Journal of Current Development in Artificial Intelligence

ENRICHED PUBLICATIONS

Journal of Current Development in Artificial Intelligence

Aims and Scope

Journal of Current Development in Artificial Intelligence is a Journal addresses concerns in applied research and applications of artificial intelligence (AI). the journal also acts as a medium for exchanging ideas and thoughts about impacts of AI research. Articles highlight advances in uses of AI systems for solving tasks in management, industry, engineering, administration, and education evaluations of existing AI systems and tools, emphasizing comparative studies and user experiences and the economic, social, and cultural impacts of AI. Papers on key applications, highlighting methods, time schedules, person months needed, and other relevant material are welcome.

Journal of Current Development in Artificial Intelligence

Journal of Current Development in Artificial Intelligence

Contents

Teachbot (Teaching Robot) Using Artificial Intelligence and Natural Language Processing

N. Ambiga

Assistant Professor, Department of Computer Science,
Sri Akilandeswari Women's College, Wandiwash- tamilnadu, India

A B S T R A C T

The teaching robot is used for teaching the school students, undergraduates, postgraduates, research scholars and others. This can be designed using natural language processing and artificial intelligence. This can be helpful to the teachers, academician, educators, Research scholars and to the people who is interested to learning. Artificial intelligence is given to teachbot to fetch the specific topic from the topics stored and it tech it to the students. presentation, portable document files, text, images can also be stored in teachbot and it should have the ability to draw the pictures, diagrams, tables while teaching and explanation is given. The robot is loaded with all the documents, presentation, news etc. This robot can be used as a news reader, singer, player-any games, trainer to software people, adviser to business people. The main aim is to make a single robot for all purpose. From preparing budget to read it to the people in assembly can also be done. It can eliminate all the work or burden of a human being in future especially teaching people.

***Keywords** Teachbot, learning, retrieving, uses of robot*

1. INTRODUCTION

The teaching robot is used for teaching the school students, undergraduates, postgraduates, research scholars and others. This can be designed using natural language processing and artificial intelligence. This can be helpful to the teachers, academician, educators, Research scholars and to the people who is interested to learning. Artificial intelligence is given to teachbot to fetch the specific topic from the topics stored and it teach it to the students. The presentation, portable document files, text, images can also be stored in teach robot and it should have the ability to draw the pictures, diagrams, tables while teaching and explanation is given. Intelligence is to be given for robots to be able to handle identification of student/people from the speech or voice of them. It can be loaded with any kind of subjects like current affairs, general knowledge , history to computers ,software, politics or any topic. In school or college if one is specialized in one area he/she is eligible to teach in that field. But a teachbot can teach any kind of subjects. The teach robot can take the lecture or class interestingly. It can be loaded with all the books journals and all.

The robot is connected to the internet by software and it can retrieve all the information within a fraction of a second and it can deliver the lecture easily. the foreign language teaching is difficult to human. But if we give artificial intelligence to the robot learning a new language is easy and also at the same time new languages can be generated by the teachbot easily. Classrooms use robots mostly for very specific and repetitive tasks, such as vocabulary, attendance and behavior imitation. This type of Artificial Intelligence-powered technology can learn as it teaches, in tandem of creating a persona (albeit artificial) of unbridled knowledge and limitless patience.

2. NATURAL LANGUAGE PROCESSING FOR TEACHING ROBOT (TEACHBOT)

2.1. What is Natural Language Processing?

Natural Language Processing (NLP) is "ability of machines to understand and interpret human language the way it is written or spoken".

The objective of NLP is to make computer/machines as intelligent as human beings in understanding language.
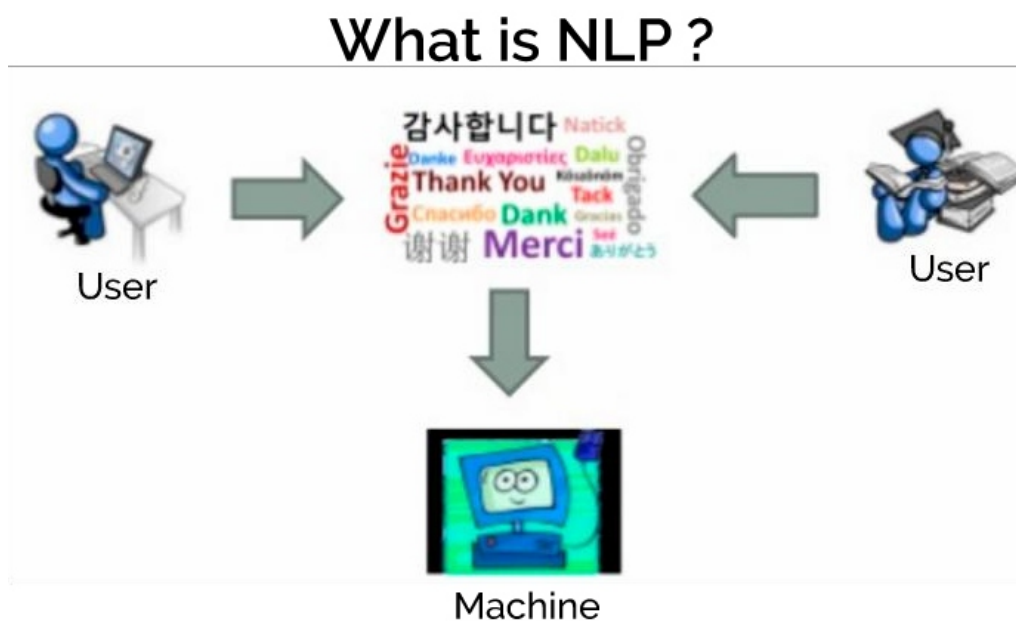
The ultimate goal of NLP is to the fill the gap how the humans communicate(natural language) and what the computer understands(machine language).

There are three different levels of linguistic analysis done before performing NLP -

Syntax — What part of given text is grammatically true.

Semantics — What is the meaning of given text?

Pragmatics — What is the purpose of the text?

NLP deal with different aspects of language such as

Phonology — It is systematic organization of sounds in language.

Morphology — It is a study of words formation and their relationship with each other.

Approaches of NLP for understanding semantic analysis

- **Distributional** — It employs large-scale statistical tactics of Machine Learning and Deep Learning.
- **Frame — Based** — The sentences which are syntactically different but semantically same are represented inside data structure (frame) for the stereotyped situation.
- **Theoretical** — This approach is based on the idea that sentences refer to the real word (the sky is blue) and parts of the sentence can be combined to represent whole meaning.
- **Interactive Learning** — It involves pragmatic approach and user is responsible for teaching the computer to learn the language step by step in an interactive learning environment. The true success of NLP lies in the fact that humans deceive into believing that they are talking to humans instead of computers.

Why Do We Need NLP?

With NLP, it is possible to perform certain tasks like **Automated Speech and Automated Text Writing** in less time.

Due to the presence of large data (text) around, why not we use the computers untiring willingness and ability to run several algorithms to perform tasks in no time.

These tasks include other NLP applications like Automatic Summarization(to generate summary of given text) and **Machine Translation** (translation of one language into another) **Process of NLP**

In case the text is composed of speech, speech-to-text conversion is performed. The mechanism of Natural Language Processing involves two processes:

- **Natural Language Understanding**
- **Natural Language Generation**

Natural Language Understanding

NLU or Natural Language Understanding tries to understand the meaning of given text. The nature and structure of each word inside text must be understood for NLU. For understanding structure, NLU tries

to resolve following ambiguity present in natural language:

- **Lexical Ambiguity** — Words have multiple meanings
- **Syntactic Ambiguity** — Sentence having multiple parse trees.
- **Semantic Ambiguity** — Sentence having multiple meanings
- **Anaphoric Ambiguity** — Phrase or word which is previously mentioned but has a different meaning.

Next, the meaning of each word is understood by using lexicons (vocabulary) and set of grammatical rules.

However, there are certain different words having similar meaning (synonyms) and words having more than one meaning (polysemy).

Natural Language Generation

It is the process of automatically producing text from structured data in a readable format with meaningful phrases and sentences. The problem of natural language generation is hard to deal with. It is subset of NLP

Natural language generation divided into three proposed stages:-

1. Text Planning — Ordering of the basic content in structured data is done.

2. Sentence Planning — The sentences are combined from structured data to represent the flow of information.

3. Realization — Grammatically correct sentences are produced finally to represent text. Difference Between NLP and Text Mining Natural Language Processing (NLP) refers to AI method of communicating with the intelligent systems using a natural language such as English. Processing of Natural Language is required when you want an intelligent system like robot to perform as per your instructions, when you want to teach, taking decision from a variety of topics stored.

The field of NLP involves making computers to perform useful tasks with the natural languages humans use. The input and output of an NLP system can be

- Speech
- Written Text

2.1. Components of NLP

There are two components of NLP as given

2.1.1. Natural Language Understanding (NLU)

Understanding involves the following tasks −

- Mapping the given input in natural language into useful representations.
- Analyzing different aspects of the language.

2.1.2. Natural Language Generation (NLG)

It is the process of producing meaningful phrases and sentences in the form of natural language from some internal representation. In this we are making the robot to learn the language and pronounce the text and sentences to teach to the students, people.

- **Text planning** − It includes retrieving the relevant content from knowledge base.
- **Sentence planning** − It includes choosing required words, forming meaningful phrases, setting tone of the sentence.
- **Text Realization** − It is mapping sentence plan into sentence structure.
- **Speech Synthesizer-**It contains the speech modulation.
- **Document Reader-** It is mapping to read the document in a nice voice.

3. ARTIFIAL INTELLIGENCE AND NLP FOR TEACHBOT

Natural Language Processing (NLP) refers to AI method of communicating with an intelligent systems using a natural language such as English.

Processing of Natural Language is required when you want an intelligent system like robot to perform as per your instructions, when you want to hear decision from a dialogue based clinical expert system, etc.

The field of NLP involves making computers to perform useful tasks with the natural languages humans use.

- **Text planning** − It includes retrieving the relevant content from knowledge base.
- **Sentence planning** − It includes choosing required words, forming meaningful phrases, setting tone of the sentence.
- **Text Realization** − It is mapping sentence plan into sentence structure. The NLU is harder than NLG.

4. DIFFICULTIES IN NLU

NL has an extremely rich form and structure.

It is very ambiguous. There can be different levels of ambiguity −

- **Lexical ambiguity** − It is at very primitive level such as word-level.
- For example, treating the word "board" as noun or verb?
- **Syntax Level ambiguity** − A sentence can be parsed in different ways.
- **For example, "He lifted the beetle with red cap."** − Did he use cap to lift the beetle or he lifted a beetle that had red cap?
- **Referential ambiguity** − Referring to something using pronouns. For example, Rima went to Gauri. She said, "I am tired." − Exactly who is tired?
- One input can mean different meanings.
- Many inputs can mean the same thing.

NLP Terminology

- **Phonology** − It is study of organizing sound systematically.
- **Morphology** − It is a study of construction of words from primitive meaningful units.
- **Morpheme** − It is primitive unit of meaning in a language.
- **Syntax** − It refers to arranging words to make a sentence. It also involves determining the structural role of words in the sentence and in phrases.
- **Semantics** − It is concerned with the meaning of words and how to combine words into meaningful phrases and sentences.
- **Pragmatics** − It deals with using and understanding sentences in different situations and how the interpretation of the sentence is affected.
- **Discourse** − It deals with how the immediately preceding sentence can affect the interpretation of the next sentence.
- **World Knowledge** − It includes the general knowledge about the world.

Steps in NLP

There are general five steps −

- **Lexical Analysis** − It involves identifying and analyzing the structure of words. Lexicon of a language means the collection of words and phrases in a language. Lexical analysis is dividing the whole chunk of txt into paragraphs, sentences, and words.

- **Syntactic Analysis (Parsing)** − It involves analysis of words in the sentence for grammar and arranging words in a manner that shows the relationship among the words. The sentence such as "The school goes to boy" is rejected by English syntactic analyzer.
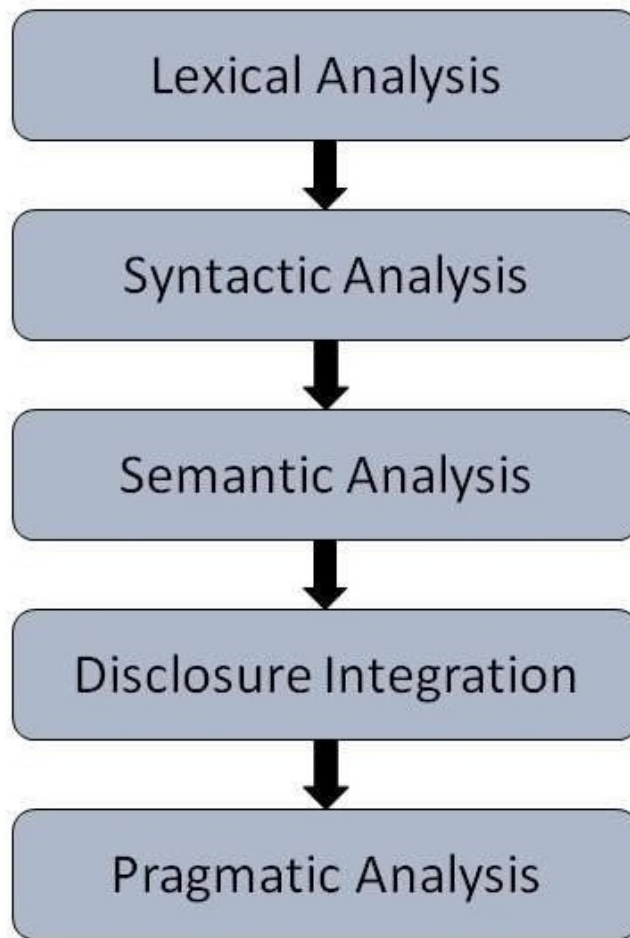
5. COMPONENTS OF THE TEACHBOT

- **Electric motors (AC/DC)** − They are required for rotational movement.
- **Pneumatic Air Muscles** − They contract almost 40% when air is sucked in them.
- **Muscle Wires** − They contract by 5% when electric current is passed through them.
- **Piezo Motors and Ultrasonic Motors** − Best for industrial robots.
- **Sensors** − They provide knowledge of real time information on the task environment. Robots are equipped with vision sensors to be to compute the depth in the environment. A tactile sensor imitates the mechanical properties of touch receptors of human fingertips.

6. Computer Vision of teachbot

This is a technology of AI with which the robots can see. The computer vision plays vital role in the domains of safety, security, health, access, and entertainment.

Computer vision automatically extracts, analyzes, and comprehends useful information from a single image or an array of images. This process involves development of algorithms to accomplish automatic visual comprehension.

Hardware of Computer Vision System of teachbot This involves −

- Power supply
- Image acquisition device such as camera
- a processor
- a software
- A display device for monitoring the system
- Accessories such as camera stands, cables, and connectors

7. TASKS OF COMPUTER VISION OF TEACHBOT

- **OCR** − In the domain of computers, Optical Character Reader, a software to convert scanned documents into editable text, which accompanies a scanner.
- **Face Detection** − Many state-of-the-art cameras come with this feature, which enables to read the face and take the picture of that perfect expression. It is used to let a user access the software on correct match.
- **Object Recognition** − They are installed in supermarkets, cameras, high-end cars such as BMW, GM, and Volvo.
- **Estimating Position** − It is estimating position of an object with respect to camera as in position of tumor in human's body.

8. APPLICATION DOMAINS OF TEACHBOT

- Agriculture
- Autonomous vehicles
- Biometrics
- Character recognition
- Forensics, security, and surveillance
- Industrial quality inspection
- Face recognition
- Gesture analysis
- Geoscience
- Medical imagery
- Pollution monitoring
- Process control
- Remote sensing
- Robotics
- Transport

8. APPLICATIONS OF TEACHING ROBOTICS

The teaching Robot can also be used for the following.

The robotics has been instrumental in the various domains such as −

- **Industries** − Robots are used for handling material, cutting, welding, color coating, drilling, polishing, etc.
- **Military** − Autonomous robots can reach inaccessible and hazardous zones during war. A robot named Daksh, developed by Defense Research and Development Organization (DRDO), is in function to destroy life-threatening objects safely.
- **Medicine** − The robots are capable of carrying out hundreds of clinical tests simultaneously, rehabilitating permanently disabled people, and performing complex surgeries such as brain tumors.
- **Exploration** − The robot rock climbers used for space exploration, underwater drones used for ocean exploration are to name a few.
- **Entertainment-** engineers have created hundreds of robots for movie making.

9. SPEECH RECOGNITION

Speech recognition is the technology where the teaching robot should understand the questions, doubts raised by the students. It take the speech or voice of the students by using a microphone. Spoken out is converted in to the digital format. This digital input is broken down into the unit/symbol that represents sounds of speech. This is compared with the voice of the student from its database and it identify the student's voice.

10. ARTIFICAL INTELLIGENCE TO TEACHBOT

Artificial intelligence is given to the robot to store the documents, newspaper, diagrams, tables from the books, journals etc. It should fetch the specific topic from the topics, documents, portable document files stored and it should be designed to deliver the topics neatly without any error. It is given with the knowledge to present the topic clearly when the students raise the questions from the specific topic.

11. ROBOT TEACHERS (TEACHBOT)-ADVANTAGES

The teaching robot (teachbot) are programmed for their jobs and They will always obey and find the solution easily and fastly when compared to the human. They are the solution to the education , They can teach you technological skills as well as any kind of topic without any irritation and hesitation. They can teach poor kids that have no chance to ever go in contact with technology and they do not have to get paid for that .It will not beat or give any kind of punishment to the students.

The robot teachers are better than the human, They are new & they will have new methods but otherways the teachers have the old methods while the robot teachers have up to date methods, If the robots become the teachers it will not get tired, it will teach at any time anywhere, any topic to any person including the science, technology, medical, business, software etc.

The robot teachers are mainly used as the classroom assistants in the elementary schools, Some robots can transmit the video from far places , so , the teacher does not have to be in the classroom if they do not live in the country , The kids not only love the robots , but also that the robots benefit the kids in the classroom .

The scientists think that the social interaction with the live human being is crucial for learning to take place in children under 1 year, In the future, more and more of us will learn from the social robots, especially the kids learning pre-school skills and the students of all ages studying a new language.

The social robots are being used on the experimental basis already to teach various skills to the preschool children, including the colour names, the new vocabulary words and the songs and they can save the money for the schools by not having to pay the teachers.

In the future, the robots (teachbot) will only be used to teach certain skills such as acquiring the foreign or new language, possibly in the playgroups with the children or to the individual adults, but the robot teachers can be cost-effective compared to the expense of paying the human beings. The teaching robot can take the classes, presentation without boring and it can cut many jokes in the relevant field if it is loaded with all topic.

12. ROBOT TEACHER DISADVANTAGES

Many schools don't have a lot of money , They don't pay their teachers , So , they will not afford the robot teacher even at the cheapest price , The robots need the electricity and the electricity costs a lot .

The robot teachers do not have feelings, they are not able to help you to get over things and help you feel better but the human teachers can and the robot wouldn't know what to do.

If we converted to the robots, the teachers and staff worldwide would lose their jobs, The robots are not able to develop the personal distinctions between the students.

Implementing this technology in the classroom requires the existing infrastructure for the electricity and Internet , an instructor device (desktop/laptop/iPad)is needed to connect to and the software to enable the use of all aspects of the hardware .

The robot teachers are higher cost technologies in the developing world, the software is employed on low-cost laptops, desktops or tablets to simulate the teacher instruction.

In these classrooms, the entire curriculum can be imparted to the students through the computer program, making a quality human teacher unnecessary.

There are no inspiring robot teachers, they are all programmed to spit the knowledge out at the students and expect the students to spit it back at them, The robot teacher cannot develop the creative or innovative ideas for teaching the material in a new way, it cannot comment on the papers to provide the students with valuable positive feedback or the critiques.

The robot teacher cannot pull the struggling student aside and determine if there are the personal issues related to his/her performance , It cannot encourage the students with the particular strength and interest in the subject to consider certain career paths .

In developing regions, employing technology as the alternative to the human instruction makes it is difficult to gauge the design specifications for the effective instructional software.

13. MINIMUM REQUIREMENTS FOR SYSTEMS TO BE AI — ENABLED

AI or Artificial Intelligence — Building systems that can do intelligent things.
NLP or Natural Language Processing — Building systems that can understand language. It is a subset of Artificial Intelligence.
ML or Machine Learning — Building systems that can learn from experience. It is also a subset of Artificial Intelligence.
NN or Neural Network — Biologically inspired network of Artificial Neurons.
DL or Deep Learning — Building systems that use Deep Neural Network on a large set of data. It is a subset of Machine Learning.

Source: vincejeffs.com
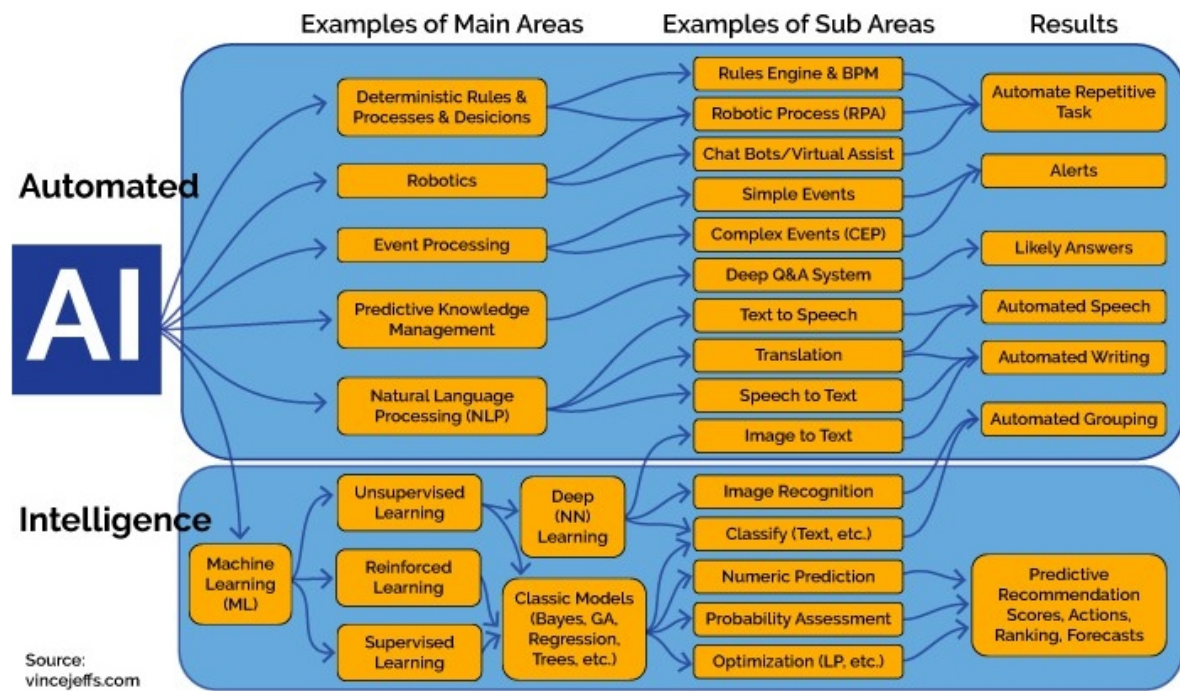
- same interpretation is coming from different sources like applications or operating systems.
- **Classification & Tagging** — Classification & Tagging of different log messages involves ordering of messages and tagging them with different keywords for later analysis.
- **Artificial Ignorance** — It is a kind of technique using machine learning algorithms to discard uninteresting log messages. It is also used to detect an anomaly in the normal working of systems.

14. ROLE OF NLP IN TEACHBOT

Natural Language processing techniques are widely used in log analysis and log mining.

The different techniques such as tokenization, stemming, lemmatization, parsing etc are used to convert log messages into structured form.

Once logs are available in the well-documented form, log analysis, and log mining is performed to extract useful information and knowledge is discovered from information.

The example in case of error log caused due to server failure.

Dividing into Natural Language Processing

Natural language processing is a complex field and is the intersection of artificial intelligence, computational linguistics, and computer science.

Future work

In the future, this teachbot can be used to singing a song when the lyrics are given, it can compose music and also designed to create many stories and acts as a story writer for the films. The robot is loaded with all the documents, presentation, news etc. This robot can be used as a news reader, singer, player-any games, trainer to software people, adviser to business people. The main aim is to make a single robot for all purpose. From preparing budget to read it to the people in assembly can also be done. It can eliminate all the work or burden of a human being in future especially teaching people. It can be used as a news reader if the news is given in the document forms.

It also can prepare a budget for the nation with the previous figures and produce a new budget for the nation and also it will read it in the assembly. It also used to market the products in future.

CONCLUSION

With this teachbot human being work can be replaced in various ways. Humanbeings get tired when he has lot of work. But robot cannot get tired. It can do more work than a human being. IT can teach for 24/7 also. This is the new kind of teaching.

14. BIBLIOGRAPHY
1. *Rise of the Robots: Technology and the Threat of a Jobless Future by martin*
2. *Robotics in Education: Research and Practices for Robotics in STEM Education (Advances in Intelligent Systems and Computing) Kindle Editionby MunirMerdan (Editor), WilfriedLepuschitz (Editor), Gottfried Koppensteiner (Editor), Richard Balogh (Editor)*
3. *Artificial Intelligence and Natural Language Processing Raymond J. MoMooney, university of Texas at*

A Survey on Routing Protocols for Underwater Sensor Wireless Networks

Ankita Korlvala[1], Prof. Janak Tank[2]
[1]Computer Engineering, LDRP-ITR, Gandhinagar, India
[2]CE Department, LDRP-ITR, Gandhinagar, India

A B S T R A C T

Underwater communication in recent times has gained great importance owing to reasons varying from predicting natural disasters to formulating strategic defence systems. Underwater communication systems face challenges ranging higher propagation delays to frequency related constraints like bandwidth limitations, Doppler spread, multipath propagation and is greatly affected by distance between nodes and link orientation. This calls for the formation of most appropriate routing protocol for UASN. This paper explores the significant advantages, disadvantages and applications of different existing routing protocols

1. INTRODUCTION

Underwater sensor networks are being widely utilized in modern times in different areas of underwater research including industrial research, structural monitoring, micro-habitat monitoring[1] etc. The topic is still in the beginning stage compared to its terrestrial counterpart basically due to the involvement of high cost and physical challenges involved in. Even then, UASN found place in many vital physical applications in the fields like oil and gas exploration [2], sensing of chemical contamination and biological phenomena, seismic studies etc. This topic assumes great importance in modern times not only for scientific community but also for the governments; industries etc as it have found application in every underwater human activity.

To understand the basics of UASN, we can utilize many design principles and tools used in terrestrial sensor networks. But they are characteristically different in some fundamental points. Most importantly radio is unsuitable for underwater sensors due to their limited propagation ability [3]. This is when acoustic signals are being utilized for underwater communication which again poses many challenges[4] like high propagation delays, loss of connectivity in shadow zones, high rate of power absorption etc. Hence the requirement for specially designed routing protocols for UASN becomes inevitable. Thus, intense research programmes are being undertaken for designing efficient protocols considering the uniquecharacteristics of underwater communication networks.

A. Applications of underwater acoustic sensor networks

The broad range of applications for underwater acoustic sensor networks can be categorized as under.

- Surveillance: surveillance and reconnaissance like detecting presence of submarines, underwater vehicles, mines and divers. It relatively delivers more accuracy than the conventional radar and sonar systems. For this, different types of sensors are utilized in combination.

- Assisted Navigation: Underwater Acoustic sensors are used in assisted navigation to locate and identify different underwater threats like rocks, shoals, submerged wrecks etc and bathymetric surveys.

- Ocean Sampling Networks: Underwater acoustic sensors can be used for synoptic, cooperative adaptive sampling of ocean environment. The introduction of sophisticated robotic vehicles of advanced models has improved the effectiveness of the UASN when used collectively.

- Environmental monitoring: The recent development in UASN and electronics can effectively be used in environmental monitoring in underwater surroundings.

- A large number of nodes can be deployed in vast areas to monitor the impact of urbanization and industrialization on oceanic environment. It also helps in assessment and of risk and environmental sustainability and also can assist with real time data about bioavailability and mobility.

- Preventing natural calamities: Underwater sensor networks can effectively be utilised [30] for monitoring submarine seismic activities which in turn can predict tsunami like disasters. It also helps to study the impact of underwater earthquakes.

- Mineral and oil exploration: Underwater sensors can be used for detecting the presence of minerals and oil under sea water. It can also be used for detecting chemical and oil leaks from commercial tankers carrying them and also in monitoring biological phenomena like presence of phytoplankton in large numbers.

- Water quality monitoring: Underwater sensors find place in analysing water properties in dams, rivers, lakes ,oceans and underground water reserves. It enables the creation of database of water bodies and allows the constant monitoring [28] in locations of difficult access without physical human interference.

B. Major challenges in designing of UASN

Intense researches are presently underway in developing suitable networking solutions for Underwater acoustic sensor networks. Even though there are many recently developed protocols for wireless sensor networks, the entirely different characterists [31] of underwater communication systems poses different challenges[6] which can be summarized as follows.

- Propagation delay in underwater communication is 5 times higher than terrestrial channels and is also variable in nature.

- Underwater sensors face failure due to corrosion and fouling.
- Power supply to UWSN is a major concern as the battery power is limited and recharging is difficult. Again, it has higher power consumption requirements.
- Due to extreme characteristics [32,41] of underwater channel like shadow zones, temporary loss of connectivity is common accompanied by high bit error rates.
- Available bandwidth for UWSN is extremely limited.
- Underwater channels are severely impaired mainly due to fading and multi-path.
- High level of noise [33] from shipping activity and machinery noise are concern in UASNs.

II. UNDERWATER NETWORK ENVIRONMENT

Underwater sensor networks is a composition of a group of sensor nodes anchored to the sea bed which are connected to other underwater gateways by acoustic links. UASN consists of underwater LANs called clusters or cells. These clusters consists of sensors and sinks where sensors are connected to sinks within each cluster. This connections may be direct paths or multiple hops. The signals shared at each sink within cluster is sent to surface stations through a vertical link. The surface station with the help of acoustic transceivers handles multiple parallel communication with the sinks deployed under the water. A sample network environment is shown in the figure 1.[7,46].

III. DIFFERENCE BETWEEN TERRESTRIAL AND UASN

Due to the major difference in the operational environments, there exists many basic differences[8] between terrestrial sensor networks and their underwater counterparts. They can be summarized as follows:
- Difference in deployment: Since terrestrial sensor networks are deployed densely, the underwater deployment of sensors are sparse due to the involvement of high cost factor and difficulty in deployment itself.
- Cost: Due to more complex design and hardware protection requirements, the underwater sensors are much more costlier than terrestrial sensors.
- Power requirement: Underwater sensor networks require more power consumption [34] due to higher distance and usage of complex signal processing methods at the receivers to balance the impairments of the channel.
- Storage: Underwater sensor need to have more data storage capability as the channel may be intermittent.
- Performance: Performance [40] of ground based wireless sensor networks are better than underwater acoustic protocols.
- Mobility: Terrestrial networks use fixed sensor and underwater sensors are mobile [39,47].

IV. NETWORK LAYER CHALLENGES

The main objective [38] of the network layer is to allow end system, connected to different networks, to exchange data through intermediate systems called router. It find the path from source to the destination while taking into consideration of the characteristics of the channel.

This includes energy of nodes, propagation delays etc. Routing protocols for underwater sensor networks face a number of difficulties due to the peculiar underwater environment. Routing protocols are divided in to three categories namely proactive, reactive and geographical[9,44] .Due to memory, energy and scalability issues, proactive routing protocols are generally avoided. High latency and asymmetrical links and topology of reactive protocols make them unsuitable for underwater sensor networks. Geographical routing protocols [36] are promising for their scalability and localized signaling. But strict synchronization requirement of geographical routing protocols are difficult to obtain in underwater networks due to variable propagation delays. GPS used in terrestrial networks to estimate the geographical location cannot be used in underwater environment as the GPS radio receivers doesn't work [48] under water. Scope for further research is immense in this area.

Open research issues at the network layer [10] are,

- Mechanisms have to be developed for delay-tolerant
- Applications to manage loss of connectivity without provoking immediate retransmissions.
- Development of healthy routing algorithms is required with respect to the intermittent connectivity of acoustic channels. Due to fading and multipath, the quality of acoustic links is highly unpredictable.
- The delay variance of acoustic signals to propagate from one node to another heavily depends on the distance between two nodes. The delay variation in horizontal acoustic links are generally larger than in vertical links which is due to multipaths [37]. This necessitates the development of algorithms to provide strict or loose latency bounds for time critical applications [11].
- Credible simulation models and tools are required to be developed for accurate modeling to understand dynamics of data transmission at network layers.
- Protocols and algorithms are required to be developed to address connection failures, unforeseen mobility of nodes and battery depletion.
- Suitable algorithms for local route optimization needs to be designed [12] to address the consistent variations in the metrics describing the energy efficiency for the underwater channel.
- In case of geographical routing protocols development of efficient underwater location discovery techniques [42] are to be developed.
- Necessary integration mechanisms are to be developed to integrate AUVs in underwater to communicate between sensors and AUVs.

V. ROUTING PROTOCOLS FOR UASN

Designing an optimum routing protocol is the basic issue involved with any network. Formulating an efficient routing algorithm is an important issue related to network layer. Till recent times, most of the research works involving underwater sensor networks were limited to physical layers. But a substantial shift of interest towards research on network layers is taking place in recent times. Still the field of underwater sensor networking and routing protocols are in the incipient stage of research.

The major routing protocols proposed for UASN are discussed below:

A. Vector based forwarding (VBF)

In vector Based Forwarding [13], data packets are forwarded along redundant and interleaved paths from the source to sink. This helps in handling the problems of packet losses and node failures. Forwarding path is nominated by the routing vector from sender to target. All the nodes receiving the packet computes their positions by measuring its distance to the forwarder. It is assumed that every node already knows its location and each packet carries the location of all nodes involved. The forwarding path is virtually a routing pipe and the nodes inside this pipe are eligible for packet forwarding.

B. Hop-by-hop Vector based forwarding (HH-VBF)

In HH-VBF [14], virtual routing pipe concept is used. Each forwarder is defined by per hop virtual pipe. Based on its current location, every intermediate node makes decision about the pipe direction. The advantage is, HH-VB can find delivery path even if the number of nodes available in the forwarding path is very limited in number. Simulation results show that it has good packet delivery ratio and more signaling overhead in sparse areas than VBF. Simultaneously, it faces the problem of routing pipe radius threshold, affecting its performance.

C. Focused beam routing (FBR)

FBR protocol [15] for acoustic sensor networks are intended to avoid unnecessary flooding of broadcast queries. Overall expected throughput can significantly be reduced by overburdened networks due to uncertain location information of nodes. In FBR, every node in the network is expected to be aware of its location and every source node is aware of its destination. Locations of intermediate nodes are insignificant here and routes are established vivaciously during data transfer.

The concept of FBR is not free from drawbacks. Due to water movements, nodes can become sparse resulting in a situation that none of the node lie within the forwarding cone of angle. Secondly if some

nodes are positioned outside the forwarding area, it is forced to retransmit the RTS eventually resulting in the increase in communication overhead. It will subsequently affect the data delivery in the sparse areas. Lower flexibility of network is also a drawback of FBR concept.

D. Reliable and energy balanced routing algorithm (REBAR)

It is a location based routing protocol [16]. An adaptive scheme is formulated by defining data propagation range to balance the energy consumption of the network. Geographic information is used by the nodes between the source and sink to transfer the data. Each node is assigned a unique ID and fixed range. REBAR is based on the following assumptions.

     a) Every node knows its location and of the sink through multihop routing.

     b) Sensed data i are sent to the sink at a specific rate.

The major disadvantage of REBAR is that the available simulation results focus only on delivery ratios and energy consumption with different node speeds. But end to end delays, variable according to different node movements, are not taken in to consideration.

E. Sector-based routing with destination location prediction (SBR-DLP)

It has been designed for routing a data packet in mobile UASN where both intermediate and destination nodes are mobile. It is assumed that each node knows its own location and pre planned movement of destination nodes. Forwarding of data packets are done in a hop by hop manner to avoid flooding. SBR-DLP [17] tries to achieve destination mobility by assuming that all pre planned movements are known to all nodes before the deployment. But the limitation of this concept is that, post launch position changes are impossible. Moreover, scheduled movements of destination nodes can be affected by underwater currents.

F. Directional flooding-based routing (DFR)

Reliability, packet loss and dynamic conditions are the major challenges in UASN which results in retransmissions. This protocol enhances reliability by packet flooding technique[18]. The assumption is that all nodes knows about its own location, location of one hop neighbours and that of the final destination. Link quality is the foundation for deciding the forwarding nodes. This protocol rectifies the void problem by the selection of at least one node to transmit the data packet towards the sink. But void problem can still exist if the sending node cannot find a next hop closer to the sink as reverse transmission of data packet is impossible.

G. Location aware source routing (LASR)

In LASR [19], two techniques are adopted for handling high latency of acoustic channels, namely link quality metric and location awareness. Link quality metric assures better routes through the networks. All the network information including routes and topology information are passed on in the protocol header. Resultantly header size increases as the hop count between source and sink increases. This leads to overhead for acoustic communication with a narrow bandwidth.

H. Depth based routing (DBR)

Unlike the location based routing protocols, the DBR [20] requires only the depth information of sensor node. Depth sensors are used for this purpose. When a node wants to send a data packet, it senses own relative current position from the surface and place its value in the header and then broadcasts. The receiving node calculates its own depth position and compares this value with the value embedded in the packet. If it is smaller, the packet is forwarded. Otherwise the packet will be discarded. The process is repeated until the packet reaches the destination. The main disadvantage of this protocol is that in sparse and high density areas, the performance is affected by packet loss and inefficient memory usage.

I. Pressure routing (HydroCast)

In order to overcome the limitations of geographic routing, Hydrocast [21]is proposed as an alternative as it doesn't require distributed localization. Like DBR, data packets are greedily forwarded towards a node with lowest pressure level of the surrounding nodes. Hydrocast is not affected by the problem of void regions.

High delivery ratios are also ensured in Hydrocast by the use of simultaneous reception among the neighbour nodes. But the problems like energy usage of pressure sensors and delivery of multiple copies of the same data due to opportunistic routing are still to be addressed.

J. Adaptive routing

In UWSN, unavailability of persistent route from source to destination is a common problem arising out of sparse deployment and node mobility. Hence, UWSNs are called intermittently Connected networks (ICN) or Delay Tolerant Network (DTN) [22,43] and usual routing techniques are unsuitable for them. Adaptive routing [23] is technique is introduced where it is assumed that all nodes know their 3rd position. Here routing decisions are dependent on the characteristics of each packets. Main disadvantage of this method is that, due to the complex nature of the protocol, energy consumption and end to end delays are common.

K. Distributed underwater clustering scheme (DUCS)

Main concern related to UWSNs is effective utilization of energy because continuous power supply is dependent on batteries having limited capacity [45]. This emphasized the requirement of an energy efficient routing protocol. DUCS [24] is designed as an adaptive self-organizing protocol and the network is divided into clusters of nodes having a cluster head. All other nodes except cluster head transmit data packet to cluster head node. Cluster heads process the signals and transmit it to the sink. This ensures high packet delivery ratio and reduces the network overhead. Major problem faced by DUCS is that the cluster structure can be affected by underwater currents which reduces the cluster life. Another serious drawback is that communication is possible only between cluster heads.

L. Distributed minimum-cost clustering protocol (MCCP)

In this routing technique, clusters are formed by computing three major parameters, ie, total energy requirement, residual energy of cluster head and members and relative location of the cluster head and underwater sink. In MCCP [25], clusters are selected using a centralized approach. In this, all the sensor nodes are candidates for cluster head and cluster member. Each node constructs its neighbour set and uncovers neighbour set in order to form a cluster. Average cost of particular cluster is calculated and broadcasted among the all nodes within its two –hop range with its cluster head ID. The node with minimum cost becomes the cluster head and other nodes become members. This approach avoids formation of hot spots and balances the traffic load periodically. Major disadvantage of this.

M. Temporary cluster based routing (TCBR)

In many of the existing routing protocols for UWSN, a general problem faced by the network is that the nodes around the sink more prone to energy depletion and their life span is short comparative to the other nodes. TCBR [26] is proposed to address this problem where multiple sinks are deployed on the water surface \to receive data packets. This ensures higher bandwidth and reduced propagation delays. Two different types of nodes are used in this protocol namely ordinary and courier nodes. Ordinary nodes are supposed to sense event happening and collect information which is forwarded to nearer courier node. Courier nodes transmits data packets to the surface sink. Here, 2 to 4 percentage of total nodes are used as courier nodes which enables equal energy consumption throughout the network. The major disadvantage of TCBR is that it is not suitable for time critical applications.

N. Location-based clustering algorithm for data gathering (LCAD)

A cluster based architecture is proposed for three dimensional UASN which can address the problem of rapid energy drains of sensor nodes around the sink. In this architecture, sensor nodes are deployed at fixed relative depths. Sensor nodes in each tier are deployed in clusters with multiple cluster heads.

According to the node position, this algorithm select cluster head at each cluster. The maximum length of horizontal acoustic link is limited to 500m which are used for intra-cluster communication. Data packet collection from the cluster heads are done by AUVs. LCAD [27] performance depends on the position of cluster head inside the grid structure. Node movements are not considered here. Therefore this structure is less applicable for UASN.

VI. CONCLUSION

Underwater communication is assuming greater importance day by day due to its ever increasing application in industrial, commercial and defense fields [50]. Unmanned underwater explorations are necessitated by the environment like inhospitable surroundings, unpredictable underwater activities, high pressure conditions [49]. In this paper we have presented an overall view of the UASNs and different routing protocols used depending on the requirements, appropriateness and availability of resources. Development of optimum routing protocol which makes it reliable and efficient is regarded as the vital part in UASNs. We have tried to compare, analyze and classify different routing techniques on the basis of their advantages, disadvantages and applications. Due to the different qualities these routing techniques possess, it becomes difficult to propose a particular one for a particular situation. Eventually, this study is to provide an overview of the topic which is growing rapidly and steadily.

VII. COMPARISON OF PROTOCOLS

Category	Routing Protocol	Application	Advantages	Disadvantages
Location Based Routing	VBF HH-VBF FBR REBAR SBR-DLP DFR LASR	Energy Efficient UWSN	a) Energy efficient b) Robustness c) High success of data delivery	a) Low bandwidth b) High latency c) Delay, efficiency, performance and reliability are low
Depth Based Routing	DBR	Dense Network Application	a) Very high packet delivery ratio b) No need of full dimensional location information of nodes	a) Not energy efficient b) Batteries are
Pressure Based Routing	Hydro cast	Dense Network Application	a) Lower end-to-end delay b) Good performance and delivery ratio c) Delay efficient	a) Bandwidth and energy efficiencies are b) Higher cost in packet transmission
Adaptive Routing	Adaptive	Underwater delay/disruption tolerant sensor network	a) Energy and Bandwidth efficient b) Reliable c) High delivery ratio	a) Not able to use water current b) Delivery efficiency is not good
Cluster Based Routing	DUCS MCCP TCBR LCAD	Energy Efficient UWSN	a) High scalability and robustness b) Less load and energy consumption	a) Processing overhead is complex

REFERENCES

1) Ocean Engineering at Florida Atlantic University,Available online at: http//www.oe.fau.edu/research /ams. html

2) X.Yang, K.G.Ong , W.R.Dreschel, K.Zeng, C.S.Mungle and C.A.Grimes, Design of a wireless sensor network for long-term, monitoring of an aqueous environment, pp 455-472,Sensors 2 Vol.11,2002

3) J.H.Cui,J.Kong .M.Gerla and S.Zhou,Challenges : Building scalable mobile underwater wireless sensor networks for aquatic applications, IEEE Network, Special issue on wireless sensor networking,pp. 12-18,2006

4) Akyildiz IF, Pompili D, Melodia T. Underwater acoustic sensor networks: research challenges. Ad Hoc Networks 2005;3(3):257–79.

5) Akyildiz IF, Pompili D, Melodia T. State-of-the-art in protocol research for underwater acoustic sensor networks. In: Proceedings of the 1st ACM international workshop on underwater networks. ACM: Los Angeles (CA, USA); 2006.

6) Ayaz M, Abdullah A. Underwater wireless sensor networks: routing issues and future challenges. In: Proceedings of the 7th international conference on advances in mobile computing and multimedia. ACM: Kuala Lumpur (Malaysia); 2009.

7) Manjula R.B, Sunilkumar S.Manvi,Issues in UASNs,International Journal of Computer and Electrical Engineering,Vol 3,No.1 February,2011

8) Mohd.Ehmer khan , Farmeena khan , An Empirical study of UASN and Terrestrial network, IJCSI International journal of Computer Science issues, Vol.9,Issue 1,No.1,January 2012

9) Pompili D. Efficient communication protocols for underwater acoustic sensor networks. School of Electrical and Computer Engineering, Georgia Institute of Technology; 2007.

10) Heidemann J, et al. Research challenges and applications for underwater sensornetworking. In: Proceedings of the IEEE wireless communications and networking conference, WCNC; 2006.

11) Quazi A, Konrad W. Underwater acoustic communications. Commun Mag, IEEE 1982;20(2):24–30.

12) Ovaliadis K, N.S.a.V.K. Energy efficiency in underwater sensor networks: a research review. J Eng Sci Technol Rev 2010;3(1):151– 6.

13) Xie P, Cui J-H, Lao L. VBF: vector-based forwarding protocol for underwater sensor networks.Networking 2006. Networking technologies, services, and protocols;

14) performance of computer and communication networks; mobile and wireless communications systems. Berlin/Heidelberg: Springer; 2006a. p.1216–1221

15) Nikolaou N, et al. Improving the robustness of location-based routing for underwater sensor networks. In: Proceedings of the OCEANS.– Europe; 2007.

16) Jornet JM, Stojanovic M, Zorzi M. Focused beam routing protocol for underwater acoustic networks. In: Proceedings of the third ACM international workshop on Underwater Networks. San Francisco (California, USA): ACM; 2008.

17) Jinming C, Xiaobing W, Guihai C. REBAR: a reliable and energy balanced routing algorithm for UWSNs. In: Proceedings of the seventh international conference on grid and cooperative computing, GCC '08; 2008.

18) Chirdchoo, N, Wee-Seng S, Kee Chaing C. Sector-based routing with destination location prediction for underwater mobile networks. In: Proceedings of the international conference on advanced information networking and applications workshops, WAINA '09; 2009.

19) Daeyoup H, Dongkyun K. DFR: directional flooding-based routing protocol for underwater sensor networks. In: Proceedings of the OCEANS; 2008.

20) Carlson EA, Beau jean PP, An E. Location-aware routing protocol for underwateracoustic networks. In: Proceedings of the OCEANS; 2006.

21) Yan H, Shi ZJ, Cui J-H. DBR: depth-based routing for underwater sensor networks. In: Proceedings of the 7th international IFIP-TC6 networking conference on adhoc and sensor networks, wireless networks, next generation internet. Singapore: Springer- Verlag; 2008.

22) Uichin L, et al. Pressure routing for underwater sensor networks. In: Proceedings of the IEEE, INFOCOM; 2010.

23) Zheng G, et al. Adaptive routing in underwater delay/disruption tolerant sensor networks. In: Proceedings of the fifth annual conference on wireless on demand network systems and services, WONS; 2008.

24) Domingo MC, Prior R. A distributed clustering scheme for underwater wireless sensor networks. in personal, indoor and mobile radio communications. In: Proceedings of the IEEE 18th International Symposium on PIMRC; 2007.

25) Pu W, Cheng L, Jun Z. Distributed minimum-cost clustering protocol for underwater sensor networks (UWSNs). In: Proceedings of the IEEE international conference on communications, ICC '07; 2007.

26) Ayaz M, Abdullah A, Low Tang J. Temporary cluster based routing for Underwater Wireless Sensor Networks. In: Proceedings of the International Symposium in Information Technology (ITSim); 2010.

27) Chitre M, et al. Underwater acoustic communications and networking: recent advances and future challenges. In: Proceedings of the OCEANS; 2008.

"Construct Network Security Model using Cryptography, Firewall for Social Organization"

Dr. P. Avinash*, Y. Gyana Deepa*

* Sridevi Women's Engineering College,
Telangana.ndeswari Women's College, Wandiwash- tamilnadu, India

A B S T R A C T

In these days, network security plays a very important role in growing networks. As crackers & hackers effect the networks. The network security is prime concept for any big organization such as business, academic or any governmental offices .It requires need to balance the security setup against the risk that are migrated. Various software programs are developed on security basis which has capability of detecting and preventing the attacks from unauthorized side. The most important thing about network security is confidentiality, integrity and availability. This paper discusses various concepts of network security. The various concepts discussed in this paper are Firewall, Cryptography, & Virtual Private Network, need of network security, OSI layer, and advantages of network security architecture.

1. INTRODUCTION

Use of the computer and communication using computer, sharing of data is tremendously increases. Network configuration and reconfiguration is easier, faster, and less expensive. However the overall security objectives are preserving confidentiality, ensuring integrity, and maintaining availability of the information and information systems.

Most of the employee work from their home, they share information with their co- worker. Some information is confidential so that both the employee who share the information need strong security. The number of intrusions into computer systems is growing and raising concerns about computer security. Every organization has to define a security policy to display the level of protection which they need to avoid unauthorized access to the resources of their internal network, and to defend against the unauthorized export of private information. The points which will discussed in this paper is :-

- ❖ What is network security?
- ❖ Network Security Architecture.
- ❖ Advantages Network Security Architecture.
- ❖ Why the network security is important?
- ❖ OSI Layer Model.

2. WHAT IS MEAN BY NETWORK SECURITY?

Before starting with network security, we should know the meaning of the term Network Security. It is the combination of network and security. Simply network means connection between two or more computer. Security means only access only to the authorized user who have some rights. Security means the safety of a state or organization. Perhaps the greatest strength of network is that they enable information to be shared, perhaps the greatest weakness of the network is they enable information to be shared. Security is the trick to permit only legitimate user to share.

Network security consists of the provisions made in an underlying computer network infrastructure, policies adopted by the network administrator to protect the network and the network-accessible resources from unauthorized access and the effectiveness of these measure combined together. Network security starts from authenticating any user. Once authenticated, firewall enforces to user access any information they want or any services are allowed to be accessed by the network users. Though effective to prevent unauthorized access, this component fails to check potentially harmful contents such as computer worms being transmitted over the network.

3. NETWORK SECURITY ARCHITECTURE

Network security architecture is the planning and design of network to reduce the security risks which came from attackers. This security architecture focused on reducing the security risks and policy through the design and configuration of firewall, routers and other component related to the network security.

Network security is important because it is one of the means to enforce the procedures and system developed by the organization to protect the information.
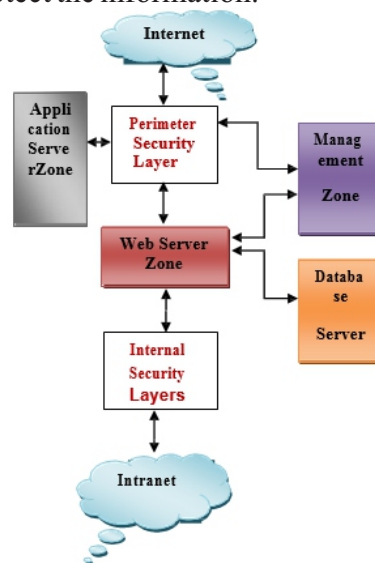
Figure 1. Simple network security architecture for organization

This architecture consist of total six fields such as Database server zone, Application server zone, Web server zone, Internet security layer, Intranet, Internet, Perimeter security layer.

Internet is relatively short, its growth has been dynamically explosive. The Internet users are increases in worldwide day by day. The Internet is a worldwide collection of networks that links together millions of computers by various means, such as modems, fibre optic lines and various servers. It provides connections to various businesses, the government, industries, educational institutions, and individuals. Each of these organizations has become increasingly dependent on networks and distributed computing and processing systems.

Intranets provide organizations with tremendous ability to communicate, but they do not use any traditional model which use for communication. While you can publish employee information on the Intranet, the system empowers employees and departments themselves to become publishers and communication facilitators. An Intranet allows anyone in the company to tap into the entire organization's intellectual capital, rather than the limited circle of fellow employees with whom most employees have day-to-day contact.

Web server zones are responsible for interaction with the user , the **application server zone** perform data processing and database server zone provide data storage. Those server which has same type that provides the various services and that services are separated and located in different zones. **Internet** does not have authority for the direct accessing the application and database server. **Web server zone** access only the **application server zone** and **application server zone** access only **database server zone.** The main reason behind designing this architecture is to stop the various attacks from hackers and crackers in **web server zone** .There are two security layer such as **Perimeter security layer** and **Internet security layer**. **Perimeter security layer** consist of routers providing first layer of protection which has dedicated security devices such as firewall, VPN and other required devices. **Internet security layer** consist of some dedicated security devices such as firewall, IPS and other required security devices.

4. ADVANTAGES OF NETWORK SECURITY ARCHITECTURE
- Isolation of low-trust network areas, which can be potentially used to launch attacks against strategic IT system resources
- Limitation of the security breach scope to one system or network segment as well as limiting the incident spreading to other systems

- Accurate network access control to IT system resources as well as monitoring and auditing resource usage and management

- Quick identification of IT systems security incidents based on the events detected in the network areas, these events should not occur.

- Cost optimization by an appropriate IT resource location and segmentation, and deployment of adequate safe guards for requirement compliance.

## 5. NEED OF NETWORK SECURITY: -

The need for network security is quite obvious. There are criminal activities in every field, computers being no exception. People like to store private information on computers. If a criminal was successful in his attack onto your network, they would successfully retrieve the information on that computer. By addressing their security issues, you not only will be able to make a more informed decision when choosing a protocol but you will also understand all these efforts and fuzz on security alternatives i.e.

➢ FIREWALL.

➢ CRYPTOGRAPHY.

➢ VIRTUAL PRIVATE NETWORK

becomes necessary.

5.1. Firewall

A firewall is the entry gate in front of many group of machines. It's main function is to control communication between machines. At the time of this communication over the internet a stream of data send in both directions. Firewall comprises of a application software that can reside in a communication router, server or some other device. Firewall are designed to keep unwanted and unauthorized traffic from an unprotected network like the Internet out of a private Network like your LAN/WAN, yet still allowing you and other user of your local network to access Internet Services.
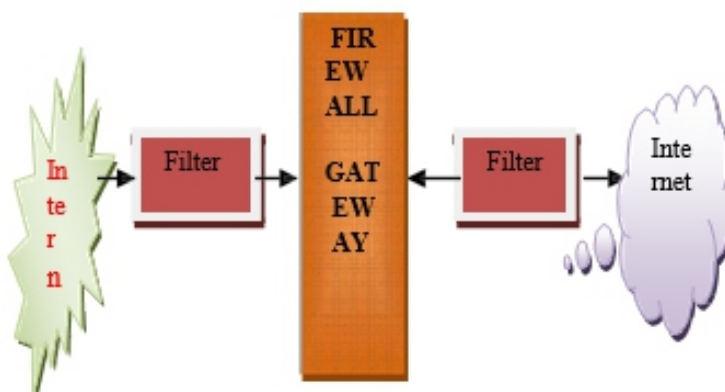
Figure 2.Basic purpose of the firewall

The purpose of firewall, or a security gate, is to provide security to those components inside the gate, as well as control of who (or what) is allowed to get into this protected environment, as well as those allowed to go out. It works like a security guard at a front door, controlling and authenticating who can or cannot have access to the site.

5.1.1. Merits of firewall :-

1. One of the primary goal of the firewall is to protect each site against hackers.
2. It's setup provide controllable filtering traffic on, the network and allowing restricted access to certain Internet port numbers.
3. Firewall is also used to protect against unauthenticated interactive login from the outside world.
4. With the firewall, we can also protect our site from the arbitrary connections and can also be the set up tracing tools.

5.1.2. De-Merits of firewall :-

1. It does not protect your site against connection bypassing.
2. A firewall is not infallible; its main purpose is to increase the security. If you have very valuable information LAN, your server should not be connected to first place.
3. If you have a web server inside your internal LAN then watch for internal attacks, as well as to your corporate server. But firewall can do nothing a about threats coming from inside of the organization.

5.2. Cryptography

The simple meaning of Cryptography is conversion of simple message into the unreadable format so that only known or authorized person can read it and to avoid the alteration of message. It is an art and science of keeping messages and information secure from uninterested third party i.e. when a sender sends a message to a receiver it is send in such a way that no one except sender and receiver can recognize the message and alter the message. Cryptography is another way to provide security to a network. Cryptography allows two parties to exchange sensitive information in a secure manner. Encryption scrambles the information so that only the intended recipient recovers the original information by decrypting it .Fig. shows that sender can send the simple message to the Encryptor, Encryptor can convert that simple message into encrypted form and this message is now send to the Decryptor. Decryptor can convert this encrypted message into decrypted message and then this message is send to Receiver.
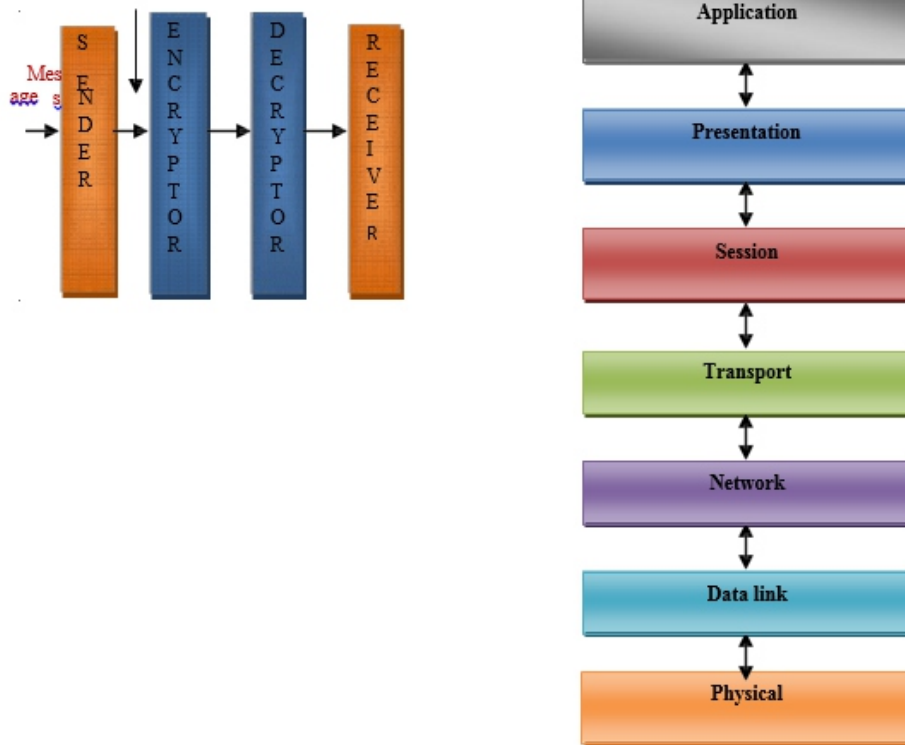
Encrypted   Decrypted

message   message

emails. It is also use for file transfer, remote login and remote job entry.

Figure 3. Simple representation of cryptography

5.3. Virtual private network

A virtual private network (VPN) is a way to use a public telecommunication infrastructure, such as the Internet, to provide remote offices or individual users with secure access to their organization's network through the security procedures. It is one solution to establishing long-distance and/or secured network connections. VPNs is mostly used and implemented by businesses or organizations rather than single user, but it is also use for home network. As compared to other technologies, it gives various several advantages, particularly it is beneficial for wireless local area networking.

5. OSI LAYER MODEL

The OSI, or Open System Interconnection, model defines a networking framework to implement protocols in seven layers. This article explains the 7 Layers of the OSI Model. The OSI, or Open System Interconnection, model defines a networking framework to implement protocols in seven layers. Control is passed from one layer to the next, starting at the application layer in one station, and proceeding to the bottom layer, over the channel to the next station and back up the hierarchy.

Application Layer (Layer 7)

Application layer provide a service that directly support the end user of the network. The application layer is basically a collection of various protocols for various commonly used application such as

Figure 4. OSI Layer Model Presentation Layer (Layer 6)

The purpose of this layer is to represent message information. Presentation layer is concerned with the representation of data i.e being exchanged. This can include conversion of the data between different format data compression and encryption.

Session Layer (Layer 5)

The purpose of the session layer is to provide a the means by which presentation entities can organize and synchronize their dialogue and manage their data exchange. The dialogue control is useful for sending and receiving message.

Transport Layer (Layer 4)

This layer provides transparent transfer of data between end systems, or hosts, and is responsible for end-to-end error recovery and flow control. It ensures complete data transfer. Another job of the transport layer is to provide a site to site communication and hide the all the data or detail of communication. The transport layer accept the message of arbitrary length from the session layer and then segment them into packet at destination. Some packets are lost on the way from the sender to the receiver.

Network Layer (Layer 3)

The Network Layer is responsible for setting the logical path between two sites for communication. This layer also provides switching and routing technologies, creating logical paths, known as virtual circuits, for transmitting data from node to node. It encapsulate the frame into packets that can transmitted from one site to another using a high level of addressing and routing scheme. Routing and forwarding are functions of this layer, as well as addressing, internetworking, error handling, congestion control and packet sequencing.

Data Link Layer (Layer 2)

The physical layer simply transmit the data from the senders site to the receiver site as raw data. It is responsibility of data link layer to detect and correct any error in the transmitted data. Since the only physical layer concerned with the raw data , the data link layer partitioned into the frame so that error detection and correction performed for each frame. The data link layer also perform the operation of flow control of frames.

Physical Layer (Layer 1)

The physical layers responsibility is to transmit the raw data between two sites i.e. may convert the sequence of binary bit into electrical signal, light signal or electromagnetic signal depending upon the whether two sites are on cable circuit, fibre optic circuit or microwave circuit. In short the physical layer deal with mechanical, electrical, procedural and functional characteristic of transmission of raw data between two sites.

6. FUTURE WORK

Although Network security is very important in today's growing world of networking. Some powerful software may be developed which common for all field which protecting the physical infrastructure and gives confidence to the user including strong detection and preventation power. In future some other software are developed for the home network security. Some strategy which encrypting the communication between the parties. The future of network security might be far from clear-cut.

7. CONCLUSION

Network security is prime concept in today's world of networking. Everyone should about security with their advantages, disadvantages and also preventation. It is an important and critical issue that all computer systems need to have implemented some sort of security control. Without having security, sensitive information can be easily gained by hackers or crackers or any other unauthorised person so it is important that we determine, prevent, detect, and correct security issues.

8. REFERENCES
[1] W. Cheswick and S. Bellovin. *Firewalls and Internet Security: Repelling the Wily Hacker. Addison-Wesley, 1994.*
[2] *Joshua Backfield, John Bambenek, "Network Security Model", SANS Institute, 2008*
[3] *Virtual Private Networks http://technet.microsoft.com/enus/network/bb545442.aspx.*
[4] *J.P. Holbrook, J.K.Reynolds. ``Site Security Handbook.'' RFC 1244.*
[5] *Dowd, P.W.; McHenry, J.T., "Network security: it's time to take it seriously," Computer, vol.31, no.9,pp.24-28, Sep 1998*
[6] *Kartalopoulos, S. V., "Differentiating Data Security and Network Security," Communications, 2008. ICC '08.IEEE International Conference on, pp.1469-1473, 19-23 May 2008.*
[7] *SecurityOverview,"www.redhat.com/docs/manuals/ent erprise/RHEL-4-Manual/security-guide/ch-sgs-ov.html.*
[8] *Network Security Architecture By Mariusz Stawowski – ISSA member, Poland Chapter*
[9] *ISO/IEC 18028-2 (ITU X.805) Network security architecture. 2006 ISO/IEC.*
[10] *http://www.engpaper.com/free-research-papers- network-security-11.htm*
[11] *http://www.engpaper.com/free-research-papers- network-security-02.htm*
[12] *Cooper, P.S. (February 1996). Network Security Management With Firewalls [DOE Information Security ConferencePresentations]. Retrieved on March 6 2005 from http://doeis.llnl.gov/ConferenceProceedings/ DOECompSe c96/firewall.pdf*
[13] *Al-Shaer, S.E. & Hamed, H.H. Design and Implementation of Firewall Policy Advisor Tools. Retrieved on March 3, 2005 from http://facweb.cs.depaul.edu/research/TechReports/TR04- 011.pdf.*
[14] *Protecting and Connecting the Distributed Organization – A Comprehensive Security and VPN Strategy. Retrieved February 15, 2005, from https://partners.mysonicwall.com/WhitePaper/Download Center/White Papers.asp*

Artificial Intelligence and Decision Support Systems

Tetali Perraju

Assistant Professor in MCA Department,
Priyadarshini College of Engineering, RTM Nagpur University, Nagpur, India.

A B S T R A C T

Decision support systems would consist in the following components): data management component; model management component; user interface management component; decision support system architecture.

Nowadays, the components of decision support systems are very much like the ones identified by Sprague in 1982: user interface; knowledge based subsystems; data management module; model management module. Most DSSs are applied to structured and semi-structured problems.

A host of new tools and technologies are adding new capabilities to DSS/ESS and will reshape DSS developments in organizations. They include hardware and mathematical software developments, artificial intelligence techniques, the data warehouse/multidimensional databases (MDDB), data mining, online analytical processing (OLAP), enterprise resource planning (ERP) systems, intelligent agents, telecommunication technologies such as World Wide Web technologies, the Internet, and corporate intranets.

Keywords: Characteristics of DSS, DSS Applications, The future of decision support systems, Single user decision support systems, Knowledge-based decision support systems (Intelligent DSS), The World Wide Web and Group/Organizational/Global DSS.

1. INTRODUCTION

According to Sprague and Carlson [Lu03], decision support systems would consist in the following components (Figure 1): data management component; model management component; user interface management component; decision support system architecture. Nowadays, the components of decision support systems are very much like the ones identified by Sprague in 1982 (Figure 1): user interface; knowledge based subsystems; data management module; model management module.

The user interface is a component that provides the communication between the user and the decision support system. The proper design of this component is really important, as it is the only one the user actually deals with.

The data management method is a subsystem of the computer-based decision support system, and has a number of subcomponents of its own (Figure 2.):

- the integrated decision support system database, which includes data extracted from internal and external sources, data which can be maintained in the database or can be accessed only when is useful;
- the database management system; the database can be relational or multidimensional;
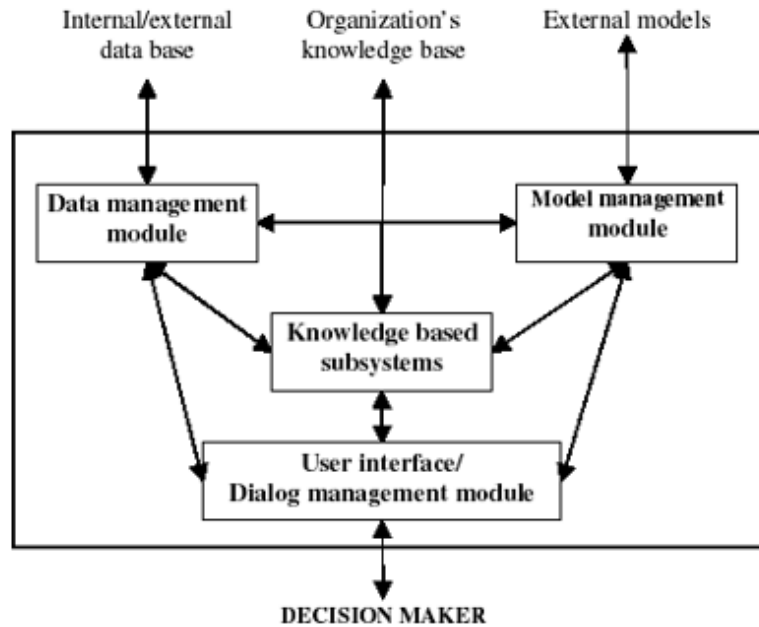

Figure 1

- a data dictionary, implying a catalog containing all the definitions of database data; it is used in the decisional process identification and definition phase;
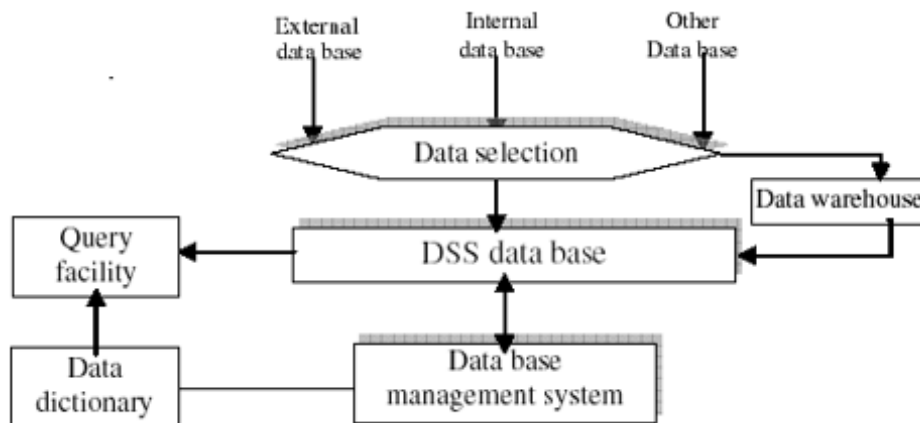- query tools, assuming the existence of languages for querying databases.

Figure 2

The model management module consists in the following components:
- the model base, that contains the quantitative models that offer the system the capacity of analyzing and finding solutions to problems
- the model base management module, that is meant to create new models by using programming languages;
- the model dictionary, that contains the models' definition and other information related to them;
- the creation, execution and integration module of models, that will interpret the user's instructions according to models and will transfer them towards the model management system.

One naturally raises questions about the future of DSS: will it follow the foot-steps of MIS? A field without definition has the flexibility of expansion and changing direction, but also has the danger of falling apart. Consequently, it is possible to generate heated debate and disagreement. As an example, are the followings DSSs or tools of DSSs:
- non-programmable calculator,
- programmable calculator,
- financial modelling,
- spreadsheet,
- statistics package,
- PERT/CPM/Iinear programming,
- simulation,
- expert system.

For instance, non-programmable or programmable calculator can be used for calculation during decision making - is it a DSS? Similarly, PERT/CPM can be used for generating alternatives for facilitating decision making by changing parameters and assumptions - is it also a DSS? One may argue that it is possible to use the intention of a design to differentiate DSS from non-DSS. However, it is easy to find counterexamples.

For instance, is a statistics package a DSS? - clearly a statistics package was not intended to be a DSS but is used heavily in decision making under some circumstances Similarly, some early financial modelling packages (Greenwood, 1969) that were not intended to be DSSs can be adapted to be DSSs by altering the user interface. Nevertheless, some authors have attempted to define the term Decision Support System. Their definitions, however, can be faulted in one way or another For instance, Keen and Scott Morton (1978) gave an earlier definition of DSS: 'The application of available and suitable

computer-based technology to help improve the effectiveness of managerial decision making in semi-structured tasks.' Here, the phrase 'available and suitable computer-based technology' does not have a unique meaning, and varies with time. Furthermore, the term 'semi-structured tasks' is undefined, and may vary from person to person. The reader is invited to consider whether or not computer simulation is a DSS.

2. CHARACTERISTICS OF DSS

- They tend to be aimed at the less well structured, under-specified problems that upper-level managers typically face.
- They attempt to combine the use of model or analytic techniques with traditional data access and retrieval functions.
- They specifically focus on features that make them easy to use by noncomputer people in an interactive mode.
- They emphasize flexibility and adaptability to accommodate changes in the environment and decision-making approach of the user.

3. DSS APPLICATIONS

Most DSSs are applied to structured and semi-structured problems. A list of existing DSS applications, non-exhaustive of course, is given below:

Corporate financial planning

    - loan amortization

    - depreciation

    - lease versus buy

    - discounted cash flow and net-present value

    - break-even analysis

- Marketing analysis

    - forecasting

    - sales analysis

    - promotion analysis

    - consumer sales audits

- Real estate investments

    - financing alternative

    - cash flows

    - impact on taxes

    - payoff

- Mineralogical exploration
- Transportation routing
- Portfolio analysis

4. THE FUTURE OF DECISION SUPPORT SYSTEMS

A host of new tools and technologies are adding new capabilities to DSS/ESS and will reshape DSS developments in organizations. They include hardware and mathematical software developments, artificial intelligence techniques, the data warehouse/multidimensional databases (MDDB), data mining, online analytical processing (OLAP), enterprise resource planning (ERP) systems, intelligent agents, telecommunication technologies such as World Wide Web technologies, the Internet, and corporate intranets.

5. SINGLE USER DECISION SUPPORT SYSTEMS

Ever-increasing computing power makes it possible to solve a large-scale mathematical optimization model in a fraction of a second. The size of the problem solvable by commercial software is virtually unlimited, only dependent upon the size of random access memory of computers and the user's patience. Moreover, several solvers are built into the spreadsheet programs such as Microsoft Excel and Borland's Quattro-Pro, along with the capabilities of linking to databases and graphical user interfaces. With the increasing trend of national and global communication networking, single user DSS will increasingly become a part of organization-wide distributed decision-making (DDM) systems. The DDM system consists of several single user DSS that work together and independently to make a sequential decision such as joint production/marketing decisions (Rathwell and Burns 1985). DDM systems work as a mechanism for integrating a number of separate DSSs that coexist in an organization, facilitating group cooperation between several DSSs in a distributed environment, and meeting the specific needs of group planning and group decision making. Notable developments that will significantly affect the future development of DSS are the data warehouse, data mining and intelligent agents. The data warehouse is a subject- oriented, integrated, time variant, and non-volatile (read only) collection of a relational/multidimensional database (MDDB) optimized for decision support, which is separated from operational databases. MDDB organizes data as an n-dimensional cube so that users deal with multidimensional data views such as product, region, sales, time, etc. with a faster query response time. Data mining, also known as Knowledge Data Discovery, refers to discovering hidden patterns/trends/classes/insights/relationships from data, and it attempts to automatically extract knowledge from the in large databases, either in the data warehouse or elsewhere (e.g., spreadsheets, transaction processing system files, etc.) (see DATA WAREHOUSING and DATA MINING).

Intelligent agents (known also as intelligent interfaces, or adaptive interfaces) research is an emerging interdisciplinary research area involving researchers from such fields as expert systems, DSS, cognitive science, psychology, databases, etc. Intelligent agents research has contributed to the emergence of a new generation of active and intelligent DSS and EIS. The active DSS will be equipped with the tools (stimulus agents) that will act as experts, servants, or mentors to decide when and how to provide advice and criticism to the user,

while the user formulates and inquires about its problems under the continuous stimulus of electronic agents. The essence of active decision support activities includes monitoring decision making processes and stimulating creative ideas through carrying out insightful conversations with decision makers.

6. KNOWLEDGE-BASED DECISION SUPPORT SYSTEMS (INTELLIGENT DSS)

An increasing number of systems are incorporating domain knowledge, modelling, and analysis systems to provide users the capability of intelligent assistance. Knowledge base modules are being used to formulate problems and decision models, and analyse and interpret the results. Some systems are adding knowledge-based modules to replace human judgments. Managerial judgments have been used to ascertain (assess) future uncertainty and to select assumptions on which decision models can be based. Some decisions are both knowledge and data intensive. Consequently, a large amount of data usually requires considerable efforts for their interpretation and use.

The knowledge-based DSS include a knowledge management component which stores and manages a new class of emerging AI tools such as machine learning and case-based reasoning and learning. These tools can obtain knowledge from prior data, decisions and examples (cases), and contribute to the creation of DSS to support repetitive, complex real- time decision making. Machine learning refers to computational methods/tools of a computer system to learn from experience (past solutions), data and observations, and consequently alter its behavior, triggered by a modification to the stored knowledge. Artificial neural networks and genetic algorithms are the most notable approaches to machine learning. The role of knowledge-based DSS should be to allow experts to broaden and expand their expertise, not to narrow it down. Zeleny suggests the important future direction of knowledge-based DSS development in this way

7. THE WORLD WIDE WEB AND GROUP/ORGANIZATIONAL/GLOBAL DSS

The World Wide Web is increasingly being used as the client-server platform of many business organizations due to its network and platform-independence and very low software/installation/

maintenance costs. More and more groupware will be inextricably tied to Internet technology. Especially, the World Wide Web is becoming an infrastructure for the next generation of decision support systems and groupware applications. Many groupware products, such as Lotus Development's Domino and Microsoft's Exchange, are integrating more Internet protocols into them. Microsoft's next version of Office suite is expected to completely remove the boundaries between the World Wide Web and groupware. Many companies are applying groupware technology to increase business-to- business collaborations (e.g. collaborations among the company, its customers, and its suppliers, a.k.a. super workgroup software) over intranets and extranets (see COMPUTER- SUPPORTED COOPERATIVE NETWORK). Another development in the information systems area is the growing importance of enterprise resources planning (ERP) systems. ERP systems are a new generation of information systems packages that integrate information and information-based processes within and across functional areas in an organization. ERP has focused primarily on processing of transaction data resulting in the creation of the extensive, organizational databases of an organization that may consist of individual business units across the globe. The extensive databases created by the ERP system provide the platform for decision support, data warehousing, data mining, and executive support systems. Integrated solutions provided by the ERP system are attributable to the use of the common database.

As we enter the age of the global village where geographical and temporal boundaries are shrinking rapidly, global DSS are emerging as the new frontiers in management information systems area. Over the next decade, DSS will focus on teams, work groups, and distributed, decentralized organizational structures (King 1993). Consequently, many organizations will increasingly design and implement group/organizational/global DSS. Global management support systems (MSS) will emerge as a key element in management decision making and as an essential weapon against global competitors. Supporting global business activities is becoming a most important and extremely complex task.

To effectively cope with multinational managerial problems such as multiple currency management, foreign exchange risk management, global tax management and global consolidated reporting, global DSS are not enough. It is essential to develop an integrated global MSS which integrates EIS, artificial neural networks, ES with knowledge base captured from numerous experts in the same subject area as well as from a variety of specialists in international financial management, international accounting, international tax areas, and so forth.

8. REFERENCES

1. Eom, S.B. (1996) 'Mapping the intellectual structure of research in decision support systems through author cocitation analysis (1971–1993), Decision Support Systems 16 (4): 275–96. (This article reports influential authors, frequently cited DSS articles, and major DSS research sub-specialities and DSS reference disciplines.)

2. *Eom, S.B. (1997) 'Assessing the current state of intellectual relationships between the decision support system area and academic disciplines', in K. Kumar and J.I. DeGross (eds) Proceedings of the Eighteenth International Conference on Information Systems, Atlanta, GA: 167–82. (This article identifies the roots of decision support systems research and assesses contributions to DSS areas from reference disciplines.)

3. *Eom, S.B. (2000) ' Decision support systems implementation research: review of the current state and future directions', in: Proceedings of the Ninth International Conference on Information Systems Development, Christiansand, Norway (forthcoming) (The current state of DSS implementation research is reviewed based on author cocitation analysis of a bibliometrical data compiled over the period of 1991-1997 and suggest future implementation research directions.)

4. Gorry, G.A. and Scott-Morton, M.S. (1971) 'A framework for management information systems', Sloan Management Review 12 (3): 55–70. (This article emphasizes that information systems should exist only to support decisions of varying structuredness.)

5. *Jessup, L.M. and Valacich, J.S. (eds.) Group Support Systems: New Perspectives, New York, NY: Macmillan. (A collection of 17 group support system articles including introduction and overview, research issues, issues in the design, development, and management, and future directions).

6. Keen, P.G.W. and Scott-Morton, M.S. (1978) Decision Support Systems: An Organizational Perspective, Reading, MA: Addison-Wesley. (The most frequently cited classic textbook presenting the broad conceptual overview of managerial decision making and the role of DSS.)

7. King, D. (1993) 'Intelligent support systems: art, augmentation, and agents', in R.H. Sprague, Jr and H.J. Watson (eds), Decision Support Systems: Putting Theory into Practice, 3rd edn, Englewood Cliffs, NJ: Prentice Hall. (An account of integrated intelligent system development trends and the future of DSS and expert systems.)

8. Checkland, P.B. (1981), Systems Thinking, Systems Practice, John Wiley: Chichester.

9. Dearden, J. (1972), MIS is a Mirage, Harvard Business Review, Vol. 50, No. 1, pp. 90- 99.

10. DeSanctis, G. and Gallupe, B. (1985), Group Decision Support Systems: A New Frontier, Data Base, Vol. 16, No. 2, pp.3-10.

11. Ginzberg, M.J., Reitman, W. and Stohr, E.A. (1982), Decision Support Systems, North- Holland: Amsterdam.

12. Greenwood, W.T. (1969), Decision Theory and Information Systems, South-Western Pub.: Cincinnati.

13. Hogue, J.T. (1985), MIS Manager's Guide to Decision Support Systems, Data Processing Management, pp. 1-8.

14. Huff, S.L. (1985), Decision Support Systems, Computer Programming Management, pp. 1-11.

15. Humphreys, P. (1984), Levels of Representation in Structuring Decision Problems, Journal of Systems Analysis, Vol. 11,pp. 3-22.

16. Keen, P.G.W. (1981), Value Analysis: Justifying Decision Support Systems, MIS Quarterly. Vol. 5, pp. 1-15.

17. Keen, P.G.W. (1987), Decision Support Systems: The Next Decade, Decision Support Systems 3, 253-265.

18. Keen, P.G.W. and Scott Morton, M.S. (1978), Decision Support Systems: An Organizational Perspective, Addison-Wesley: Reading, MA.

19. King, W.R. (1983), Achieving the Potential of Decision Support Systems, Journal of Business Strategy, Winter, pp.84-91.

20. King, W.R. (1984), Strategic Management: Decision Support Systems, in manuscript.

21. Klein, H.K. and Hirschheim, R. (1985), Fundamentals Issues of Decision Support Systems: A consequentialist Perspective, Decision Support Systems, Vol. 1, pp. 5-24.

22. Landry, M., Pascot, D. and Briolat, D. (1985), Can DSS Evolve Without Changing Our View of the Concept of 'Problem'? Decision Support Systems, Vol. 1, pp. 25-36.

Applications of Artificial Intelligence Methods in Robotics and its Effectiveness

Radhika Gade[1], Dr. Yash Pal Singh[2]

Department of Electronics and Communication Engineering

[1,2]OPJS University, Churu(Rajasthan), (India)

A B S T R A C T

Artificial Intelligence is being applied in several areas these days. In many application areas, AI and robotics systems are needed to handle data with increasing complexities. Given increased accuracy and sophistication of AI and robotics systems, they will be used in more and more sectors including finance, pharmaceuticals, energy, manufacturing, education, transport and public services. In some of these areas they can replace costly human labor and create new potential applications and work along with/for humans to achieve better service standards. It has been predicted that the next stage of AI and robotics is the era of augmented intelligence. Ubiquitous sensing systems and wearable technologies are driving towards intelligent embedded systems that will form a natural extension of human beings and our physical abilities. Human sensing, information retrieval and physical abilities are limited in a way that AI systems are not. AI algorithms along with advanced sensing systems could monitor the world around us and understand our intention, thus facilitating seamless interaction with each other. This paper explored the application of Artificial intelligence methods in robotics and how it is effective.

1. INTRODUCTION

The artificial intelligence is the procedure in which machine can act like a human. This robust component permits AI permits working in different fields effortlessly. Some of the important application territories where the AI can enormously utilize are Military, Antiterrorism, Automobile Industry, Internet Search Engines, and Robotics and so on. The working idea of AI is like the human mind with the goal that AI has a wide degree in inquiring about these days.

The well-known regions of artificial intelligence are Robotics, Speech Recognition, common Language Processing, Expert system; design acknowledgment, Fuzzy system and so forth are valuable for the advancement of new application helpful for an individual. The counterfeit consciousness appears to assume enter part in security if the reconciliation of some AI strategy finished with the security system authoritatively improves the security foundation of any association or nation. This research focuses on these strategies in understanding to give powerful security system in view of AI.

The Artificial Intelligence is a new and developing field in the computer world. Many creators exhibited their perspectives on AI strategies in security administration. The creator Emmanuel Hooper (2008)[1] present the keen methods are appropriate for organizing convention security, checking, estimation, and exact forecast. The person to person communication issues are a very major issue henceforth the creator Sattikar, Dr. R. V. Kulkarn (2012) [2] presents the Artificial Intelligence procedures can plot important classes of protection concerns, including answers for them. N.B. Shanmugam.B (2005) [3] proposes a dynamic model Intelligent Intrusion Detection System, in light of particular AI approach for interruption location. The systems that are being researched incorporate neural systems and fluffy rationale with arranging to profile, that utilizations straightforward information mining methods to process the system information.

The creator EnnTyugu (2011) [4] current circumstance of quickly developing intelligence of malware and refinement of digital assaults, it is unavoidable to create insightful digital guard techniques. The DDoS alleviation has demonstrated that even a resistance against vast scale assaults can be robotics with rather constrained assets when wise strategies are used. Many creators introduced their perspectives on AI procedures for security purposes.

These applications are generally utilized as a part of various distinctive situations. Initial, an Intelligent Simulation System (ISS) might be produced to take in more about the conduct of a unique system when the first frame is not accessible for control. The demonstrating of atmosphere systems is a decent case. Second, the first frame may not be accessible due to cost or security reasons, or it may not be fabricated yet and the motivation behind finding out about it is to outline it better. Third, an ISS may be utilized for preparing purposes in foresight of risky circumstances, when the cost of genuine preparing is restrictive. Such advances are especially all around cutting edge in military applications through the recreation of war 'amusements'.

2. BACKGROUND

The word robot was presented in 1920 out of a play by Karel Capek called R.U.R., or Rossum's Universal Robots. Robot originates from the Czech word "Robota", which means constrained work or drudgery. In the play, human-like mechanical animals created in Rossum's industrial facility are meek slaves. Since they are simply machines, the robotics is gravely treated by humans. One day a misinformed researcher gives them feelings, and the robots revolt, kill almost all humans and assume control over the world.

Mary Shelley drew upon such customs in her 1818 novel Frankenstein. A model mechanical robot arm named Unimate (designed by George Devol and Joseph Engelberger) was sold to General Motors in 1959. It culled hot vehicle parts out of a bite the dust throwing machine and extinguished them in water.

The 1970s saw a revolution in assembling as robots traded humans for some, tedious jobs. Nonetheless, this robotics was not wise by today's measures. Generally they were modified by humans preparing their developments, and they had almost no basic leadership abilities.

Robots are gone for controlling the articles by seeing, picking, moving, altering the physical properties of question, decimating it, or to have an impact in this way liberating labor from doing tedious capacities without getting exhausted, diverted, or depleted. Robotics is a branch of AI, which is made out of Electrical Engineering, Mechanical Engineering, and Computer Science for designing, development, and use of robots.

3. APPLICATION OF AI AND ROBOTICS

The worldwide academic group has made considerable progress since the improvement of artificial intelligence (AI) and robotics as an idea to its advanced interest as a field with close boundless potential in pivoting the way exercises are performed in a working society. A definitive wilderness for AI systems keeps on being accomplishing a level of modernity that matches that of the human personality. In spite of the fact that making a system displaying human-like intelligence remains subtle, robotics that can perform particular autonomous tasks, for example, driving a vehicle [5], flying in characteristic and man-made conditions [6], swimming [7], conveying boxes and material in various landscapes [8], get objects [9] and put them down [10] do exist today.

Another important use of AI in robotics is for the task of perception. Robotics can detect the earth by methods for coordinated sensors or PC vision. In the most recent decade, PC systems have enhanced the nature of both sensing and vision. Perception isn't important for planning yet in addition for making an artificial feeling of mindfulness in the robotic. This licenses supporting connections with the robotic with different substances in a similar domain. These teach is known as social robotics. It covers two expansive domains: human-robotic communications (HCI) and psychological robotics.

4. EFFECTIVENES OF ECONOMIC AND EMPLOYMENT

Currently, 8% of jobs are possessed by robotics, yet in 2020 this percentage will ascend to 26%. Robotics will turn out to be progressively autonomous and have the capacity to interface, execute and settle on more perplexing choices. On account of 'enormous data', robotics now has a considerable database that allows them to try and realize which calculations work best.

The quickened procedure of technological advancement now allows work to be supplanted by capital (machinery). Be that as it may, there is a negative correlation between the probability of mechanization of a calling and its average yearly pay, recommending a conceivable increment in here and now imbalance. The problem isn't the quantity of jobs lost through robotization, however in making enough to make up for potential occupation misfortunes. In past modern revolutions, new ventures contracted a greater number of individuals than the individuals who lost their jobs in organizations that shut, in light of the fact that they couldn't contend with the speed of advancement in new technologies.

5. CONCLUSION

Artificial intelligence (AI) and robotics has revolutionized information technology. The new economy of information technology has molded the way we are living. As of late, AI calculations have pulled in close consideration of scientists and have additionally been connected effectively to take care of problems in designing. By the by, for substantial and complex problems, AI calculations devour significant computation time because of stochastic component of the pursuit approaches. Thusly, there is a potential necessity to create productive calculation to discover arrangements under the constrained assets, time, and cash in certifiable applications. This extraordinary issue plans to report the most recent advances in each part of artificial intelligence technology, including machine learning, information mining, PC vision, multiagent systems, developmental computation, and fuzzy logic. In many application areas, AI and robotics systems are needed to handle data with increasing complexities. Given increased accuracy and sophistication of AI and robotics systems, they will be used in more and more sectors including finance, pharmaceuticals, energy, manufacturing, education, transport and public services. And its direct effect on human infrastructure likes jobs, social, economic issues etc.

6. REFERENCES
1. *Emmanuel Hooper (2008) "Intelligent Techniques for Effective Network Protocol Security Monitoring, Measurement and Prediction", International Journal of Security and Its Applications Vol.2, No.4.*
2. *Sattikar, Dr. R. V. Kulkarni, (2012). "A Role of Artificial Intelligence Techniques in Security and Privacy Issues of Social Networking", IJCSET, Vol 2, Issue 1.*
3. *Idris, N.B. Shanmugam.B.(2005) ," Artificial Intelligence Techniques Applied to Intrusion Detection" ,INDICON 2005 Annual IEEE Conference , pp 52 − 55.*
4. *EnnTyugu, ,(2011). "Artificial Intelligence in Cyber Defense", 3rd International Conference on Cyber Conflict.*
5. *Z. Kappassov, J.-A. Corrales, and V. Perdereau, (2015)."Tactile sensing in dexterous robot hands—Review," Robotics and Autonomous Systems, vol. 74, pp. 195-220.*
6. *H. Arisumi, S. Miossec, J.-R. Chardonnet, and K. Yokoi, (2008), "Dynamic lifting by whole body motion of humanoid robots," in Intelligent Robots and Systems, 2008. IROS 2008. IEEE/RSJ International Conference on, pp. 668-675.*
7. *M. Asada, (2015)."Towards artificial empathy," International Journal of Social Robotics, vol. 7, pp. 19-33,*
8. *L. Zhang, M. Jiang, D. Farid, and M. A. Hossain, ,(2013)."Intelligent facial emotion recognition and semantic- based topic detection for a humanoid robot," Expert Systems with Applications, vol. 40, pp. 5160-5168*
9. *N. Mavridis, "A review of verbal and non-verbal human–robot interactive communication," Robotics and Autonomous Systems, vol. 63, pp. 22- 35, 2015.*
10. *T. Kruse, A. K. Pandey, R. Alami, and A. Kirsch, (2013)."Human-aware robot navigation: A survey,"*

Sentiment Analysis and Classification by Considering Negation Polarity Shifter and Opinion Summarization for Product Reviews

Nilam V. Kolekar[1], Prof. GauriRao[2]

M. T ECH, Department of Computer Engineering, BVDUCOE,Pune, India
Associate Professor, Department of Computer Engineering BVDUCOE,Pune, India

A B S T R A C T

Sentiment analysis is special kind of task in Natural language processing as it determines the sentiment expressed by the customer or different users in the form of text format. There are different techniques existed to determines the user sentiment into different polarities. BOW it is very popular model used to represent and model the text for sentiment analysis and text classification. It gives better performance for text classification but sometimes BOW model performance becomes worst in sentiment classification, because it has some limitations and disadvantages. The main challenging task in BOW model is polarity shift problem. We proposed a system to address the polarity shift problem to provide feasible solution to the BOW model and make use of BOW model in sentiment analysis with better performance. In this system we are addressing, removing and modifying polarity shift problem in context of sentence-level sentiment analysis and phrase-level sentiment analysis in the contrast of negative reviews. Furthermore we extend our system to determine sentimental features or opinions that has expressed by the customers in given comments (in text format) and opinion targets. At last we performed classification on customer reviews to classify that reviews into three sentiment polarities i.e., positive, negative, neutral class labels and generate graph based on opinion summarization for customer understanding purpose. Proposed system based on lexicon-based approach using dictionary based technique.

Keywords: Natural Language Processing, sentiment analysis, Machine learning, polarity shifter.

1. INTRODUCTION

Now a day's use of internet and e-commerce is growing day by day with this volume of online reviews are growing day to day for online shopping sites so because of online reviews user can decide the quality of particular product. Sentiment analysis and opinion mining these are integral part of Natural Language Processing to determine the subjective attitude or we can say sentiment of user expressed in textual format [1].Sentiment analysis is one type of Natural Language Processing task used to keep track on public mood about a particular Entity, product or topic [6]. Sentiment analysis also referred as opinion mining it is the study of analyzing the users sentiment, opinion, fillings, appraisals, attitude towards particular think, object, individual, topic, product etc [17]. Sentiment analysis it is the process to determine the sentiment of peoples according to its polarity such as positive, negative, neutral

sentiment polarity classes about particular product which is expressed in Blogs posts, comments, reviews or tweets on a different sites. In e-commerce and online shopping, customers expressed their fillings in the form of comments, star rating, thumb up and thumb down about their likes and dislikes which is helpful to other peoples to judge the quality of online products. We can see in fig (1) simple model of sentiment analysis and its different tasks first task in sentiment analysis is to extract the customer comments from web after that next task is pre-processing. Data pre-processing phase remove unwanted data from extracted text and produce clean data to process it further. Next step is feature identification it used to identify the opinionative features or phrases from given text, means we can say that it only identify the subjective information from given text which is required for sentiment analysis. Sentiment classification is one of the crucial task in sentiment analysis which we can see in fig(1) which is used to classify the users sentiment into different sentiment polarities like positive, negative, neutral polarity classes.
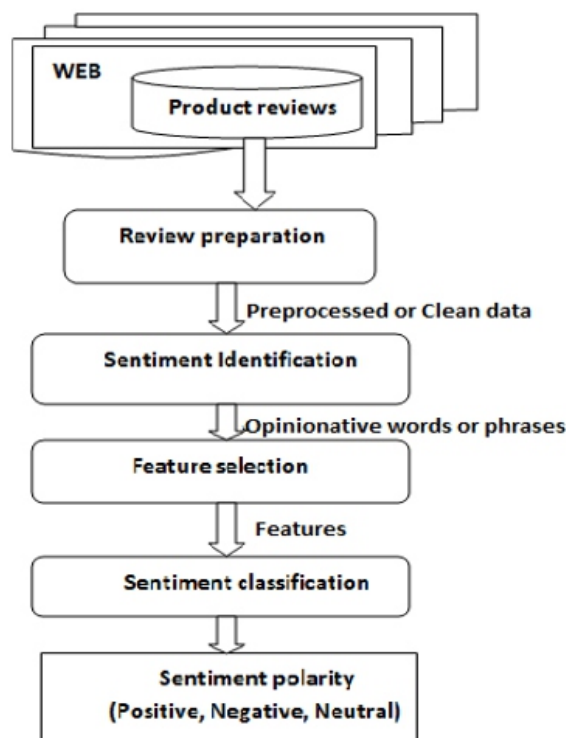
Figure (1): "Model of sentiment analysis"

Sentiment classification it is the part of sentiment analysis to classify people's sentiment into different polarity classes. To model the sentiment features and text for sentiment analysis and classification, BOW (Bag-Of-Word) model is one of the popular model typically useful to represent the text in sentiment analysis [1][2].BOW model used to represent the text in multiset of words format and it represents review text in vector of independent words. BOW model is very simple and efficient for text classification but sometime its performance become worst for sentiment classification, because it has some disadvantages such as it is disregarding of grammar, disturbs word order, breaks syntactic

structures and discards some semantic information from available review at the time of model the text[1][18].Polarity shift problem is one of the big problem in BOW model. Many researchers have done their research to address the polarity shift problem. Polarity shift is one of the linguistic phenomenon which change the sentiment orientation; it means polarity shift flips the polarity of text from positive to negative and vice versa. Negation polarity shifter creates the problem in BOW model as it considers only unigram features; for examples "this laptop is good" this text indicate positive sentiment if we add negative polarity shifter "not" in front of sentiment word "good" the sentiment orientation will be change from positive to negative such as "This book is not good". In Bag-Of-Word (BOW) model two sentiments-opposite texts is to be represent very similarly so its classification results also be the same. We proposed system to address polarity shift problem by detecting, removing and modifying negation in contrast of negative sentences. We build our own shopping portal from which we are extracting comments for sentiment classification. We build our proposed system for sentence-level sentiment analysis and phrase-level sentiment analysis using lexicon-based dictionary. If extracted comment is simple sentence then we directly send it for sentiment classification and also determine the sentiment feature or opinion expressed by customer about particular product into given text and opinion target on which customer has expressed their opinions. If extracted comment is compound sentence and containing negation then we first address the negative polarity shifter, remove and modify it based on some rules. Furthermore we design our system for opinion summarization based on different features of particular product and show summarization in graphical format for each product. In feature-based opinion summarization we are depicting graph for each product according to its features by considering overall reviews on that particular product.

2. LITERATURE SURVEY

Sentiment analysis used to identify the senti words or features from the text and then classify it according to their polarities i.e., Positive, Negative, Neutral. That means sentiment analysis is a technique to determine sentiment words/phrase/expressions from a text. Sentiment analysis can be done on three levels for classification first one is Sentence-levels SA, second is Document-level SA and last one is Aspect-Level sentiment analysis [11]. Document-level SA used to analyse opinions or sentiments of peoples given in document. Its aim is to classify the opinion of people into different categories and according to its polarities, but it consider the whole document as an information unit (consider as one topic) [11].Sentence-level SA used to identify and classify sentiment related feature expressed in each sentence. In aspect-level sentiment analysis the polarity shift problem was taken under consideration using both methods that is corpus-based and lexicon-based methods [1] [2].In document-level sentiment analysis and sentence-level sentiment analysis, we found two methods in literature: term counting and machine learning methods, in term counting method we can get overall

orientation of sentiment text by summing up the score which assign for content words in a given text[1].In machine learning technique sentiment classification is based on statistical classification problem in which BOW model is useful to model the text after that different supervised machine learning algorithms are useful for classification purpose[1]. In literature we have found different challenges in sentiment analysis while performing sentiment analysis on texts from which first challenge is selection of subjective information, there are two types of information which can appear in sentences i.e., subjective information and other is objective information we need subjective type information for sentiment analysis, if sentence is subjective then system will determine that users opinions which appear in text either it is positive, negative, or neutral . For example we have text for sentiment analysis "(1) I bought this book, (2) Story is very nice" in this example we can observe that sentence (1) only represents factual information or objective information and sentence(2) represents subjective information about story of book, so we can identify users opinion from second sentence but not from sentence first. In sentiment analysis our main task is to select the features for sentiment classification purpose, we can select features from given text for sentiment analysis and classification using different techniques such as terms presence, frequency counting, POS(Part-Of-Speech) tagging, Determining Opinion words or features, and last one is negation detection[11].There are different techniques useful for sentiment analysis and classification basically it divided into two types that is machine learning technique and lexicon based approach. Most of the research scholars used machine learning approach with supervised learning to classify the sentiment of customers into different polarities. Supervised machine learning uses different algorithms for sentiment classification such as decision tree classifier, maximum entropy, naive bayesetc [11].Lexicon based approach uses sentiment lexicon with its predefined sentiment terms. We proposed and build system for sentiment analysis with addressing polarity shift problem. As we have discussed above polarity shift is one of the big problem in BOW model. In this paper we train system to address polarity shift problem by addressing, removing and modifying negation polarity shifter in case of negative comments. There are many researchers was conducted their research to address polarity shift problem, for example researchers Das and Chen proposed a system to examine polarity shift problem by simply attaching negation word "NOT" to the sentiment words in the scope of negation *7+, e.g. consider the text "This book is not good" by attaching "NOT" to the sentiment word the word "good" become "good-NOT" in Das and Chen system, but some research scholars reported that this technique has not proven best in all cases to improve the sentiment classification accuracy. Rui Xia et al. [1] [2] they proposed system to address polarity shift problem by creating dual training and dual prediction algorithms. They used lexicon-based antonym dictionary, corpus-based pseudo antonym dictionary and many other techniques to improve the sentiment classification accuracy. J. Na et al. [3] had proposed their system to model the negation by using POS (Part-Of-Speech) tagging.

3. PROPOSED SYSTEM

In fig (2) we can see that flow of our proposed system; we build system for sentiment analysis and classification with addressing polarity shift problem. Here our main aim is to perform sentence-level sentiment analysis and phrase-level sentiment analysis. In our proposed system we extract comments from one of the customized shopping portal; if extracted comments are compound sentences then we first split it into numbers of sub-sentences using segmentation process. After segmentation we apply parsing process on given text to detect negation polarity shifter, if parser found negation polarity shifter then we train system to remove and modify negation polarity shifter from the text. In this work we used WordNet dictionary to replace sentiment word in scope of negation with its antonym to address polarity shift problem, in fig (3) we can observe that process of polarity shift detection, elimination and modification as we have described here. Same process we apply for simple sentences excluding segmentation process on it. After this we train system to determine customer's opinion from a given text, opinion targets on which customer has expressed their opinions and perform sentiment classification to classify customer's opinion into different sentiment polarities. Furthermore we extend our system for opinion summarization and feature-based opinion summarization and depict graphical representation based on customer's sentiment for each product by considering overall customer reviews on that product.

DICTIONARY BASED APPROACH

Our proposed system based on dictionary based approach, to address polarity shift problem we usedWordNet (Release 2.1) dictionary includes English lexicon dataset. WordNet is a collection of English words with its antonyms and synonyms. In our proposed system we are detecting negation polarity shifter after that remove it and modify sentiment word in the scope of negation with it antonyms so because of that we can provide feasible solution to the BOW model. Here we are replacing sentiment word in the scope of negation with its antonym by making use of WordNet dictionary. We used following tasks and tools to implement proposed system which is given below

3.1. Data Pre-processing

Pre-processing is very vital process in sentiment analysis to clean the extracted data. Aim of pre-processing task is to remove noisy and unwanted data. Pre-processing includes some another tasks also like tokenization, stop words removing process, data filtering etc. In our proposed system we apply pre-processing on fetched data to make that data clean, to perform tokenization of given text, and data filtering.

3.2. Segmentation

We used segmentation process to split compound sentences into simple sub sentences after that apply parsing to detect negation. Because of segmentation we can segment given text into small sentences that is helpful to determine opinions of customers and opinion targets from each separated sentence. Using segmentation we can show that where actually text orientation is changing because of negative polarity shifter in case of negative sentences by separating to that particular sub-sentence from given text.
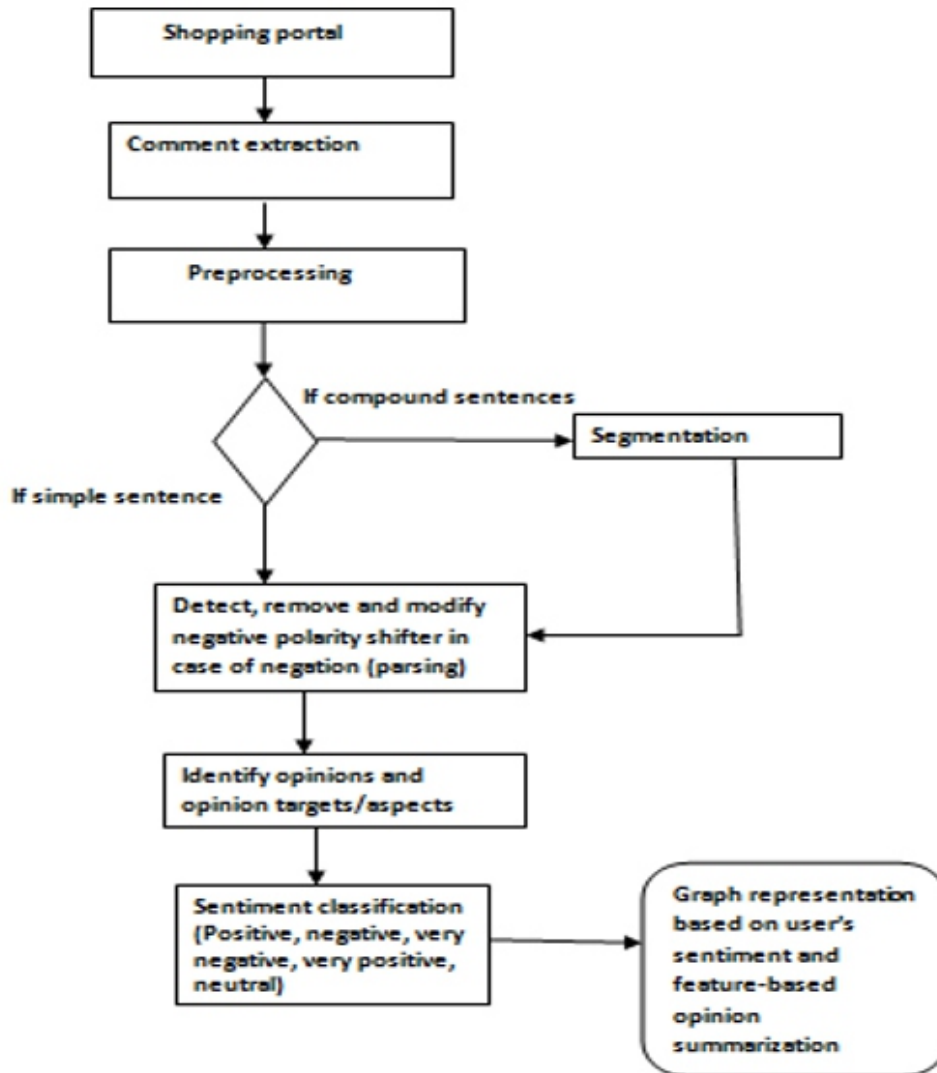

Figure (2): "Flow of proposed system"

3.3. Parsing

Here we have created our own parser to detect negation polarity shifter to remove it. We have created array of negation polarity shifters such as "not", "never", "don't", "couldn't", "nobody", "cant", ""didn't, etc., after removal of negative polarity shifter system replace sentiment word in the scope of negation with its antonyms.

3.4. POS (Part-Of-Speech) Tag

Part-Of-Speech tagging plays very important role in NLP to process natural language.

In sentiment analysis we apply POS tag on each word to identify opinions of customers and opinion targets which appear in given text. POS used to determine nouns, noun phrase, adjectives, adverbs etc. In our work we determine opinion target by extracting nouns from text and customers opinion by extracting adjective words from text.
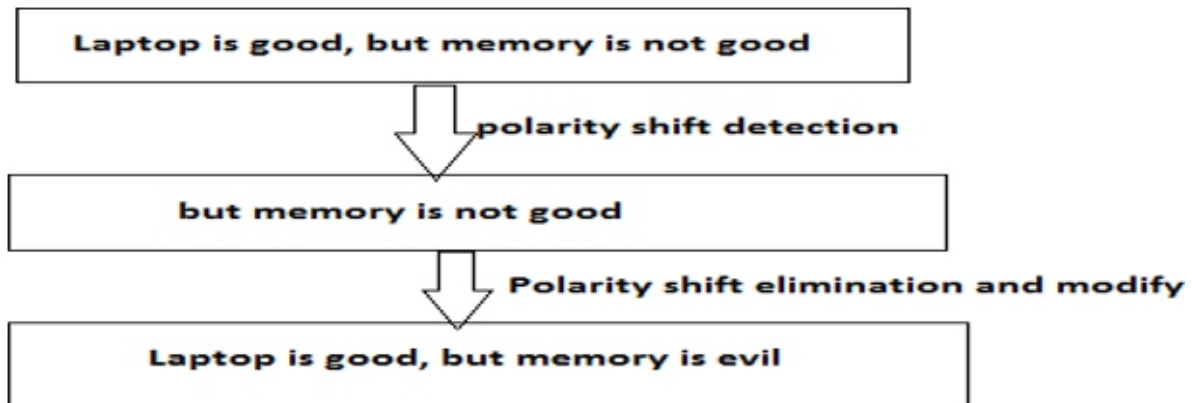
Figure (3): "Process of negation polarity shift detection, elimination and modification"

3.5. Dataset, Resources and Tools used

We have created our own shopping portal for extracting customer reviews on different products, in which we have added four datasets of different domains such as Home Appliances, Books, Computers, and Electronics. We used WordNet dictionary with version WordNet Release 2.1 in our implementation, WordNet is one of the well-known NLP resource and useful in sentiment analysis. To implement and build this system we have used different libraries and tools such as OpenNlp toolkit, Stanford libraries for sentiment analysis and classification

4. RESULTS

In Fig (4) we have shown the results of opinion summarization for domain home appliances. In which we have generate graphical representation by counting number of positive, negative and neutral opinions of users for each product by considering overall reviews of that product. Here X-axis represents sentiment polarities and Y-axis represents count for the sentiment polarities. Similarly fig (5) represents feature-based opinion summarization; in this we are representing all features of that particular Product by considering overall reviews on that product, here x-axis represents number of features with positive, negative and neutral sentiment of customers for each product feature and y-axis represents count of sentiment polarities. We have generated same results for all products of different domains.
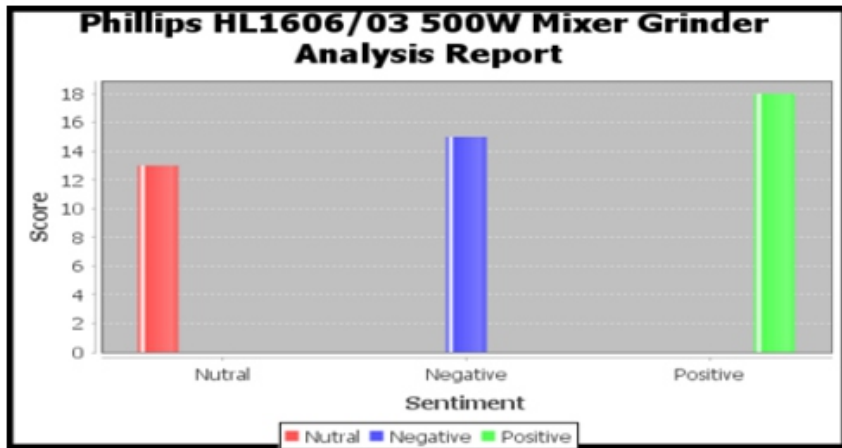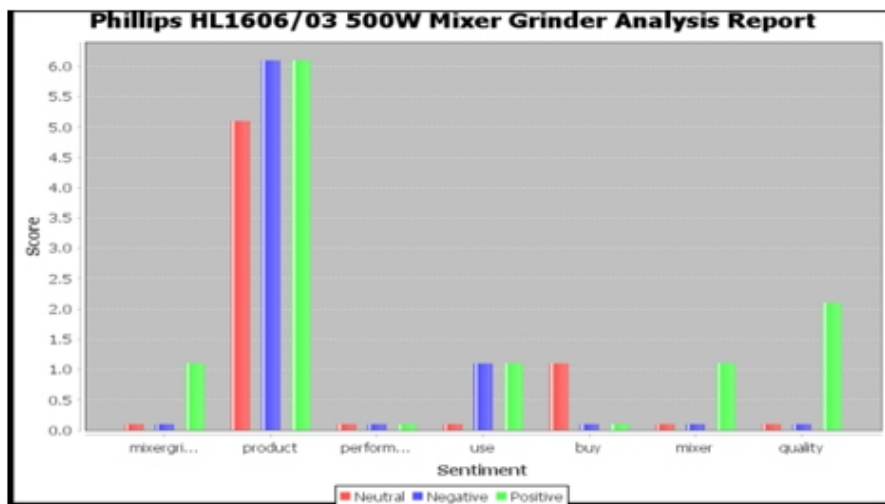
Figure (4): "Results of Opinion summarization"

Figure (5): "Results of feature-based opinion summarization"

Result of addressing, removing and modifying negation is shown in following table 1, also we have shown result of opinion targets identification, then identify customer's opinions from given text and sentiment classification by taking some comments.

comment text as input	Result of addressing polarity shift as output	Opinion Target as output	Opinion of customers as output	Sentiment classification as output
1. This product is disappointing	-	Product	disappointing	Negative
2. I bought this product	-	Product		Neutral
3. This product is good, satisfactory performance	-	Product, performance	good, satisfactory	Positive
4. I like this product, but memory is not good	I like this product, but memory is evil	Product, memory	like, evil	Negative

Table 1: "result of other things shown in columns"

5. CONCLUSION

In our research work we have proposed system for sentence-level sentiment analysis and phrase-level sentiment analysis using lexicon-based dictionary. We have also train system to address the polarity shift problem and provide feasible solution to the BOW model. In future we can apply this experiment on large freely available dataset of different sites. We can apply this experiment to perform document-level sentiment analysis in future.

6. REFERENCES

*1+ Rui Xia, FengXu, ChengqingZong, Qianmu Li, Yong Qi, and Tao Li, "Dual Sentiment Analysis: considering Two sides of One Review", IEEE transaction on knowledge and data Engineering, Vol 27, No.8,August 2015.

[2] Rui Xia, Tao Wang, Xuelei Hu , Shoushan Li , ChengqingZong, "Dual Training and Dual Prediction for Polarity Classification", in Proceedings of the 51st Annual Meeting of the Association for Computational Linguistics, 2013

[3] J. Na, H. Sui, C. Khoo, S. Chan, and Y. Zhou, "Effectiveness of simple linguistic processing in automatic sentiment classificationof product reviews," in Proc. Conf. Int. Soc. Knowl. Org., 2004,pp. 49–54.

*4+ Kushal Dave, Steve Lawrence and, D. Pennock, "Mining the peanut gallery: Opinion extraction and semantic classification of product reviews", in Proc. Int. World Wide Web Conf , pp. 519–528 , 2003.

[5] Vincent Ng, S. Dasgupta and S. Arifin, "Examining the role of linguistic knowledge sources in the automatic identification and classification of reviews," in Proc. Int. Conf. Comput. Linguistics Annu.Meeting Assoc. Comput. Linguistics, 2006, pp. 611–618.

*6+ G.Vinodhini and RM.chandrasekaran, "Sentiment Analysis and Opinion Mining: A Survey", www.ijarcsse.com , ISSN: 2277 128X,Volume 2, Issue 6, June 2012

*7+ S. Das and M. Chen, "Yahoo! for Amazon: Extracting market sentiment from stock message boards," in Proc. Asia Pacific Finance Assoc. Annu. Conf., 2001.

*8+ Asst.Prof.AKowcika, Aditi Gupta, KarthikSondhi, NishitShivhre, Raunaq Kumar, "Sentiment Analysis for Social Media". www.ijarcsse.com, ISSN: 2277 128X , Volume 3, Issue 7, July 2013

[9] Shoushan Li, Sophia Yat Mei Lee,Ying Chen, Chu-Ren Huang, Guodong Zhou, "Sentiment classification and polarity shifting", in International Conference on Computational Linguistics, 2010.

*10+ Chloe Clavel and Z. Callejas, "Sentiment Analysis: From opinion mining to human-agent Interaction" , IEEE transaction on affective computing, 2015.

*11+ WalaaMedhat , Ahmed Hassan , HodaKorashy, "Sentiment analysis algorithms and applications: A survey", Ain Shams Engineering Journal (www.sciencedirect.com), pp. 1093–1113,2014

*12+ GeorgiosPaltoglou, Mike Thelwall, "More than Bag-of-Words: Sentence-based Document Representation for Sentiment Analysis", Proceedings of Recent Advance in Natural Language Processing, page546-552, Hissar, Bulgaria, 7-13 September 2013.

*13+ S. Li and C. Huang, "Sentiment classification considering negation and contrast transition," in Proceeding of the Pacific Asia Conference on Language, Information and Computation, 2009.

[14] Soo-Min Kim and Eduard Hovy, "Determining the sentiment of opinions", Proceeding of the COLING conference,Geneva,2004

*15+ A. Kennedy and D. Inkpen, "Sentiment classification of movie reviews using contextual valence shifters," Comput.Intell., vol. 22, pp. 110–125, 2006.

*16+ Minqing Hu and Bing Liu, "Mining Opinion Features in Cutomer Reviews", American association for Artificial Intelligence, 2004.

*17+ Bing Liu, "Sentiment analysis and opinion mining", Morgan & Claypool Publishers, May 2012[Book].

Instructions for Authors

Essentials for Publishing in this Journal

1 Submitted articles should not have been previously published or be currently under consideration for publication elsewhere.

2 Conference papers may only be submitted if the paper has been completely re-written (taken to mean more than 50%) and the author has cleared any necessary permission with the copyright owner if it has been previously copyrighted.

3 All our articles are refereed through a double-blind process.

4 All authors must declare they have read and agreed to the content of the submitted article and must sign a declaration correspond to the originality of the article.

Submission Process

All articles for this journal must be submitted using our online submissions system. http://enrichedpub.com/ . Please use the Submit Your Article link in the Author Service area.

-

Manuscript Guidelines

The instructions to authors about the article preparation for publication in the Manuscripts are submitted online, through the e-Ur (Electronic editing) system, developed by **Enriched Publications Pvt. Ltd**. The article should contain the abstract with keywords, introduction, body, conclusion, references and the summary in English language (without heading and subheading enumeration). The article length should not exceed 16 pages of A4 paper format.

Title

The title should be informative. It is in both Journal's and author's best interest to use terms suitable. For indexing and word search. If there are no such terms in the title, the author is strongly advised to add a subtitle. The title should be given in English as well. The titles precede the abstract and the summary in an appropriate language.

Letterhead Title

The letterhead title is given at a top of each page for easier identification of article copies in an Electronic form in particular. It contains the author's surname and first name initial .article title, journal title and collation (year, volume, and issue, first and last page). The journal and article titles can be given in a shortened form.

Author's Name

Full name(s) of author(s) should be used. It is advisable to give the middle initial. Names are given in their original form.

Contact Details

The postal address or the e-mail address of the author (usually of the first one if there are more Authors) is given in the footnote at the bottom of the first page.

Type of Articles

Classification of articles is a duty of the editorial staff and is of special importance. Referees and the members of the editorial staff, or section editors, can propose a category, but the editor-in-chief has the sole responsibility for their classification. Journal articles are classified as follows:

Scientific articles:

1. Original scientific paper (giving the previously unpublished results of the author's own research based on management methods).

2. Survey paper (giving an original, detailed and critical view of a research problem or an area to which the author has made a contribution visible through his self-citation);

3. Short or preliminary communication (original management paper of full format but of a smaller extent or of a preliminary character);

4. Scientific critique or forum (discussion on a particular scientific topic, based exclusively on management argumentation) and commentaries. Exceptionally, in particular areas, a scientific paper in the Journal can be in a form of a monograph or a critical edition of scientific data (historical, archival, lexicographic, bibliographic, data survey, etc.) which were unknown or hardly accessible for scientific research.

Professional articles:

1. Professional paper (contribution offering experience useful for improvement of professional practice but not necessarily based on scientific methods);

2. Informative contribution (editorial, commentary, etc.);

3. Review (of a book, software, case study, scientific event, etc.)

Language

The article should be in English. The grammar and style of the article should be of good quality. The systematized text should be without abbreviations (except standard ones). All measurements must be in SI units. The sequence of formulae is denoted in Arabic numerals in parentheses on the right-hand side.

Abstract and Summary

An abstract is a concise informative presentation of the article content for fast and accurate Evaluation of its relevance. It is both in the Editorial Office's and the author's best interest for an abstract to contain terms often used for indexing and article search. The abstract describes the purpose of the study and the methods, outlines the findings and state the conclusions. A 100- to 250-Word abstract should be placed between the title and the keywords with the body text to follow. Besides an abstract are advised to have a summary in English, at the end of the article, after the Reference list. The summary should be structured and long up to 1/10 of the article length (it is more extensive than the abstract).

Keywords

Keywords are terms or phrases showing adequately the article content for indexing and search purposes. They should be allocated heaving in mind widely accepted international sources (index, dictionary or thesaurus), such as the Web of Science keyword list for science in general. The higher their usage frequency is the better. Up to 10 keywords immediately follow the abstract and the summary, in respective languages.

Acknowledgements

The name and the number of the project or programmed within which the article was realized is given in a separate note at the bottom of the first page together with the name of the institution which financially supported the project or programmed.

Tables and Illustrations

All the captions should be in the original language as well as in English, together with the texts in illustrations if possible. Tables are typed in the same style as the text and are denoted by numerals at the top. Photographs and drawings, placed appropriately in the text, should be clear, precise and suitable for reproduction. Drawings should be created in Word or Corel.

Citation in the Text

Citation in the text must be uniform. When citing references in the text, use the reference number set in square brackets from the Reference list at the end of the article.

Footnotes

Footnotes are given at the bottom of the page with the text they refer to. They can contain less relevant details, additional explanations or used sources (e.g. scientific material, manuals). They cannot replace the cited literature.

The article should be accompanied with a cover letter with the information about the author(s): surname, middle initial, first name, and citizen personal number, rank, title, e-mail address, and affiliation address, home address including municipality, phone number in the office and at home (or a mobile phone number). The cover letter should state the type of the article and tell which illustrations are original and which are not.