train moves along the guide way with the help of magnetic field which helps the train to levitate and propel.
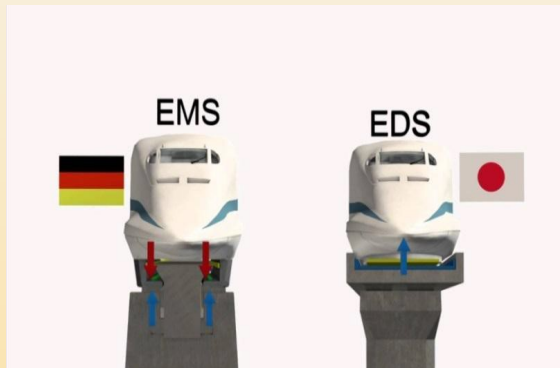
- **Magnetic Bearing:** Magnetic bearing use rotor to levitate and rotate with magnetic flux interaction from stator mounted electromagnet. Since no contact thus no friction, no drag and no wear and tear of parts. Magnetic bearing are used in flywheel as energy storage device, as blood pump, micro positioning system and semiconductor industries.
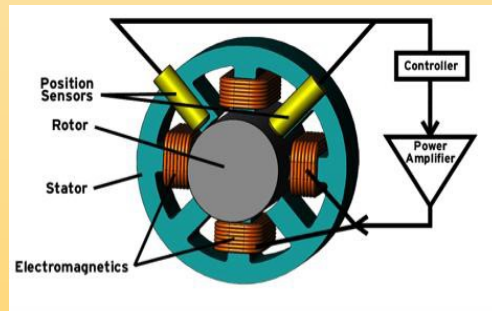
- **Maglev wind turbine:** Guangzhou Energy Research Institute researchers have estimated that magnetically levitated wind turbine can as much 20% more efficient than traditional wind turbine. The proposal is given for colossal wind turbine with vertical blades and supported by neodymium magnets.

- **Electromagnetic Aircraft launch system:** Electromagnetic Aircraft launch system uses magnetically levitated based catapult to launch aircraft in aircraft carrier. This system achieved better acceleration than conventional linear motor as well the stress on air frame of aircraft is also less.

The Evaluation History of Reversible Circuit and its Journey towards Quantum Computing

Dr. Chandan Bandyopadhyay (CSE, Data Science), & Mr. Sovan Bhattacharya (CSE)

In the last couple of years, the semiconductor industry has witnessed a tremendous advancement in the integrated circuit (IC) technology. Although, the growth of IC technology is still following the pattern predicated by Moore's law [1], but as the packing density of transistors in IC increases exponentially, it would be very difficult to limit the energy loss in the conventional logic circuits. This continuous downscaling of feature size is not alluring anymore due to multiple obstacles, such as, poor yield, high thermal footprint, low reliability, and in general is giving diminishing returns. So, the necessity of designing energy efficient circuits is observed. Though over the last three decades, IC technologists, engineers and researchers have significantly succeeded in reducing the energy loss in the irreversible logic gates by using improved process technologies, higher levels of integration, and low power design methods and tools, but more improved and sophisticated technologies need to be developed. After extensive research, it is found that one of the possible future solution to this energy dissipation problem can be in form of reversible circuit which promises asymptotic zero power dissipation under ideal circumstances.

The concept of reversible logic was first introduced by Landauer [2] in the year of 1961. From his findings, Landauer said that for every bit of information loss, $KT \log_{10} 2$ Joule [where K is Boltzman constant and T is the absolute temperature of the environment] of heat energy dissipates from logic circuits and this problem can be addressed if the circuits can be implemented in reversible domain, where all the information bits can be preserved perfectly. Later, Bennett [3] claimed the same theory again and postulated that the energy dissipation problem can be avoided by the incorporation of information-lossless property in circuits. The recent physical verification of Landauer's principle by Berut et al. [4] has further added a new dimension to this newly emerging field.
Gradually, the reversible computing finds significant applications in the different domains e.g. in the design of quantum computing systems [5], on-chip interconnects [6], adiabatic computation [7]. Due to the growing emphasis and high end research, it can be predicted that reversibility will become a dominant factor in the future nano-scale circuit designs.

In contrast to the design of conventional logic circuits, where Boolean logic gates are used to design circuits, Quantum circuits [8] are built with reversible logic gate libraries as the reversible logic is the basis of the quantum computation. Several such libraries are shown to be universal, i.e., can be used to create any arbitrary Boolean function. However, the Boolean function itself may not be fully reversible and therefore, it requires a pre-processing step from irreversible to reversible. More importantly, Quantum technologies enforce physical reversibility via unitary transformations in Bloch sphere, which, in turn, mandates logical reversibility.

From the implementation point of view, though the designs of quantum circuits are known to be very complicated but this field has witnessed some remarkable progresses with the development of quantum circuit implementing technologies. In recent years, technologies like ion trap [9], NMR [10] and superconducting qubits [11] have successfully demonstrated their capabilities in physical realizations of reversible logic gates like Fredkin [12] and Toffoli [13]. Application of silicon technology in the fabrication of Quantum gates [14] has also been reported recently [15].

As the direct design and synthesis of the quantum circuits is a complex task, it needs a multiple-step approach. Basically, the quantum functionality of Boolean components is first realized as a reversible circuit, rather than a quantum circuit. Then, the resulting reversible circuit is mapped to an equivalent quantum circuit representation. This technique drastically reduces synthesis complexity of the quantum circuits. So, here the necessity of developing efficient synthesis algorithm is observed.

In last few years, this field has witnessed several developments, where the researchers have mainly contributed in the development of efficient circuit synthesis algorithms. As the inherent complexity in the synthesis process of reversible logic circuits further needs to be explored, it has breed new scopes for further improvements in the synthesis stage.

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Soliman's Modified Wien Bridge Oscillator

Dr. Shibendu Mahata, Assistant Professor

The Wien bridge oscillator (WBO) is an audio frequency sinusoidal waveform generator that is familiar to undergraduate students of electrical and electronics engineering. An operational amplifier based WBO circuit is illustrated in Fig. 1.
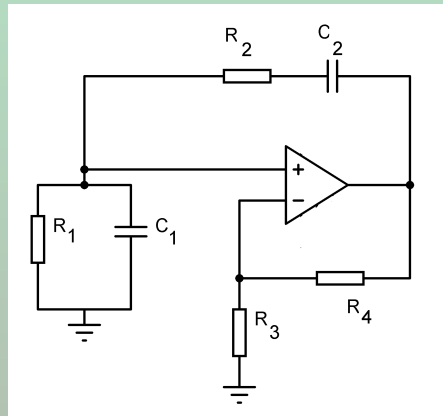

Fig. 1. Op-amp based Wien bridge oscillator circuit.

For such a bridge based circuit, with $Z_1 = R_1 \,//\, (1/sC_1)$, $Z_2 = R_2 + 1/(sC_2)$, $Z_3 = R_3$ and $Z_4 = R_4$, the balancing condition is given by

$$Z_1Z_4 = Z_2Z_3 \qquad\qquad (1)$$

Equating the real and imaginary parts of the obtained complex valued expression leads to the following well-known results:

Condition for Sustained Oscillation: $(C_1/C_2) + (R_2/R_1) = (R_4/R_3)$

Frequency of Oscillation: $\omega = \dfrac{1}{\sqrt{R_1R_2C_1C_2}}$ radians per second (rad/s)

While the WBO implementation is straightforward, one of the fundamental disadvantages of WBO is its 'non-orthogonality' about the frequency and condition of sustained oscillation. Note that the design parameters C_1, C_2, R_1, and R_2 are involved in both the expressions. Thus, no independent parameter is available to tune the oscillation frequency independently of the necessary and sufficient condition to sustain the oscillations.

A simple modification to the WBO was proposed by Soliman [1] in 1979 to alleviate this issue. Unfortunately, the paper received little attention and was never incorporated in standard electronics textbooks or monographs. It may be worth revisiting this forgotten circuit topology, henceforth, known as Soliman's modified Wien bridge oscillator (SMWBO).

The simple modification provided in SMWBO is to incorporate a capacitor (C_3) in parallel to resistor R_3 of the WBO. An operational amplifier based SMWBO circuit is presented in Fig. 2.
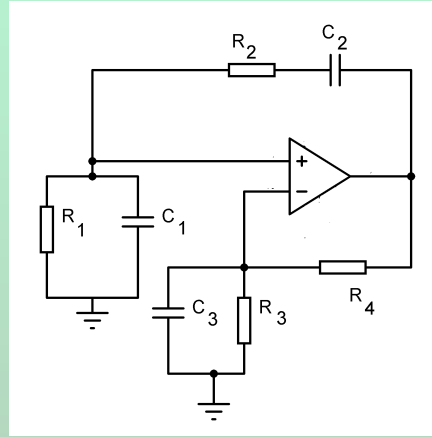

Fig. 2. Soliman's modified Wien bridge oscillator circuit.

Following (1), with $Z_3 = R_3 \; // \; (1/sC_3)$ and the remaining impedances as before, the balancing condition for SMWBO is defined by (2).

$$\left(\frac{R_1}{1+sC_1R_1}\right) \times R_4 = \left(R_2 + \frac{1}{sC_2}\right) \times \left(\frac{R_3}{1+sC_3R_3}\right)$$

(2)

Proceeding with the substitution $s = jw$ in (2) followed by equating the real and imaginary parts to zero will result in the following expressions:

$$-\omega^2 C_2 R_1 [C_1 R_2 - C_3 R_4] + 1 = 0$$

(3)

$$\omega\left[C_1 R_1 + C_2 R_2 - \frac{R_1 R_4 C_2}{R_3}\right] = 0$$

(4)

Therefore, for the SMWBO

- Condition for Sustained Oscillation: $(C_1/C_2) + (R_2/R_1) = (R_4/R_3)$

Frequency of Oscillation:

$$\omega = \frac{1}{\sqrt{R_1 R_2 C_1 C_2 \left(1 - \frac{C_3 R_4}{C_1 R_2}\right)}} \text{ rad/s}$$

While the oscillation condition of SMWBO and the original WBO is the same, note that the parameter C_3 acts as a newly incorporated tuning knob to allow an independent setting for the oscillating frequency.

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How technological progress helps developing countries stay stable and grow their economies over time

Sohini Ghosh (BSH) & Kingsuk Majumdar

For states to work together to tackle the economic, social, and environmental concerns of globalisation, there is no better platform than the Organisation for Economic Co-operation and Development (OECD). The OECD is at the forefront of efforts to help nations adapt to new developments and concerns. The OECD's efforts to promote economic and social progress via the use of scientific and technological knowledge are coordinated by the Directorate for Science, Technology, and Industry (DSTI). This pamphlet explores the significance of innovation for development and many of the issues that emerge. Also included is a synopsis of efforts made to make OECD innovation statistics accessible..

Any viable development plan should heavily invest in the innovative capacity of developing nations. Capacity for invention and local innovations are essential for developed nations to tackle the unique problems that have arisen in their societies. At certain points in a nation's history, various forms of innovation play pivotal roles. Developing and growing nations need both high-tech, R&D-based innovation and incremental innovation that facilitates "catch-up" learning. The nature of the innovations and the key players involved vary depending on the types of support mechanisms put in place.

It will be essential to avoid "middle-income traps" by focusing on building up innovation capacity if one is to reach the global technology frontier in many sectors. Mostly developed nations will benefit, although low- and middle-income nations may also benefit, which requires the complete development of innovation systems, including diasporas as a connection. Developed nations that follow global market trends see the same level of innovation. Indications indicate research and development (R&D) contributed significantly to the rapid growth of China, India, and Korea's growing economies.

Industries and businesses in emerging economies are often at the cutting edge of technology and must constantly innovate to stay ahead of the pack. China has impressive expenditures for research and development. The vertical fragmentation of East Asian value chains appears to be expanding as other countries take over lower-value activities from China. The rising need for basic inputs in the industrial industry may provide problems, for example. In this way, ICTs have the potential to be a potent tool

for assisting low- and middle-income communities in overcoming obstacles to technology adoption and innovation effectiveness..

Global value chains have the potential to provide a new framework for growth. Today's developing nations may take a different road than those of the past if they decide to begin industrialization. It's possible that answers to the topic of how to best assist innovation in emerging and developing countries might be gleaned by studying the economic development trajectories of China and India. Through its collaboration with the OECD and other non-member nations, DSTI has amassed extensive knowledge on innovation in the context of high-income economies. The objective of the OECD's Development Strategy is to transfer the extensive expertise of OECD members to the developing world by compiling their combined knowledge on development processes and policies.

The contribution of innovation to economic growth and well-being, the influence of globalisation on development and innovation, and so on are only two of the six topics now being explored in the field of innovation for development. Social issues like poverty and poor health may be combated using growth-enhancing solutions. The Green Revolution in India saw the development of high-yielding seed types and increased usage of fertilisers and irrigation thanks to these innovations. This addresses the issue of food insecurity for the nation's underprivileged. As a key factor in GDP expansion, innovation is crucial to progress.

Innovation and the Development Agenda, a joint publication of the OECD and the World Bank, focuses on this very topic. The frequently unfavourable framework circumstances for firms are explored, along with many policy implications. The world's problems are nothing new, but they've become larger and more pressing in recent years. When applied to these goals, science, technology, and innovation (STI) may play a crucial role. International STI cooperation may be challenging to develop and requires strong governance structures.

Specifically, the question of how to improve the public policies that impact the innovation performance of nations is examined. At the Global Science Forum, researchers are continuing their investigation with a focus on enhanced collaboration between industrialised and underdeveloped nations. The objective of the Innovation Policy Platform (IPP) is to provide an online, user-friendly database of publicly available data. Its purpose is to give help in studying innovation systems and policies. To add to that, it will help with group studies of both theory and practise.

Traditional trade and innovation policies are being tested in unexpected ways by the rising international fragmentation of industrial processes. If it's no longer essential for countries to build up their industrial production capacity, then they'll need to pursue a new strategy for development. In this context, the problem of specialisation within sectors becomes more important than the issue of specialisation between sectors. The OECD studies the effects of GVCs on national economies because of their growing

significance. Current OECD initiatives investigate topics including the impact of rising countries on global value chains (GVCs), national competitiveness, and global systemic risk.

The concepts of "innovation" and "inclusion" are connected in the following ways: To begin, the term "innovation" may help find ways to close the gap between the affluent and the poor. There are differences in living standards, income, and ability between nations. The lives of millions of low- and middle-income individuals can be helped by innovation from these organisations. There are two ways it may do this: The first is that it may function autonomously by fostering the growth of a market for private sector companies.

Second, it might help integrate previously disadvantaged populations into circuits of economic activity. As opposed to focusing only on technological advancements, it is important to recognise the importance of locally developed inventions that are borne out of need and may help raise people's quality of life. Many people at the bottom of the economic pyramid have to rely on underdeveloped rural marketplaces because they are shut out of the official economy. To a lesser degree than grassroots groups, firms do not participate in innovation activities. The main cause of the lack of convergence between emerging and developed nations is the absence of "inclusiveness," or the vast dispersion of productivity and wealth.

In new and emerging countries, income disparities are exacerbated to much greater degrees. New evidence on inclusive innovation and policy choices are the goals of the OECD's Project on Inclusive Innovation. In November, during the 6th Conference on Micro Evidence on Innovation and Development (MEIDE), a pilot research project will be presented. UNU-MERIT and the South African Centre for Science, Technology, and Innovation Indicators are collaborating on MEIDE (CeSTII). Preventing the brain drain by working to improve the research and job prospects for highly talented individuals in their home countries is crucial.

The goal of the IHERD initiative at Sida is to increase the use of data-driven research management and innovation strategies. The Organization for Economic Cooperation and Development (OECD) seeks to be a worldwide clearinghouse for public policy recommendations on how to best promote innovation and research for the benefit of developing and middle-income nations. To do this, we will collaborate with preeminent scholars, establishments, and policymakers to strengthen ties between frontier research and policy. Information and communication technologies (ICTs) play a crucial role in the dissemination of knowledge by reaching out to previously unreached places and populations. They may also be important for fostering innovation when new ideas are shared with more people.

The two articles linked below explore the obstacles that must be overcome in order to fully realise the promise of ICTs. The OECD has assessed Mexico's telecommunications policy and regulation and put forward a number of proposals. This research has

sparked heated discussions throughout the country and shed light on the financial burden that Mexico's broken telecom sector has imposed on the country's economy. Lack of competition puts a penalty on consumers and firms, the report suggests. An Internet and Communications Technology (ICT) for Inclusive Development Module is currently being developed as part of the OECD Project on Inclusive Innovation.

A review aimed at assessing different essential components of the Internet economy, as well as new advances and innovation models Skills, both current and desired, will be examined for their central importance. Public institutions in developing nations tend to be less robust, which results in a slew of failures that are less pervasive in industrialised nations. The capacity of public institutions to fulfil their missions is hampered by a lack of information sharing and coordination across different organisations. Policies that make sense "in principle" may not be practical in that setting.

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Technological Advancement: A boon or a curse to the society

Dr. Sourav Paul & Dr. Sneha Sultana

In this present era, lives sans electronic gadgets are hard to believe. In short, it will be justified to say that there will be no life without the use of technological gadgets. Technology has plunged its needle in every sphere of our modern day to day life. From getting up in the morning till getting into the bed, our life is bound to depend on some or other electronic gadgets. Human race is prospering in life with the crutch of technology.

It is needless to mention that this technological advancement has made our life smooth in many spheres. But the same technology has made human hooked with the latter. Now the big question is whether this technological advancement is a blessing or curse to the human society. Like every coin has two sides, similarly the advancement in technology has.

Computer, a very useful invention to the mankind. It has made our life to the fingertip. Computers have revolutionized the way we live, work and communicate. The computer in today time penetrated every facet of our lives. Home, schools, hospitals, banks, transport system, airlines, shopping malls, and Industry are completely depending on computer. Its performance cannot be thought without a computer. We can more easily research almost any topic we can think of. It is because of the ability of computer about speed, perfection, large capacity of data storage, tremendous efficiencies of data processing and data retrieving at lightning speed. These parameters have discarded human mind error of any business. It have resulted high per capita performance. In these sense computer is tremendous blessing to us. But the same computer if mishandled can make the life miserable especially to the young generation. The young generations are known to be the future of the nation. Many of the youths are being misguided in the wrong path through the online access of the whole world through the computers. Endless hours in front of the screen cause eye strain and headaches. Now-a-days many students have got addicted in computer game. In this way they waste their vital time for doing unnecessary entertainment. Social site are negatively affecting the students life also. In many cases they have got trapped by evil through social site. Computer has reduced the man power in industries and made many people unemployed. It has been used by many nation for developing dangerous gun, missiles, and fighter planes which caused killing of man-kind. Privacy is one of the main worries since people's personal information can be easily obtained and used maliciously. In the digital age, cybercrime, such as hacking and identity theft, has grown to be a significant issue. Computer use can sometimes become addicted, resulting in a sedentary lifestyle and less physical activity. Overall, depending on how they are used, computers can be viewed as either a blessing or a curse for society.

The mobile phone is yet another very significant development for mankind. Mobile phones have had such a profound effect on the societies of the twenty-first century that we now take them for granted. Nowadays, it has become common place to observe people typing away on their cell phones throughout our towns and villages.

The way people communicate has changed thanks to mobile phones.Due to their portability and light weight, these gadgets are used everywhere, ensuring that everyone is always in contact with one another. When telephones were the only form of contact at home and at the office, this was completely different. Nowadays, regardless of the nation they are in, people can call

each other using their mobile phones from anywhere as long as there is reception. When emergency calls are required, this can save a person's life. It is also a very important tool for communicating with co-workers, family, and friends. Text messages, which may be answered at the recipient's convenience without being bothered, are another invention of mobile phones that are thought to be more convenient than phone calls.The most recent mobile technology is the smart phone, which has only been around for a few years. Through the use of the internet and third-party services like chatting and social networking sites, these phones continue to improve our ability to communicate with one another. Additionally, these phones have a wide range of other functions, including those of a computer, a music player, a camera, a video camera, a gaming console, and a diary. Mobile phones, however, have also created new difficulties and had detrimental effects on society. The reliance on technology is one of the major worries since so many people are becoming dependent on their gadgets and losing the capacity to communicate in person or unplug from technology. Because people spend so much time on their phones instead of working or doing other activities, this reliance can also result in lower productivity. Additionally, using a phone constantly can lead to neck and shoulder pain, headaches, and eye strain. The continual distraction caused by notifications from mobile devices has also resulted in shorter attention spans and a reduced capacity for concentration. The ease with which personal information can be acquired and misused for bad reasons has also generated privacy concerns. In conclusion, there are benefits and drawbacks to mobile phones for society. .They have facilitated communication and information access, but they have also introduced new difficulties and sparked worries about privacy and technological dependence. Individuals and communities must strike a balance and utilise mobile devices sensibly and healthily.

In a nutshell, the development of technology has had a significant impact on society, resulting in both beneficial and negative changes. Although technology has significantly enhanced our lives in many ways, it has also created new problems and worries.On the plus side, technology has significantly enhanced productivity and efficiency across a wide range of industries, simplifying and speeding up a large number of processes. Additionally, technology has facilitated communication and information access, enabling individuals to connect with one another and gain knowledge from any location in the world. In addition, new medical technologies and advancements brought on by technology have improved healthcare and saved numerous lives.But technological advancements have also brought about new problems and detrimental effects. The possibility of job loss as a result of automation is one of the major worries, since robots and algorithms are progressively taking the place of human workers. Due to the ease with which personal information may be obtained and misused, technology has also increased privacy issues. A sedentary lifestyle and related health issues have been brought on by excessive use of technology, which has also resulted in diminished face-to-face communication abilities, decreased physical exercise, and increased screen time.In conclusion, technology has altered society in both positive and harmful ways. While it has significantly enhanced our lives in many ways, it has also brought forth new difficulties and issues that need to be resolved. We can make sure that technological innovations continue to be a blessing rather than a curse for society by being responsible and aware of the potential risks and repercussions of technology.

Nuclear Fusion

VARAD PAWAR, Student, 1st Yr., CSE

Ever wondered how Iron Man powers his suit? It gets its energy from the arc reactor located in his chest. The process by which the energy is produced is called nuclear fusion. All the stars in the universe including our sun are powered by the same process. This means this process is directly responsible for the existence of life on Earth. In the core of the Sun, hydrogen is converted into helium and a huge amount of energy is released in the process. If 4 grams of hydrogen are converted into helium the energy released is enough to power a 60-watt bulb for over 100 years!

The energy produced in nuclear reactions exceeds that of chemical reactions by many folds. Nuclear reactions are of two types - fusion and fission. In fission, a larger atom splits into smaller atoms whereas fusion combines two atoms into one with a heavier nucleus resulting in a small amount of mass being converted into a staggering amount of energy. The energy released by fusion is three to four times greater than the energy released by fission. During fission large radioactive waste is produced and the disposal of radioactive is a complicated job. In the case of fusion very less or sometimes no radioactive waste is produced.

Though fusion seems like a better option to produce energy it comes with its own set of challenges. Fusion is possible only at very high temperatures of the order of a few hundred million degrees Celsius. Fusion reaction begins with plasma. Plasma is a separate state of matter from solids, liquids, or gasses. It is a collection of particles with positive and negative charges. It occurs when a huge amount of power is passed through a gas. It is in the movement of plasma where atoms collide with each other at high speeds and fuse with each other. One of the central challenges of fusion energy is to produce meaningful amounts of fusion power from plasma. At such high temperatures controlling it is extremely difficult as it is chemically very reactive and reacts with almost any you put it in contact with. To maintain the desired temperature for fusion to occur the energy sources have to perfectly balance the energy loss. As of today, there are no fusion reactors that are useful and used to produce energy. The nuclear reactor that produces energy does it via nuclear fission.

For decades, scientists have been pursuing the challenge of harnessing nuclear fusion. In December 2022, scientists at National Ignition Facility achieved a breakthrough in nuclear fusion. For the first time ever, the energy released in fusion was more than what was put in. In the experiment, researchers pumped in 2.05 MJ of laser energy and got about 3.15MJ out – a roughly 50% gain. Though it ended in an instant and only a small amount of energy was released, what it represents is huge. We are one step closer to a limitless and clean energy future. The promise and potential benefits to humankind from this carbon-free energy source are enormous. Even though it is extremely challenging and expensive, achieving this goal would have far-reaching and significant consequences for human civilization and for the planet.

The process of casting myself into a new version with an aim of attaining the best version of myself

Debadrita Roy (Student)

NIKOLA TESLA
COMMUTATOR FOR DYNAMO
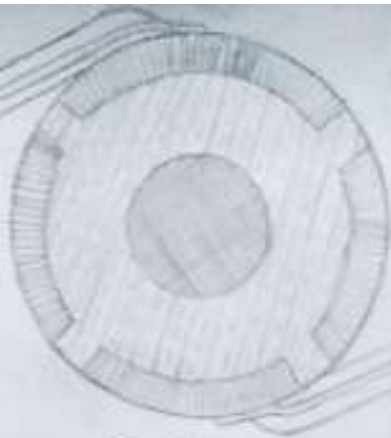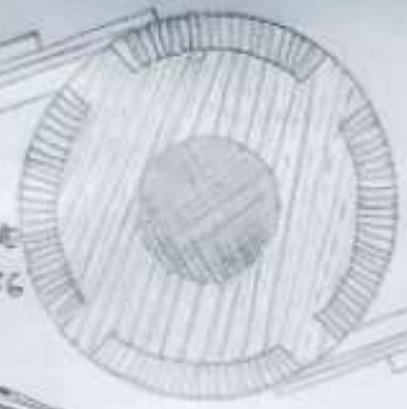ELECTRIC MACHINE
PATENTED JAN 26, 1886
NO. 334,823

Fig: 1

Fig: 2

Be alone, that is
the Secret of
Invention;
be alone, that
is when ideas
are born
— Nikola Tesla

If your hate
could be turned
into electricity,
it would light
up the whole
world.
— Nikola Tesla

NIKOLA TESLA

ELECTRIC ARC LAMP
PATENTED FEB 9, 1886
NO. 335,786

Of all things,
I liked books best!
— Nikola Tesla