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VISION

To achieve academic excellence in creating globally competent professionals and ethically strong global workforce in the field of Computer Science & Engineering, facilitating research activities, catering to the ever changing industrial demands and societal needs.

MISSION

1. Creating excellence in Computer Science & Engineering through academic professionalism for the changing needs of the society.

2. Establishing centre of excellence for research and for technical development in the area of Computer Science & Engineering.

3. Developing communication skill, team work and leadership qualities for continuing education among the students, through project based and team based learning.

4. Inculcating ethics and human values for sustainable societal growth and environmental protection.

5. Empowering students for employability, aspiring higher studies and to become entrepreneur.

PROGRAM EDUCATIONAL OBJECTIVES

1. Apply computer science theory blended with mathematics and engineering to model computing systems.

2. Nurture strong understanding in logical, computing and analytical reasoning among students coupled with problem solving attitude that prepares them to productively engage in research and higher learning.

3. Communicate effectively with team members, engage in applying technologies and lead teams in industry.

4. Engage in lifelong learning, career enhancement and adapt to changing professional and societal needs.

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TRANSFORMING AUTOMOBILE INDUSTRY WITH MACHINE LEARNING

David Paul

Today, taking actions to fight climate change have become the need of the hour and the automobile industry is one of the key players here who can make a difference in all this. This became very clear when environmentalists started protesting around the recent Frankfurt Motor shows venue currently being held at Germany. Almost every single vehicle manufacturers have introduced their new electric and semi electric line ups. It was surprising to see brands famous for their naturally aspirated engines like the Lamborghini joining the electric race with their Sian, which is an hybrid , limited to just 63 models .

Its clear that the automobile industry is trying to find more and more innovative methods to reduce the emissions and to increase the range increasing the overall efficiency of vehicles. Companies like Tesla which is famous for their all electric line up is going for delivering a fully automated driving experience to their buyers while other companies which produce cars on much a wider scale are trying to go for hybrid and plug-in hybrid models. Hybrid vehicles try to regenerate their battery from wide variety of methods like auto regenerative breaks meanwhile plug-in vehicles as the name suggests uses a plug in source to power its electric engine .

Machine learning has a key role to play in this .with the help of machine learning the automakers can now identify beforehand where a driver is most likely to use brakes using satellite maps and adjust the power-train accordingly saving fuel.

Reinforcement learning (an area of machine learning) is now being tested by few automakers to manage energy distribution to the vehicle power-train more efficient. Deep reinforcement learning (combination of traditional RL and artificial neural networks) framework offers great potential for solving many of the problems regarding this energy distribution and many other factors. It has been shown that a deep RL agent has the ability of achieving nearly-optimal fuel consumption results with a locally trained strategy which can be applied online in the vehicle. No prior knowledge of the driving route is necessary and the training with the data collected from different driving conditions by people with random driving profiles (stochastic driving cycles) allows for greater generalization to variously different velocity profiles. Additionally, deep reinforcement learning allows the efficient inclusion of further optimization criteria.

NVIDIA ,the name associated with almost all gaming laptop and PCs have now joined the AI automobile race by launching NVIDIA Drive which it claims can help car manufacturers create automated driving systems using machine learning. The NVIDIA Drive software platform consists of two parts, namely, the Drive AV for path planning and object perception which focuses on the aspects of the street like pedestrians and other objects of street and Drive IX for creating an AI driving assistant which focuses on the characteristics of drivers like if he text and drive or take his eyes of the road to talk to someone else in the care ..etc.

Waymo is another company which is contributing to this AI race owned by Google. It claims its self-driving car technology will soon be available to the public. Waymo claims its software automates driving using a combination of computer vision components such as LiDAR, radar, and hi-res cameras.Its fascinating to see a large number of car manufactures and software giants constantly bringing up new and new innovative methods to reduce fuel consumption while also making the driving experience more relaxing and fun for its passengers .

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AUDIO STEGANOGRAPHY

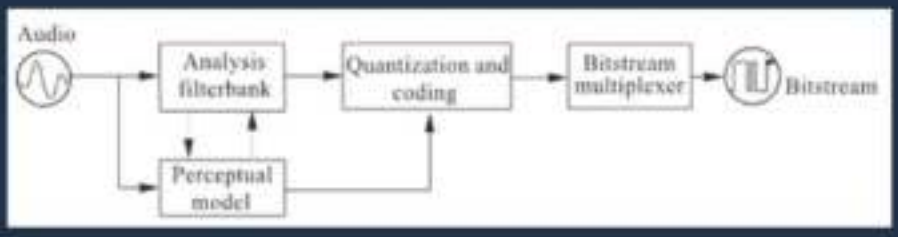
Abdul Samad

Data hiding or Steganography is a technique of encryption which makes the encryption process more secure. When we encrypt the data, the data is in the coded format, which is vulnerable to doubt. It can be sensed that something is being transferred secretly. But using steganography we can hide the encrypted data into any type of media such as audio, video or even images. By doing so, the encrypted data is hidden inside a type of media which only the sender and receiver is aware of. It must be taken care that while hiding data inside the media, the noise created by doing so must not be audible to human ears or visible to human eyes.

As an active area of research, new techniques are constantly emerging. There are many research focusing on image or video schemes but there is little research on data hiding in audio schemes, especially in high compressed audio like the MPEG-4 advanced audio coding (AAC). MPEG-4 (Moving Picture Experts Group) is a highly compressed audio file and hence gives better sound quality. For example an MP3 audio file at 320 kbps bitrate will have poor sound quality and will consume more space than MPEG-4 AAC. This is the reason why it is advantageous to use an MPEG-4 AAC for steganography.

For ensuring effectiveness of a data hiding mechanism we have to test three factors. They are Robustness, Security and Data Hiding Capacity. The mechanism must be robust to any intentional or unintentional attempts such as removal of data or alteration of data. The audio must be secure or in other words, the noise introduced by the hidden data should be almost inaudible and must not degrade the sound quality. Data Hiding Capacity refers to the number of bits per second that can be transmitted by the data hiding system. It is very difficult to achieve all three factors in one data hiding mechanism. For example, an increase in data hiding capacity will degrade the robustness and security. However, if effective data hiding mechanisms are used we can achieve robustness, security and capacity all together.

As perceptual audio coding has become the accepted technology for storage and transmission of audio signals, compressed audio information hiding enables robust, imperceptible transmission of data within audio signals, thus allowing valuable information to be attached to the content. This helps us save our upload and download time and storage. There is some research that hides data directly into the compressed audio. The disadvantage of this method is that the hidden data treated as an additional disturbance to the quantization noise, results in obvious degradation of the audio quality.



As perceptual encoders, they exploit knowledge of human perception to shape the noise distribution introduced by the irrelevancy reduction to achieve the best possible audio quality. The main task of the perceptual encoding is to compress the digital audio as much as possible such that the sound quality of the reconstructed signal is exactly the same as or as close as possible to the original audio signal. There are also some other requirements like low complexity and flexibility for a wide application area.

The uncompressed input audio signal is processed by the analysis filterbank with parameters gathered from both the signal itself and the perceptual model. The data is first compressed, encrypted, and then hidden in the AAC bitstream. The hiding process takes place at the heart of the Layer III encoding process in the inner loop. The inner loop quantized input data and reduces the quantization step size until the quantized data can be coded with the available number of bits. Another loop checks that the distortions introduced by the quantization do not exceed the threshold defined by the psychoacoustic model. Finally, the multiplexer produces a bitstream including data and side information to complete the data hiding process.

The scheme enables optimal coordination between the quantization strategy of the encoder and the data hiding process. All information about the modification of the quantization parameters is taken into account by the data hiding process. The scheme can flexibly vary the data hiding capacity by adjusting the number of coefficients for the quantization, and thus this scheme provides adaptive data hiding. When the embedded data bit rate needs to be changed, the scheme can adaptively change the quantization parameters. The scheme assures high data hiding security. The coefficients which carry the hidden data are picked up by a pseudo random mechanism which is unlikely to be intercepted by a third party.

UNMANNED AERIAL VEHICLE TO SAVE LIVES

Aanand Hari

Drones or the so called flying robots is taking the medical care to a next level. Application of drones in medical and home care has become a critical research area. Drones have already been tested efficient when trained to deliver medical and other emergency supplies to remote areas. This brings a greater hope for future use of drones in other fields as well.

People travelling in ships for a long distance are usually at risk of certain illness and diseases. These can be difficult to diagnose or treat with the limited resources found on a ship. As prevention of any illness will help to control the fatalities, it's not always practical or possible. Survival often depends on fast diagnosis and treatment but it is only available at the nearest port. 1 in 5 ships are being forced to divert for medical reasons each year.

MARINE TELEMEDICINE

Marine telemedicine, a widely acclaimed application of drones in medical care. It helps to provide medical assistance to people on board. From blood pressure monitors to diagnose hypertension to ECG machines, Telemedicine is capable of saving lives. It utilizes the best technologies that are available. It provides 24 hour a day access to expert medical advice. Now onboard healthcare is close to on-shore facilities by these advancements made in the field.

DRONES AS MEDICAL TRANSPORT SYSTEMS

Consider delivery of post-exposure rabies vaccination in rural communities. Rabies is 100% preventable if a person is vaccinated within 24 hours of being bitten. Yet an estimated 59,000 people die each year, mostly children in underserved, rural parts of Africa and Asia.

A delivery drone is an autonomous vehicle, often an unmanned aerial vehicle which can be used to transport medicine. The speed and ability to navigate increased the interest of drones in medical transportation. The unreachable terrains and issues in usual transport methods also made the drone a better option.

Drones in the market are of three categories. Fixed-wing drones travel long distances and can carry the loads at around 1-3kg. They require take-off and landing strips, which means their use is not available for forested or mountain areas. Multi-copter drones are drones having more than one propeller. This can take off and land vertically. It is better when considering the cost of shorter flight times and lighter payloads of around 1kg. Newer hybrid drones offer the benefits of Fixed-wing drones and Multi-copter drones but are more expensive.

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THE ENIGMA MACHINE

Arjun Ghosh

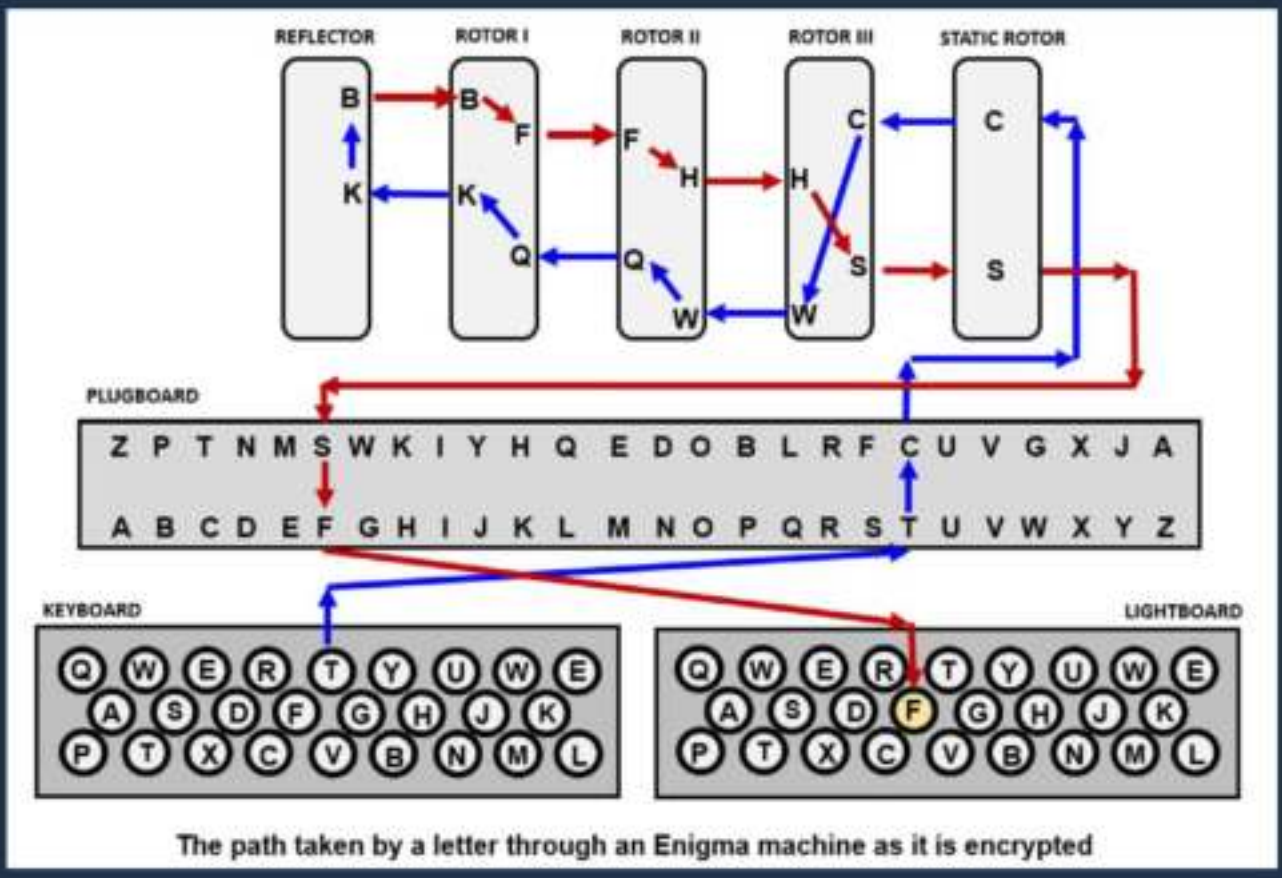
The Story of the ENIGMA MACHINE started with the end of World War I . The Allies(Great Britain, France, Russia, Italy, Romania, Japan and the United States) were able to decrypt the information passed by the Central Powers (Germany,Austria-Hungary,Bulgaria and the Ottoman Empire) which eventually lead to their defeat. The Germans had to find another way of encrypting their confidential data.

Arthur Scherbius was a German Engineer who invented the Enigma Machine during the end of World War 1. It was developed for the banking industry but due to the hyperinflation in Germany, the device didn't sell much. Rudolph Schmidt, a German Army Official decided to buy 30,000 ENIGMA MACHINES from Arthur Scherbius for World War II. They modified the Enigma Machine by adding another component called "The Plugboard" which was used only in the army version of the Enigma Machine. It is an Electromechanical Rotor Cipher Machine which is used to encrypt the data so as to prevent a third party from using the information that is passed. It mainly consists of the following :-

1. Keyboard
2. Plugboard
3. Rotor
4. Reflector
5. Lightboard

When we type plain text into the keyboard ,a circuit is activated which causes the current to pass from the keyboard to the plugboard and from there it goes through a set of 5 rotors and then bounces back from the reflector into the rotors. Then the current comes back into the plugboard and finally lights up the ciphertext in the lightboard which is noted by the encryptor and then transmitted as radio waves in morse code.

The theoretical keyspace of the enigma machine is approx 3x10115 which is greater than the number of atoms in the Milky Way galaxy. But the practical key space of the machine used by the Germans is 7,156,755,732,750,624,000 which is still a huge number.This complexity of the Enigma machine was the reason the Germans relied entirely on the Enigma machine for their communication.The sender and receiver must be synchronised in order to successfully encrypt and decrypt a message. So the Germans used a code book that depicted the machine configuration of the machine on a particular day of the month.



The path taken by a letter through an Enigma machine as it is encrypted

This code book was present with both the sender and receiver hence their Enigma machines were synchronised. But it is due to this code book that the Polish were able to crack the Enigma Machine. The Polish were able to get a hold of this code book. This along with daily message patterns , they were able to reduce the keyspace to around 150,000 combinations. This ultimately lead to Germany's loss in the war because the Allies were able to decrypt their information. Although the Enigma Machine was cracked ,its working can be simulated on a computer and since the configuration of the enigma can be programmed to be the same at the sender and receiver, we do not need any code book to maintain synchronization. So with the large keyspace of the Enigma machine ,cracking the Enigma machine in a limited period of time would be literally impossible

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POST DISASTER DAMAGE RECOGNITION ARE GETTING AUTOMATED

Gokul Das

Now a days natural disasters are happening more and more frequently. Then also, We are not getting prepared to deal with it. Even if we can predict something, like a hurricane, measures to recovery is confused because responders scramble to determine where to allocate resources. With the help of remote sensing technology, level of disaster can be identified by comparing images before and after disaster scenes and trying to identify which locations were affected more.

To deal with this problem, the Defense Innovation Unit is sponsoring a challenge known as xView2. Focusing on: developing a computer vision algorithm for automation of the process of detecting and labelling damage by analysing differences in before and after photos. Similar to all good challenges, For whoever manages to get best result from it a large amount of money is needed to be paid.

xView2 was developed from a simple idea. Input is a satellite image of an area before a disaster and output is a satellite image taken immediately after the disaster or combination of any of the above of the same area. All the algorithm works on comparing and identifying structures and rating them on a four-point damage scale that ranges from spotless to obliterated.

Computer vision algorithms can perform very well on pattern recognition. Training algorithm based on data fed to it is the key for their effectiveness, and for the use by competitors it provides hand labelled dataset. To maximize Digital Globe's Open Data Program, xView2 has stored 19,804 sq.km images before and after disaster at a resolution of 0.3 meters per pixel. The images holds outlines of about 550,230 building, drawn by a human and assigned a building damage assessment score.

The people using xView2 has to be very careful to make sure that the dataset is accurate and high quality as possible. Fifteen countries are there, including exotic locations like Australia, Indonesia, Tuscaloosa, and Bangladesh. with input from FEMA, the US Air Force, and local first responders, The standardized Joint Damage Scale for buildings which did not exist before was developed. Before finalising the dataset agencies also had an opportunity to check the labelling for accuracy.

The algorithm that performs the best on a previously unseen dataset will be the winner of the xView2 challenge, with respect to the ratings given by expert humans recognizing and labelling buildings by smashed-up-ness on the Joint Damage Scale. The algorithm should be generalised to recognize and score buildings after any of the kinds of disasters, anywhere in the world. Winning algorithm could be used for comparing pre disaster satellite images with post disaster images taken from aircraft or drones, help in making a quick and effective move by first responders is expected. And that's okay even if the best algorithm is not perfect. When time is a factor Even a pretty good algorithm could be very useful.

The Defence Innovation Unit is expecting peoples participation and do well in the xView2 challenge, without an aim of owning the winning software or anything. Competition is in the Open Source track and win $25,000 when winner agree to release the code under a permissive license. In the case of keeping code as private, and okay with giving the government a non-exclusive license to use it, the Government offers first prize of $38,000. Participants of open Source track can win the other track too. For teams who really don't want to share anything there is final Evaluation Only track; the government will check out the algorithm and tell developer to describe it. Top prize in that case is $3,000. Atlast, best performers will be considered for follow on prototyping for more opportunities later on.

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