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Caste – An Evaluation of Evolution

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Abstract: Caste - the most widely quoted term in respect to any kind of social relation is ironically the most seldom delved into. Partial and biased opinions about the discriminatory and redundancy of this social division has quite easily eclipsed its rational origin. As an evidence of history and a testimony in sociology, researched in the light of its origin and the impact that it has produced in society, caste is an interesting and relevant topic of research.

Keywords: Caste, Society, Super Ordination, Origin, Hierarchy, Relevance

1. THE ORIGIN

Classification and social categorization has always been the way of carrying out executive functions, smooth running of administration and a functional coexistence of diversely unrelated masses living together. Hence even society had to be segmentally stratified into castes, and from there on evolved caste based occupations, subsequently a rigidity did also arise making a sharp classification that simply became indissoluble, stringent and orthodox.

The Divine origin theory of castes suggests that the four castes emerged from the different parts of the AdiPurusha – Supreme God. The theory postulated that Brahmins were born from the head of God, Kshatriyas from the arms, vaishyas from the thighs and shudras from the feet. This became the most widely accepted and most socially accepted, prevalent theory and this also served as the basis for social gradation. The Brahmins naturally were given a super ordination over the other castes, and shudras were allotted to be the meanest position. This classification quite systematically categorized occupations –Brahmins were the people who dominated the social strata with the monopolistic knowledge of the Vedas, they used to perform the yagnas and offer ceremonial sacrifices as well. They were initiated with a sacred thread ceremony and enjoyed being the privileged class. Kshatriyas were in charge of protecting the masses, they were to assume kingship and rule the kingdom as administrators, be skilled in the art of warfare and wield the royal dandaas the punishment and regulating mechanism of the code of conduct of the people. Vashyas were the mercantile community who were supposed to take care of all forms of business, trade and generate income for the country or society as a whole. Shudras were the menial class who worked and assisted the other upper castes in their day to day activities. They were required to serve, obey and abide by the orders of the higher castes. Although the divine origin theory did not designate an inferior status to them, rather they originated from the feet was a symbol of representing that the shudras were close to the earth or the bhumi , the interpretations changed thereafter. This was the caste which became the most exploited, tortured and denied with successive passage of time.

Very ideally , this was a closely knit economic system which was a composition of strong self sufficient units that were complimentary to one another and helped in the smooth functioning of the economic order.

2. BOUNDARIES

While at one hand it can be possibly claimed that caste system acted as a classifying system, on the other hand it created indelible boundaries that could not be crossed over and which restricted interactions at the same time. This was primarily due to the nature of the occupations performed by the people of the caste groups and second of all the inherent desire of respective caste groups to preserve their common identity. The initiation of the system might have created sectors of economy and restricted competition to caste based employment, but it did not remain so simple after all. The sectors became boundaries and these boundaries developed into social barriers.

It can also be noted that castes served as social groups in the society. People have their inherent tendencies to group and belong on common grounds and mutual preferences, which in a way knit them up as a group together and led to a common shared identity for the members of the caste. This common identity slowly developed into rigid ethnocentrism and subsequently the boundaries of caste crystallised into permanent divisions.These divisions served as the breeding grounds of a social division which shaped a new mould in the society.

With progress of time and when the process of Aryanisation was expanding rapidly over the Indian subcontinent, ethnic or ingenious people were at first socially ostracised and pushed beyond the precincts of the Aryavrata, with minimal social interaction with them, but this trend changed soon. As chiefs began expanding their dominions, chiefdoms began to develop into kingdoms. Smaller clans and tribal units, dasas and dasyus , were conducted into the social fold. As they entered into the caste structure of the Hindus or essentially the Aryans, a new fifth caste emerged called the “panchamas” or the outcastes. They obtained a place in the mainstream society but were in a condition even worse than the Shudras. This inclusion or rather ironic inclusion of a new caste showed a new trend in the social dynamics. This gave a chance for the ostracised class to get involved but at the cost of their dignity. While on one hand this shows inclusivity in the existing system, it also points out that acceptance of a caste in a system was not on the basis of their occupation, rather the familiarity. This can be held from the point of view of social

distance. While the Brahmins, kshatriyas and the vaishyas were segments of Aryan society and although in a hierarchy still they were involved in continuous interactions and were awarded the designation of Dvija or twice born and associated with an initiation ceremony. While at one hand upanayan or the wearing of sacred thread was a spiritual aspect of life, at the same time, it was a poignant contrast in dynamic social mechanism whereby the lower castes were excluded. With the beginning being this, quite naturally opportunities, wealth and prosperity not only varied on economic lines but also on the distinctions of upper and lower castes. While at one hand it may be a tool for upper castes to preserve their culture against the inflow of indigenous people, on the other hand the economic equation of serving and served classes. This boundary that was essentially created was not very rigid and there was scope for mobility at the same time, was inherently present although not explicitly mentioned. Mobility was specified as people could change their occupations in the line of attaining higher social status and at the same time engaging in a different economic activity based on individual desire or situational demand. When this mobility allowed change of occupations and the related caste system at the same time, the system was not so rigid. AS time passed, a social classificatory system became a social segmentory mechanism which kept the castes in their respective chosen ambits and apparently sustained the social order.

This social order was first challenged by the incoming hordes of invaders – Hunas, sakas, yavanas collectively often referred to as Mlecchas. When the social fold began integrating people of foreign culture, a new dynamic developed and in which we find the roots of ethnocentrism and xenophobia bearing a direct relation with caste.

3. RESTRICTIONS

Although it may seem derogatory and orthodox to have restrictions on food habits especially when it prohibits interaction between the castes, but at the same time society has to be evaluated from a non judgemental view each time. Along with food habits, marriage was hedged to a system of endogamy – marrying within the caste groups and any exogamous marriage was unacceptable. A person of higher caste was supposed to maintain a distance from the lower castes with respect to certain criteria. In respect of the food habits – there are classifications as in kaccha food, pakka food, raw materials. While pakka food is food cooked with ghee or oil, kaccha food is boiled essentially and raw materials include raw rice or fruits. A Brahmin was not supposed to accept pakka food from any lower castes and even in case of kaccha food there were restrictions, while raw items could be easily given and taken. One significant feature that is noteworthy is that, while Kshatriyas and Vaishyas both were inferior to Brahmins, but Shudras and the outcastes were often equated and subject to yet harder prohibitions. This can be explained by the theory of familiarity, as the upper three castes represented the occupations of the Aryan tribe and as they settled, these three occupations oriented people into corresponding castes of significance therein excluding the shudras and the outcastes who had the importance of being petty labour force or manpower.

Food restrictions were followed by preventions on eating together by the higher or the lower castes and subsequently separation of wells from which water was to be drawn for domestic uses. This quickly engulfed the society into a segmented and exclusively separated existence where caste groups became myopic sectors thereby dividing the greater society into mutually exclusive compartments. Kitchen, temple and wells were the first arenas to be completely segregated. With the influx of the tribal and the foreign mlecchas into the Hindu caste fold, the xenophobic instincts of Brahmins and the upper castes took the form of a poignant notion of " purity and pollution " . This is an ubiquitous phenomenon that got itself expressed, as whenever there are cultural interactions, ideas and concepts of superiority and inferiority complex develop. In this case the Hindu society toughened its restrictions on caste boundaries as the root to belonging in the borders of the caste fold was open and invited influx. Hence upper castes in an attempt to save their privileged position, maintained that interacting with the lower castes would be pollution or maligning their purity. In this way, talking, mixing, touching a lower caste meant losing of purity and social boycott as well. In case of wells, lower castes were forbidden to use and in case of temples there entry was restricted in many cases. This may be a regressive social set up but from a particular situational point of view, it was quite a natural reaction to the ongoing socio cultural intermixing. On broader level, different caste based economic groups had different lifestyles and standards of hygiene, hence restricting intermixing would evade health issues as a natural consequence thereof, because a person of affluent class would always have standards of quality and hygiene starkly different from a relatively poorer lower caste. Secondly comes the question of marriage which completely integrates two families, so in the prevailing social set up, endogamous marriages was given the preference to once again preserve the group culture.

With the advent of Islam in India, the prevailing Hindu society encountered a different culture and religion altogether, and with a new religion the xenophobic instincts took over the prevailing upper classes and renewed restrictions came to the fore. This time the Brahmins also felt the threat of conversion and the threat of their own culture system being held at ransom by the Islam Sultan. As the Muslim population expanded, intermixing started and slowly with more liberal Islam Sultans, a peaceful coexistence developed.

4. VIEWPOINTS

Orientalism upheld that caste was essentially an economic categorisation which stifled its roots slowly into the fabric of society. From the Missionaries, Christian ambassadors of Religion, caste was found to be embedded into the Hindu religious system. From the administrative point of view, Brahmins became the law makers who interpreted the scriptures and preserved the right to teach VEDAS to the other people, and that caste was essentially a means of political control by classificatory segregation of a huge population engaged in vital economic activities.

Risely primarily took the anthropological approach and attempted to classify caste on models of race, racial features and associated characteristics which to some extent yielded positive confirmatory results as generations of endogamy led to it, but making it a theory of its origin would be neglecting the social dynamics of India. Risely's conception was modelled on the Orientalist theory of Aryanisation and that castes were actually differences of superior Aryans over the inferior Indigenous people as a result of the political subjugation.

5. BRITISH INTERVENTION

The most significant development which caste system faced in its history was during the period of British rule in India. As

the British did not recognise caste system and caste boundaries, so it essentially tried to integrate the society. Some areas where it was witnessed were in army and in train compartments or other services under the British government. In these places, castes were brought to interact with each other. This was interpreted in twin ways – first, that the liberal western ideals of British were assimilated into the common folk, as held by the liberal school of thought, second, it was the British who brought the caste issu3e to the fore by deliberately making them interact and in doing so, they tried to sabotage the common identity and shared unity of Hindus as a formidable force against them.

6. CHALLENGING THE SYSTEM, NEW WINDS

Although caste remained as a vital distinction, segregating mechanism in the society, but there were always winds of change, when there was sheer defiance to this system. Firstly mobility started with the process of Sanskritisation which M.N.Srinivas has explained in which a person of lower caste moves towards the upper castes by adopting their rites and rituals. Next there were Bhakti and Sufi movements in different parts of the country, in which emphasis was simply on devotion allowing everyone to have their own right to worship and the liberty to worship, simplifying religion to its very core. With the freedom movement in the 19th century, different castes and social groups came together, uniting for a common cause and this led to a defying of caste for greater good. Western liberal floodgates of thought and conceptions opened up in front of the people of India and the educated youth felt the need to reject the system at the same time. Jyotirao Phule was adamant in defying the caste based oppression and mobilising bonds of unity, instilling pride amongst the depressed castes.

However the biggest change came with B.R.Ambedkar and his policy of reservations on the basis of castes so that the lower castes who have suffered centuries of neglect can be pulled up at par with the other castes. 1979 Mandal Commission slated to recognise some castes as Scheduled Castes and Tribes, thereby entitling them to reservations in public sectors and educational institutions, although it was a step ahead, but today even this step is being misutilised into wrongful gains by people entitled to reservations.

7. POLITICISING AND SOCIALISING

Among the various other effects that the institution of caste has on society, perhaps the most significant in today's aspect shall be its politicising nature- the way it has aided politics to be shaped and developed on caste based grounds. As on one hand, Indian political scenario developed as the biggest democracy in the world, on the other hand, it got scarred and marred with caste based divisive forces that in turn evolved into a secondary socialising force as well. Now as an agent of socialisation, caste serves as an identity that is rigid and affiliates an identity mark to its members or the ones who bear it.

8. CONCLUSION

The Conclusion to this topic cannot be simple, but there can always be a food for thought out of this piece of research – That is the question of Dynamicity and development in each social system or mechanism. Since the only thing static in society is change, hence every social aspect undergoes a change. Caste as developed was a vital mode of social control which soon lost its significance into an orthodox practice, similarly any rule or law on society thereof should be dynamic as society churns out different consequences on the same aspects revolving around in its ambit, and caste in this sense is definitely a product of society envisioned in the perspective of history.

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Tubercles Effect on a Wing Performance for NACA 63_4-421 Aerofoil

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Abstract: Humpback whales have a morphological structure on the leading edge of their flippers that provide them with the capability of extreme manoeuvrability. Inspired by nature, tubercle design has been incorporated in wing-like structures such as wind turbines, marine propellers, etc. The idea of tubercles was studied by P Watts and F E Fish to develop their turbine blades and showed that wind farms can produce up to 20% more power with less wind.

The purpose of this study was to see how the performance of a finite wing is affected due to the geometrical modification. To understand the effect of tubercles, various parameters are being measured and compared. A Baseline model and model with Tubercles are being tested with a 6 - digit NACA 63_4-421 cambered airfoil, similar to that of the flipper of the Humpback Whale. Tubercles of various wavelength and amplitudes are taken to analyse and study various aerodynamic characteristics.

Preliminary analysis was carried out in XFLR for baseline model, modeling and computation using ANSYS ICEM CFD and ANSYS CFX respectively. Also, prototypes manufactured using 3-axis CNC Router are tested in the Subsonic Wind Tunnel. The computational data and experimental results are observed in both the cases and the potential advantages and disadvantages of having tubercles on the leading edge of a wing have been noted.

Keywords: Morphology, Flippers, Tubercles, Airfoil, CFD, Aerospace, Aerodynamics

1. INTRODUCTION

Humpback whale flippers are exceptional in many ways, which includes their curved planform, large aspect ratio especially when compared with other whale species, they also display leading edge tubercles, essentially leading edge bumps facing into the free stream flow, that alter the fluid flow over these flippers. Tubercles could be functional adaptations, thereby imparting an advantage in manoeuvrability and prey capture.

Previous studies carried out by researchers showed that separation is delayed, increasing the maximum attainable lift and maximum stall angle. However, some researchers had also observed that in certain circumstances tubercles cause deterioration in performance at angle of attack before stall. Despite this fact, these cases showed that there were still advantages from incorporating tubercles such as softer stall characteristics and higher post-stall lift.

1.1.Tubercles

Tubercles are sinusoidal structures that are present in the leading edge of humpback whale flipper. Leading edge tubercles are widely postulated as a form of passive flow control device for aerodynamic surfaces. Efforts in incorporating these tubercles onto aircraft propeller blades/wings and how tubercles presence effects the original propeller blade flow behaviour are relatively less well understood.

The use of tubercles as a flow control strategy in aerofoils / wings was motivated by observations first made by Fish and Battle on the movements of humpback whales. Humpback whales can grow up to 36 tons on an average, but have high manoeuvrability. The ability to change their direction quickly is attributed to the presence of tubercles in the ends of the flippers.

Figure 1: Humpback Whales with Tubercles on their flippers

2. AIRFOIL SELECTION

Previous studies were focused on comparing the performance of wing with tubercles having different combinations of wavelength and amplitude. However, only a limited number of tubercle configurations were investigated and the experiments were carried out on wings with the same profile shape. Hence, it was observed that there was still an opportunity to carry out a more detailed investigation into the effects of changing the amplitude and wavelength parameters of tubercles. Also, a comparison between NACA 63_4-421 airfoil profile shape with and without tubercles have not been made before the current study. Generally, previous studies used symmetric airfoils. Therefore, there was an opportunity

to investigate an alternative profile shape i.e. cambered airfoil which resembles to the Humpback whale flipper.

The length of flippers of the humpback whale varies from 0.25 to 0.33 percent of total body length. The flippers are highly mobile at the shoulder and exhibit some flexibility along their span, especially when compared with other species of whale. The flippers have high aspect ratio and its cross-section closely resembles the 21% thick, low drag, NACA 63_4-021 airfoil. Since there were many previous studies carried out on NACA 63_4-021 airfoil and very few studies were done to see the effect of tubercles on a cambered airfoil, we decided to study the effect of tubercles on NACA 63_4-421.

2.1.Tubercles Size & Spacing

Based on the Humpback whales average tubercle size and spacing, there needed to be a range of possibilities while maintain a reasonable scope. From the studies carried out by some of the biologists, it was noted that the number of tubercles typically ranges from 9 to 11 with Maximum and Minimum Aspect Ratios of 7.7 and 3.6, respectively.

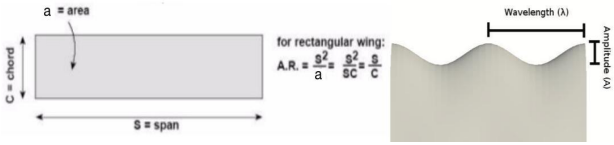

Figure 2: Relation between Span, Chord and Aspect Ratio and figure representing tubercle wavelength and amplitude

Considering the complexity in fabricating a full scale wing model, the Aspect Ratio was chosen to be 3.6. The maximum attainable span length was 580mm which was governed by the test section dimensions (600mm x 600mm x 2000mm). We obtained the chord length to be 161mm. The tubercles are 10% to 20% of the local Chord (Amplitude) and each is about 10% and 20% of Span (Wavelength).

Table 1: Considerations effecting chord length selection

Increasing Chord Length	Reynolds Number increases	**Desirable**
	Aspect Ratio decreases	**Undesirable**

A large Reynolds number was desirable, the analysis was carried out for Reynolds number having velocity around 20 m/s. Also, the aspect ratios, that were used by previous groups in this area of research were also considered.

Table 2: Tubercles Distribution

Tubercle Distribution (C = 0.161m & S = 0.580m)				
Wavelength	**(mm)**	**Amplitude**	**(mm)**	**Model Name**
10% of Span	**58**	10% of Chord	**16.00**	λ58A16
		15% of Chord	**24.15**	λ58A24
		20% of Chord	**32.20**	λ58A32
20% of Span	**116**	10% of Chord	**16.00**	λ116A16
		15% of Chord	**24.15**	λ116A24
		20% of Chord	**32.20**	λ116A32

2.2.Wing Modeling

Baseline model and tubercles model were modeled using CATIA V5. Two-dimensional profile was imported to Generative Shape Design. Further, according to the required Amplitude and Wavelength, the profiles were protruded which followed the path of a sinusoidal wave at the leading edge. Whereas, the trailing edge section of the aerofoils was kept the same throughout. The tubercles models are modeled in such a way that the planform area is same as that of the baseline model i.e., a = 0.093m^2.

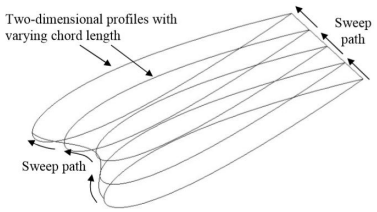

Figure 3: Process used to construct wing models with Tubercles

Figure 4: Tubercle Models of various Wavelengths and Amplitudes

3.NUMERICAL ANALYSIS

Preliminary analysis was carried out in XFLR for baseline model. Meshing and Numerical Analysis were carried out in ANSYS ICEM CFD and ANSYS CFX respectively. These are industry grade software's which were used for meshing and analysis.

3.1.Meshing using ANSYS ICEM CFD

Wing model is imported as a STEP/IGES file to ANSYS ICEM CFD and domain is created that represents a control volume. In our case, a project needs to be created to analyse flow over a wing. Hence, a domain is created to specify the direction of the fluid flow. The far field distance is kept at 8c behind and 7c in front, top and bottom. Here the value of 'c' is the mean aerodynamic chord.

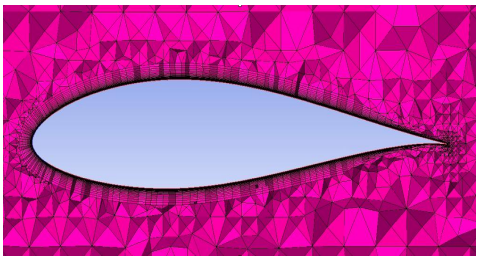

Figure 5: Cross sectional view of Prism mesh around the wing

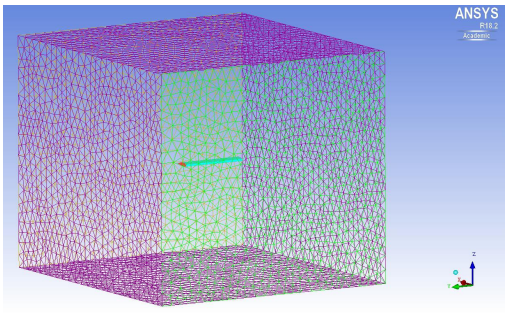

Figure 6: Mesh over the domain and wing

3.2.Numerical Analysis using ANSYS CFX

To solve this problem, Shear Stress Transport (SST) model of Menter was used. This model solves a turbulence/frequency-based model (k–ω) at the wall and k-ε in the bulk flow region. Preliminary analysis was carried out for all tubercle models shown in Figure 4. From the preliminary results it was observed that models λ58A16 and λ116A16 had better lift and drag coefficients when compared to all the other models with tubercles. Hence, models other than λ58A16 and λ116A16 were eliminated. Further, numerical analysis and experimental analysis was carried out for Baseline model, λ58A16 and λ116A16.

Solution convergence could be monitored through residuals and ensuring that the Lift and Drag values were stagnated. For all the cases the final Lift and Drag values were noted. The stagnated ones with each case took about 500 iterations to converge with computational time of 4 hours.

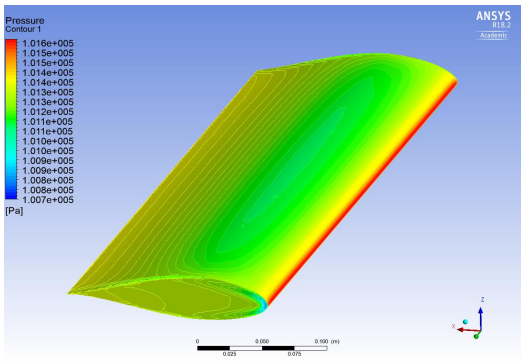

Figure 7: Pressure Distribution over Baseline Model

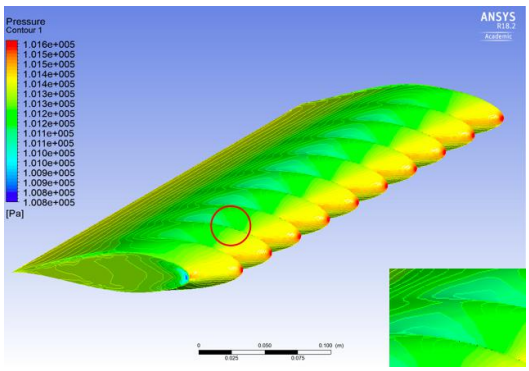

Figure 8: Pressure Distribution over λ58A16 Model

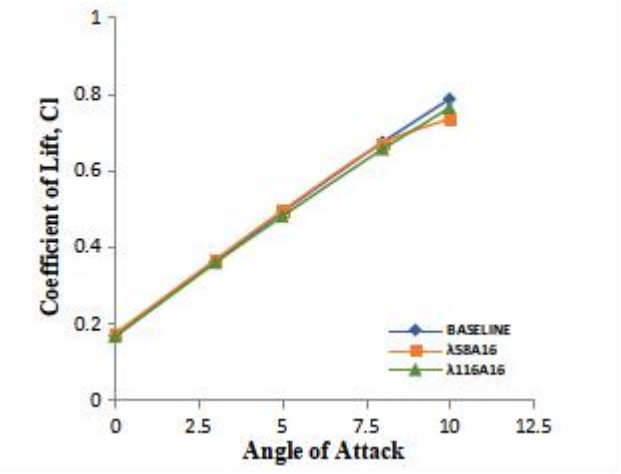

Figure 9: Comparison of C_l vs Alpha from CFD Data

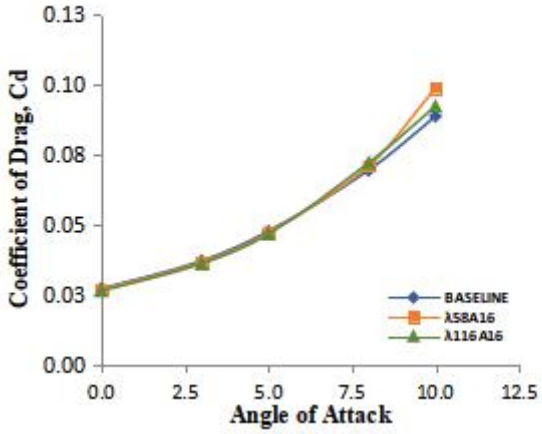

Figure 10: Comparison of C_d vs Alpha from CFD Data

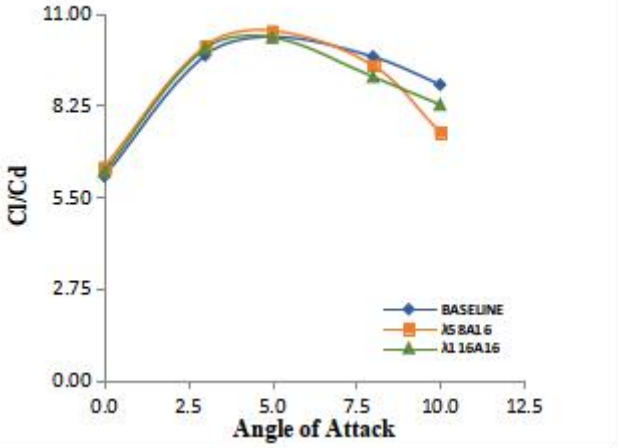

Figure 11: Comparison of C_l/C_d vs Alpha from CFD Data

4. EXPERIMENTATION AND TESTING

The prototype model is tested in a low speed wind tunnel available at IIAEM Jain University, with a test section of 600 x 600 x 2000mm and maximum speed of 45m/s. The three component balance which can measure a maximum Lift of 98.1 N and Drag of 19.62 N was used for force measurement. The flow visualisation of the baseline model was carried out using tufts to analyse the vortex generation.

Figure 12: 3-Component balance setup

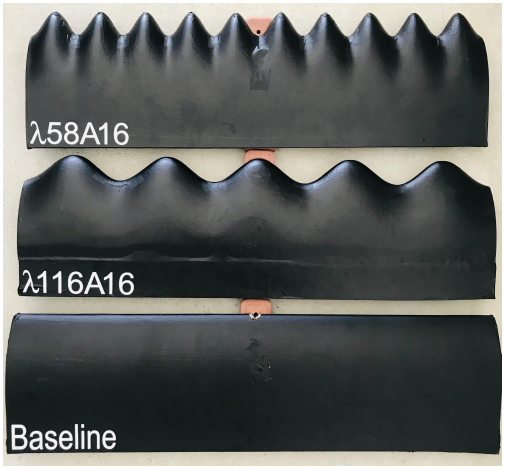

Figure 13: Fabricated wing models

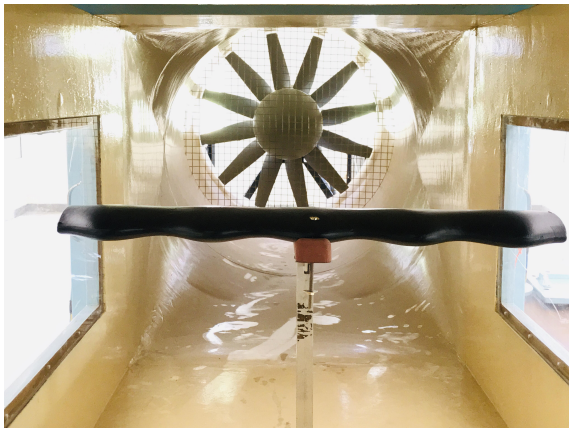

Figure 14: Wing model undergoing testing in Wind Tunnel

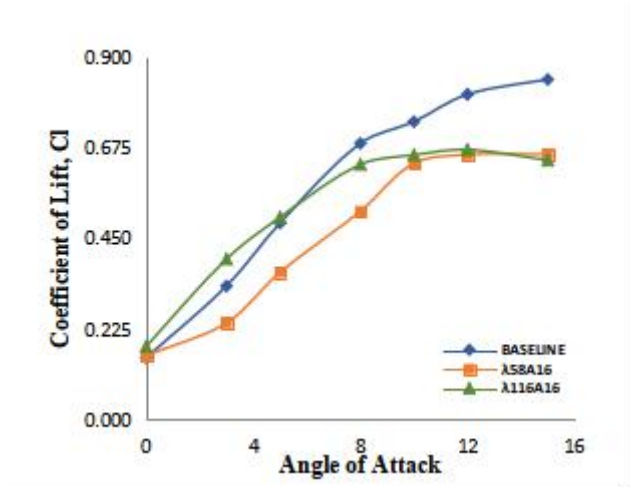

Figure 15: Comparison of C_l vs Alpha from Wind Tunnel Data

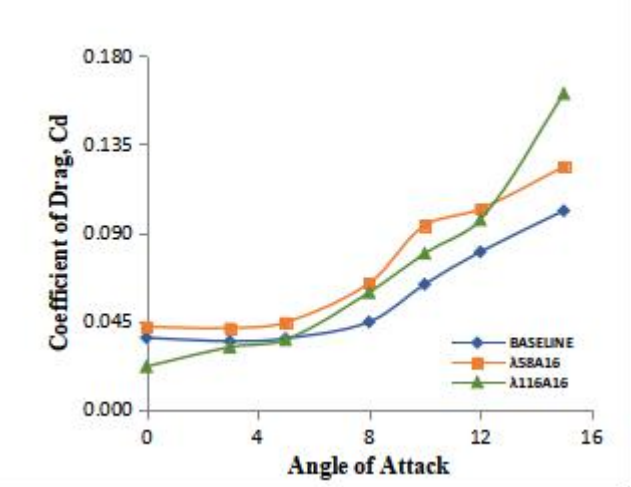

Fig 16: Comparison of C_d vs Alpha from Wind Tunnel Data

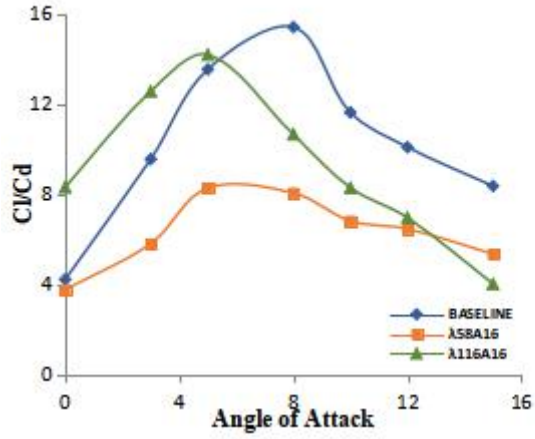

Figure 17: Comparison of C_l/C_d vs Alpha from Wind Tunnel Data

5. RESULTS

The Lift, Drag and Lift by Drag coefficients i.e., C_l, C_d, and C_l/C_d respectively are plotted against the angle of attack for Baseline, λ58A16 and λ116A16 models for both CFD and Wind Tunnel results to obtain a better understanding of behaviour of the models with and without tubercles.

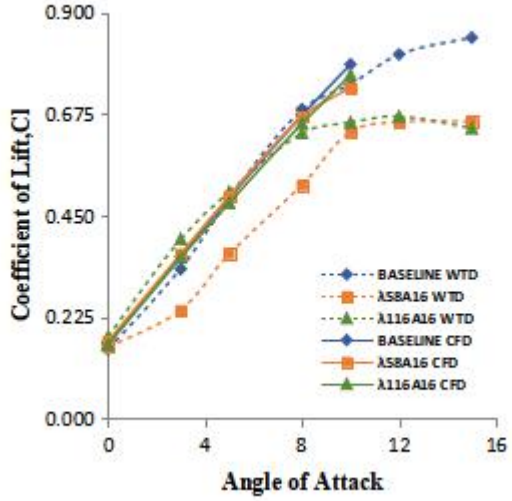

Figure 18: Comparison of C_l vs Alpha from Wind Tunnel and CFD Data

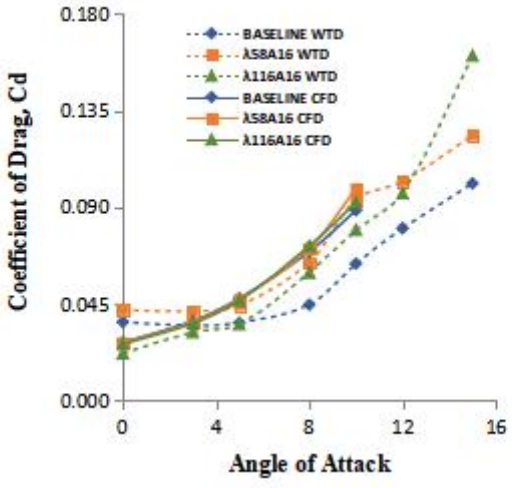

Figure 19: Comparison of C_d vs Alpha from Wind Tunnel and CFD Data

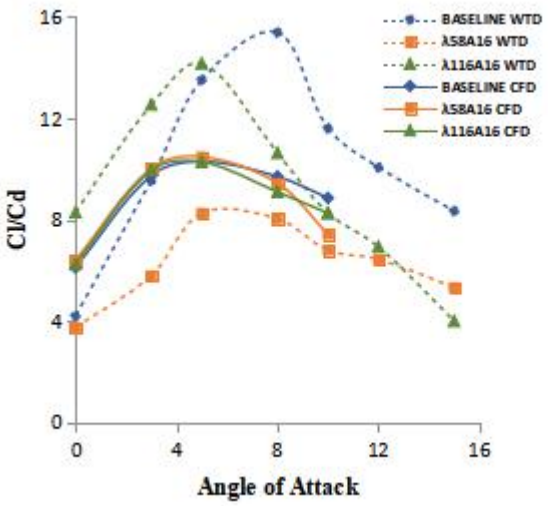

Figure 20: Comparison of C_l / C_d vs Alpha from Wind Tunnel and CFD Data

The application of leading-edge tubercles for passive control of flow have potential applications in the design of control surfaces, wings, propellers, fans, and wind turbines etc.

6. CONCLUSION

In this report, the effect of Tubercles on the Lift and Drag performance has been investigated. It was found that the amplitude and wavelength of tubercle configurations were important parameters to consider when optimising performance. A suitable method by which to compare aerofoils with and without tubercles was through force measurements of Lift and Drag. For a Reynolds number of Re~200,000 the results for NACA634-421 with tubercles i.e., λ58A16 and λ116A16 were compared with the unmodified model. Following conclusion was obtained :

1. From the graph of C_l/C_d vs Alpha from the Wind Tunnel Data, both λ58A16 and λ116A16 have higher C_l/C_d ratio at lower angle of attacks when compared with the Baseline model. But it can also be seen that as the angle of attack increases performance of the tubercle models deteriorates.
2. C_l vs Alpha curve of Wind Tunnel data shows that model λ116A16 has greater C_l at low angle of attacks and falls as the angle of attack increases.
3. Also, the same model has least C_d for angle of attack <5 degree. But above 5 degree, the slope of the curve increases drastically leading to higher C_d i.e., higher Drag.
4. From the CFD data model λ58A16 was observed to have greater C_l when compared to the other models. Also it is observed to have lower C_d.

It is important to note that the performance of the models can vary with Reynolds number. It is noted from already published papers that the performance of a wing with tubercles has higher performance at greater Reynolds number (> 500,000) and decreased performance with lower Reynolds number (< 500,000). Here, the Reynolds number for which the test was carried out is 200,000 due to the limitation of the wind tunnel being low speed.

In our present study, we have only used k-ω SST as turbulence model and based on previous papers on the same, it is not capable of capturing separation bubble. Therefore, CFD model can be refined more with respect to turbulence model and may also with respect to convergence etc.

7. ACKNOWLEDGMENTS

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Reading Device for Blind People using Python, OCR and GTTS

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Abstract: This paper presents the reader for Blind people, developed on Raspberry Pi 2. It uses the Optical character recognition technology for the identification of the printed characters using image sensing devices and computer programming [1]. It converts images of typed or printed text into machine encoded text. In this research these images are converted into the audio output (Speech) through the use of OCR and Text-to-speech synthesis. The conversion of printed document into text files is done using Raspberry Pi which again uses PyTesseract library and Python programming. The text files are processed & convert into the audio output (Speech) using GOOGLE Text-to-speech (gTTS) & python programming language and audio output is achieved.

Keywords: Character recognition, Pi Camera, Raspberry Pi 2, Python Programming, Text To Speech (TTS), Speech Output.

1. INTRODUCTION

This kind of system helps visually impaired people to interact with computers effectively through vocal interface. Text Extraction from color images is a challenging task in computer vision. Text-to-Speech is a device that scans and reads English alphabets and numbers that are in the image using OCR technique and changing it to voices. Now a day's SMS is one of the most popular way of communication using mobile phone but visually impaired people cannot use this.

This project has been built around Raspberry Pi processor board. It is controlling the peripherals like Camera and speaker which act as an interface between the system and the user. Optical Character Recognition or OCR is implemented in this project to reco gnize characters which are then read out by the system through a speaker. The camera is mounted on a stand in such a position that if a paper is placed in front of camera, it captures a full view of the paper into the system. Also, when the camera takes the snapshot of the paper, it is ensured that there are good lighting conditions. The content on the paper should be written in English and be of good font size.

When all these conditions are met the system takes the photo, processes it and if it recognizes the content written on the paper. After this it speaks out the content that was converted in to text format in the system from processing the image of the paper. In this way Reading Device for Blind People helps a blind person to read a paper without the help of any human reader.

2. WORKING PRINCIPLE

When we run the Python Program, this system captures the image placed in front of the picamera which is connected to Raspberry Pi .After captured document image undergoes Optical Character Recognition(OCR) Technology.
OCR technology allows the conversion of scanned images of printed text or symbols into text or information that can be understood or edited using a computer program. In our system for OCR technology we are using Pytesseract library.
After that Convert image into text, text convert into speech using Text-to-speech library we use GOOGLE Text-to-speech library using this data will be converted to audio. Camera acts as main vision in detecting the image of the placed document, then image is processed internally and separates label from image by using open CV library and finally identifies the text which is pronounced through voice. Now the converted text into audio output is listened either by connecting headsets via 3.5mm audio jack or by connecting speakers via Bluetooth.

3. BLOCK DIAGRAM

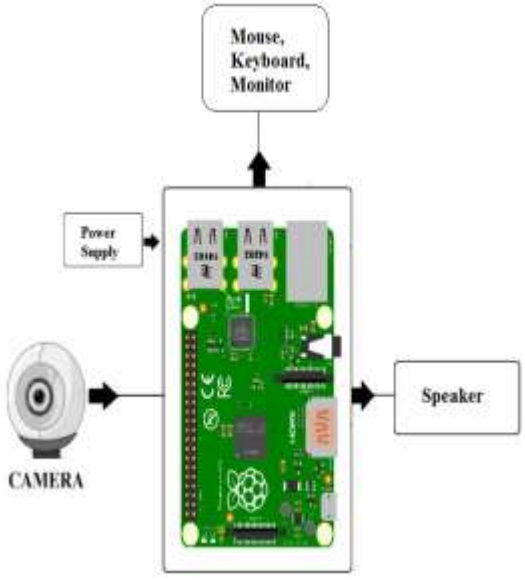

Figure.1 Block diagram of Reading Device for Blind People

4. HARDWARE IMPLEMENTATION

Figure.2 Reading Device for Blind People

Raspberry Pi is a low cost, credit card sized computer that connects to monitor and uses standard keyboard and mouse. The hardware components of the Raspberry Pi include power supply, storage, input, monitor and network.

- CPU: Broadcom BCM2836 900MHz quad-core ARM Cortex-A7 processor
- RAM: 1 GB SDRAM
- USB Ports: 4 USB 2.0 ports
- Network: 10/100 Mbit/s Ethernet
- Power Ratings: 600 mA (3.0 W)
- Power Source: 5V Micro USB
- Size: 85.60 mm × 56.5 mm
- Weight: 45 g (same as Raspberry Pi B+)
- 802.11n Wireless LAN
- 40 GPIO pins
- Full HDMI port
- Combined 3.5mm audio jack and composite video
- Camera interface (CSI)
- Display Interface (DSI)
- Micro SD card slot

Piamera
The Raspberry Pi camera module can be used to take high-definition video, as well as stills photographs. The camera module is very popular in home security applications, and in wildlife camera traps.

- 5MP sensor
- Wider image, capable of 2592x1944 stills, 1080p30 video
- 1080p video supported
- CSI
- Size: 25 x 20 x 9 mm

HDMI to VGA Converter
It is used to connect the Raspberry Pi board to the Projectors, Monitors and TV.

5. SOFTWARE IMPLEMENTATION

5.1 Programming Explanation

5.1.1 Python-Tesseract

Python-Tesseract is an optical character recognition (OCR) tool for python. That is, it will recognize and "read" the text embedded in images.

Python-Tesseract is a wrapper for Google's Tesseract-OCR Engine. It is also useful as a stand-alone invocation script to Tesseract, as it can read all image types supported by the Pillow and Leptonica imaging libraries, including jpeg, png, gif, bmp, tiff, and others. Additionally, if used as a script, Python-Tesseract will print the recognized text instead of writing it to a file.

Functions

- **get_tesseract_version** Returns the Tesseract version installed in the system.
- **image_to_string** Returns the result of a Tesseract OCR run on the image to string
- **image_to_boxes** Returns result containing recognized characters and their box boundaries
- **image_to_data** Returns result containing box boundaries, confidences, and other information. Requires Tesseract 3.05+. For more information, please check the Tesseract TSV documentation
- **image_to_osd** Returns result containing information about orientation and script detection.
- **run_and_get_output** Returns the raw output from Tesseract OCR. Gives a bit more control over the parameters that are sent to Tesseract.

Installation

- pip install pytesseract

5.1.2 GTTS (Google Text-to-Speech)

GTTS (Google Text-to-Speech), a Python library and CLI tool to interface with Google Translates text-to-speech API. Write spoken mp3 data to a file, a file-like object (byte string) for further audio manipulation, or stdout. Or simply pre-generate Google Translate TTS request URLs to feed to an external program.

Features

- Customizable speech-specific sentence tokenizer that allows for unlimited lengths of text to be read, all while keeping proper intonation, abbreviations, decimals and more;
- Customizable text pre-processors which can, for example, provide pronunciation corrections;
- Automatic retrieval of supported languages.

Installation

- pip install gTTS

Module

- from gtts import gTTS
- tts = gTTS('hello')
- tts.save('hello.mp3')

Operating system: Raspbian (Debian)
Language: Python2.7
Platform: Pytesseract, OpenCV (Linux-library)
Library: OCR engine, Google TTS engine

The operating system under which the proposed project is executed is Raspbian which is derived from the Debian operating system. The program is written using the python language. The functions in algorithm are called from the

OpenCV Library. OpenCV is an open source computer vision library, which is written under C and C++ and runs under Linux, Windows and Mac OS X. OpenCV was designed for computational efficiency and with a strong focus on real-time applications. OpenCV is written in optimized C and can take advantage of multi-core processors.

6. FLOW OF PROCESS

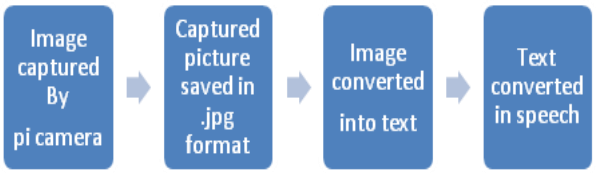

Figure.2 Flow of Process

6.1 IMAGE CAPTURING

The first step is the one in which the document is placed in front of the Picamera and the Picamera captures an image of the placed document. The quality of the image captured will be high so as to have fast and clear recognition due to the high-resolution camera.

6.2 IMAGE TO TEXT CONVERTER

Python-Tesseract is an optical character recognition (OCR) tool for python. That is, it will recognize and "read" the text embedded in images.

Python-Tesseract is a wrapper for Google's Tesseract-OCR Engine. It is also useful as a stand-alone invocation script to Tesseract, as it can read all image types supported by the Pillow and Leptonica imaging libraries, including jpeg, png, gif, bmp, tiff, and others. Additionally, if used as a script, Python-Tesseract will print the recognized text instead of writing it to a file.

6.3 TEXT TO SPEECH

gTTS (Google Text-to-Speech), a Python library and CLI tool to interface with Google Translates text-to-speech API. Write spoken mp3 data to a file, a file-like object (byte string) for further audio manipulation, or stdout. Or simply pre-generate Google Translate TTS request URLs to feed to an external program.

- Customizable speech-specific sentence tokenizer that allows for unlimited lengths of text to be read, all while keeping proper intonation, abbreviations, decimals and more;
- Customizable text pre-processors which can, for example, provide pronunciation corrections;
- Automatic retrieval of supported languages.

7. CONCLUSION

Text-to-Speech device can change the text image input into sound with a performance that is high enough and a readability tolerance of less than 2%, with the average time processing less than three minutes for A4 paper size. This portable device, does not require internet connection, and can be used independently by people. Through this method, we can make editing process of books or web pages easier. To extract text regions from advanced backgrounds, we've got projected a completely unique text localization formula supported models of stroke orientation and edge distributions. The corresponding feature maps estimate the worldwide structural feature of text at each component. Block patterns project the projected feature maps of a picture patch into a feature vector.

Adjacent character grouping is performed to calculate candidates of text patches ready for text classification. Associate degree Adaboost learning model is utilized to localize text in camera-based pictures. OCR is employed to perform word recognition on the localized text regions and rework into audio output for blind users. During this analysis, the camera acts as input for the paper. Because the Raspberry Pi board is high-powered the camera starts streaming. The streaming knowledge are going to be displayed on the screen victimization GUI application. Once the item for text reading is placed ahead of the camera then the capture button is clicked to produce image to the board.

Using Tesseract library the image are going to be born-again into knowledge and also the knowledge detected from the image are going to be shown on the standing bar. The obtained knowledge are going to be pronounced through the ear phones using Text-to-speech synthesis.

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A Survey on Artificial Intelligence and its Role in Near Future

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Abstract: AI technology has long history which is actively and constantly changing and growing. Artificial Intelligence (AI) is an emerging technology in today's world. Now and then most of the things in the world may use AI. The ability of making a machine to make decisions on its own is termed AI. This paper presents brief survey on AI and its various emerging applications along with real time examples. Intelligence is the way of thinking and acting upon the environment. This might depends on the Intelligence Quotient (IQ) of a person. The goal of this research paper is to give some guidelines to use the AI techniques that can be applied in solving problems associated with different types of problems. AI can also be used to make prediction in future. There is huge difference on Natural Intelligence (NI), Machine Intelligence (MI) and AI. There is wide range of applications for AI that ranges from computer vision to expert systems.

Keywords: AI, IQ, AP, SE, Learning, MI, NI

1. INTRODUCTION

Artificial Intelligence is a combination of computer science, physiology, and philosophy. It is concerned with the study and creation of computer system that exhibit some form of intelligence and attempts to apply such knowledge to the design of computer based systems that can understand a natural language or understanding of natural language. The term intelligence refers to the ability to acquire and apply different skills and knowledge to solve a given problem. Intelligence is integrated with various cognitive functions such as ; language, attention, planning, memory ,perception. The evaluation of intelligence is basically studied about in last ten years. We found that nearly 9 out of 10 respondents from every kind of group believe AI is transformational and that it is leading to a technological revolution.

2. HISTORY OF ARTIFICIAL INTELLIGENCE:

Born In 1950s, artificial intelligence (AI) is hardly new. In [2] Dartmouth Conference, John MC Carthy is regarded as the father of Artificial Intelligence in 1956.The evidence of AI can be traced back to ancient Egypt, but with the development of the electronic computer in 1941, the technology finally became available to create machine intelligence like human intelligence. After suffering from an 'AI Winter' in the late 1980s, recent advances with more powerful computers, more intelligent software and vast amount of "big data" have led to breakneck advances over the last several years mostly based on the "deep learning" breakthrough in 2012. The first AI program called **"The Logic Theorist"** was written by Allen Newell, J.C.Shaw and Herbert Simon in 1956 [2].The following diagram illustrate the complete history of AI.

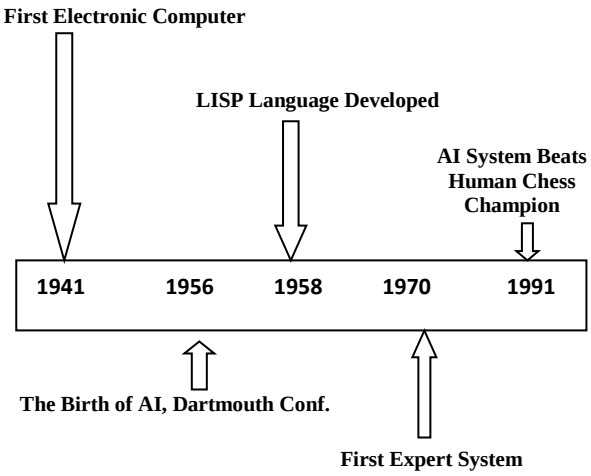

Figure 1: History of AI

3. EVOLUTION OF ARTIFICIAL INTELLIGENCE

Artificial Intelligence is already profound impact in more subtle ways. Weather forecasts, email spam filtering, Google's search predictions and voice recognition. They developed with common technologies which are machine learning algorithm that enable them to react and respond in real time. With the growing technologies there will be grow in pains, but it will have positive effect on society in terms of efficiently is immeasurable.

3.1 REVOLUTIONARY IMPACT OF ARTIFICIAL INTELLIGENCE

Through some think of robots taking over the world when they envision artificial intelligence. There is no consequence definition of AI, but we can say it is a collection of digital tools that enable machines to perceive, learn and make decision like humans. Most of the advances so far use a sub discipline of AI known as machine learning that is based on mathematical algorithms, whose performance improves as a function of processing more data. Deep learning is type of machine learning designed to mimic neurons in the human brain.

Nearly every day brings news of additional technical breakthrough and useful AI applications. These range from more accurate medical diagnostics tools and personalized drug treatment to boosting the amount of information carried over fiber-optic telecommunication networks board uses in business including spotting fraud in expense reports improving agriculture yields, offering empirical proof that fibromyalgia is a real disease, improving education, minimizing the impact of natural disasters and even helping with methods to identify potential school shooters. AI is fundamentally different from previous technical advances. The development of AI is creating a Cognitive Era, with machines able to perform tasks beyond the capabilities of people.

4. ARTIFICIAL INTELLIGENCE LEADS IN CURRENT TECHNOLOGY SIGNIFICANCE:

Much has been said in various forums about AI being the most significant technology of present time. This survey confirmed that AI ranked top 3 of most significant technologies over the next 5-10 years.

Table 1: Technology Significance

RANKED #1-3 FOR SIGNIFICANCE	TECH EXES
Artificial Intelligence	69%
Cloud Computing	58%
Big Data/ Internet of Things	50%
Robotics	26%
Blockchain	24%
Augmented Reality	18%
Nanotechnology	17%
Virtual Reality	16%
Human /Machine Integration	11%
Ambient Computing	10%

4.1 VARIOUS ARTIFICIAL INTELLIGENCE TECHNIQUES

The various artificial intelligence techniques are listed below:

Table 2: AI Techniques

AI Technique	Purpose
Knowledge Based System	Used in the design phase of software development process.
Neural Network	Eliminates the risk associated with modules in software maintenance.
Fuzzy Logic	Reasoning the uncertainty
Genetic algorithm	Used in the software testing and generating test cases.
Case Based Reasoning (CBR)	Used to calculate time duration to complete a project.
Natural Language Processing	It helps in to improve the time duration of software development life cycle.
SBSE	Reformulating the software engineering problems as optimization problems.

Rule induction	Used to defect prediction.
Expert System	Uses the knowledge to overcome the risk management strategies during development process
Genetic code	It develop automatically generate computer program
Automated tools	Use for system redesign
Simple decision making	Dealing with uncertainty
Intelligent Agent	It generates new intelligent software system for better communication.
Simulated annealing & Tabu search	Used in the field of engineering
Probabilistic reasoning	Dealing with uncertainty

5. NEED FOR ARTIFICIAL INTELLIGENCE IN SOFTWARE ENGINEERING

The most common reasons for which AI methods, tools and techniques are applicable to SE are as follows:

- Automatic Programming (AP) in AI is synonymous with Software Engineering and this represent a new paradigm for SE in the future research.
- AI methodology and techniques can be applied to the software design process.
- It reduces the cost.
- Expert system technology efficiently provides the solution to the certain aspect of SE process and problem.
- For direct application to the SE process, AI development and maintenance environment are most suitable.
- At requirement stage error detection in coding will be isolated.
- Changes should made at requirement stage only.

6.1 ARTIFICIAL INTELLIGENCE LEARNING METHODS AND APPROACHES

Learning methods are the fundamental building blocks of artificial intelligence (AI) solutions. The situated approach in AI builds agents that are designed to behave effectively.

Table 3 : Artificial Intelligence Learning methods

S:NO	AI LEARNING METHODS
1	Failure Driven Learning
2	Learning by being Told
3	Learning by Exploration

Table 4 : Approaches of Artificial Intelligence

S:No	APPROACHES	DESCRIPTIONS
1	Classical approach	Designing the AI
2	Connectivist approach	Letting AI develop

6.2 APPLICATION OF ARTIFICIAL INTELLIGENCE

AI used in today's world in various fields. They are:

1. Space Applications
2. Medicinal Application
3. Military Application
4. Telecommunication Application
5. Industrial Application
6. Automation

6.3 ADVANTAGES OF ARTIFICIAL INTELLIGENCE

In the advantage of AI – robots can perform tasks that, we human just don't want to do or cannot able to do. Robots can able to do things that are more precise work than humans and can be used in medical sciences and others useful work.

6.4 PROBLEMS ASSOCIATED WITH ARTIFICIAL INTELLIGENCE

In the growing era of AI with the advantages of AI there are some problems are also occur, these are:

1. **Job loss problems**: As the AI becomes more smarter day by day even the high paid , high skill worker becomes more vulnerable to job losses as, given the high cost of skilled workers, the companies get better margins by automating their work.
2. **Safety Problems**: There has always been much furor about safety issues associated with AI. When expert express concern related to AI safety we should pay heed to its safety issues.
3. **Trust related problem**: As AI algorithms become more powerful by the day, it also brings several trust-related issues on its ability to make decisions that are fair and for the betterment of humankind.
4. **Computation problem**: AI algorithm involves analyzing the humongous amount of data that require an immense amount of computational power.

6.5 FUTURE PREDICTIONS FOR ARTIFICIAL INTELLIGENCE

With the introduction and successful implementation of AI solutions, many industries in the world are and will benefit from increased profitability and will still have good economic growth rates.AI opportunities will be aiming at innovative. Human centered approaches and measuring the applicability of robotic technology to various industries and companies in the same entire world. Construction of various AI systems will help the entire world to industrial sector to presuppose the available symbolic structures such as, the ability to reason and also knowledge existence.

7. CONCLUSION

Artificial Intelligence bases Its operation on accessing huge amount of information ,processing it, analyzing it and, according to its operation algorithm, executing task to solve certain problem.AI will be used anywhere in the future wherever human are required. With this cost will be decreased.AI techniques are well suited to the complex software engineering problems, because they are designed to deal with the most demanding challenges. AI based system can solve task with help of automated tools and automated programming system.

8. ACKNOWKEDGEMENT

I have taken my effort to complete this survey paper. However, without the previous research paper I could not be able to complete my work. I would like to thank all given citations in the following section that I have acquired knowledge from their paper and books. Also I would like to acknowledge that, some of the images and original definitions are directly written in this paper from the following citations.

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