A RESEARCH TOWARDS TELECOMMUNICATION AND ITS IMPACT WITH BASE ON ARTIFICIAL INTELLIGENCE SYSTEM

RAJENDRA BABU GADDAM
Associate Tech Specialist
Tech Mahindra Limited, Maharashtra
Email Id: babu.prince@gmail.com

Abstract: - *AI with learning abilities is a revolutionary technology which the communication industry is exploring, with the aim of introducing it into communication networks and to provide new services, and to improve network efficiency and user experience. At this time there is no total solution or complete framework to do so. One contender in the steps towards a solution is a FINE framework, which can be illustrated by the example of an SDN/NFV collaboratively- deployed network.we present a state of the art onthe use of Multi Agent Systems (MAS) for spectrum access using cooperation and competition to solve theproblem of spectrum allocation and ensure better management.In the future, intelligent machines will replace or enhance human capabilities in many areas. Artificial intelligence is the intelligence exhibited by machines or software. It is the subfield of computer science. Artificial Intelligence is becoming a popular field in computer science as it has enhanced the human life in many areas. Artificial intelligence in the last two decades has greatly improved performance of the manufacturing and service systems. Study in the area of artificial intelligence has given rise to the rapidly growing technology known as expert system. Application areas of Artificial Intelligence is having a huge impact on various fields of life as expert system is widely used these days to solve the complex problems in various areas as science, engineering, business, medicine, weather forecasting. The areas employing the technology of Artificial Intelligence have seen an increase in the quality and efficiency.*

Keywords *– Artificial intelligence, communication network, network functions virtualization (NFV), software-defined network (SDN).*

1.0 INTRODUCTION:

In recent years, with the development and maturation of such technologies as cloud computing, big data and deep learning, the industrialization of artificial intelligence (AI) has been developed accordingly. Since AlphaGo won the Go match against Lee Se-dol in 2016, AI has attracted more and more attention. AI technology has been introduced into a number of areas. As a revolutionary force, AI has been making great progress and realized many achievements in these areas. Communications is a sector with heavy ICT use, dealing with a variety of consumer demands on individualization requirements, multimedia services and precision management, which has made network security become more and more important. With AI's advantages in learning, understanding, reasoning, and cooperating gradually being discovered, software-defined networks (SDN) and network functions virtualization (NFV) have appeared, technologies of deep packet inspection and service aware networks are almost in maturity, and the intellectualization of communication networks and services are becoming possible. Furthermore, operators have a keen interest in AI which may decrease capital

expenditure (CAPEX) and operating expense (OPEX).

Telecommunication networks today usually exist in a large, heterogeneous environment. Thenetwork components feature different operating systems, platforms, communication languages,and vendors. These components may be incompatible and require a channel or link to facilitatecooperation and coordination within the networks. In addition to such multiplicity intelecommunication networks, we are witnessing a growing enterprise of data, in terms of bothdemand and supply. The importance and the need for data collection and the subsequent datadistribution are becoming, more than ever, paramount. Interactions among networks or networkcomponents are inevitable due to the proliferation of data. This phenomenon has brought on aflood of various on-line activities such as advertisement, sale, research, information gathering,information passing, etc., which results in network traffic congestions and strains networkmanagement. Subsequently, this has demanded a better handling of the collection, processing,distribution, and understanding of data within telecommunication networks.When the networks were more constrained and localized, a centralized managementapproach was adequate to handle various system administration and traffic control tasks.However, today's telecommunication networks are constantly expanding with many distributedactivity centers. This development naturally points to a distributed approach to address issues such as routing, switching, configuration, accounting or monitoring, performance, security, and reliability in telecommunication networks. Instead of one centralized and usually very large system that assumes the complete control and intelligence of the network, a number of smaller systems, or agents, can be used to help manage the network in a cooperative manner. This has motivated the multiagent systems (MAS) in telecommunication networks.

Characterized requirements:

With an increasing number of users and the growing size of the communication network, differences of preferences, habits and the information needs of enterprises and individual users are gradually exposed. The demand for specialized businesses is becoming stronger with customized networks and services now being provided for enterprise users. In the future there will be a special service package for each user, and even a special network. Such complex requirements would be unimaginable without an intellectual tool.

Advantages of artificial intelligence:

AI continues to develop rapidly. In the communications industry, whether it's network operators, equipment manufacturers or solution providers, etc., the industry hopes to take advantage of AI to assist in areas in which they are currently struggling, such as in designing, operating, maintaining and managing communication networks and services. The next few subclauses describe some of the advantages of AI.

2.0 literature review:

AvneetPannu, M.(2015)AI technologies have matured to the point in offering real practical benefits in many of their

applications. Major Artificial Intelligence areas are Expert Systems, Natural Language Processing, Speech Understanding, Robotics and Sensory Systems, Computer Vision and Scene Recognition, Intelligent ComputerAided Instruction, Neural Computing. From these Expert System is a rapidly growing technology which is having a huge impact on various fields of life. The various techniques applied in artificial intelligence are Neural Network, Fuzzy Logic

Fritz Lang's Metropolis Gera, (2003) The representation of AI, as the creation which acquires human properties, is a concept which, surprisingly, can be dated back to our ancient ancestors. In ancient Greek mythology, for example, Homer talks about "gods granting language and implanting speech in mute, nonhuman individuals" and "the master craftsman Hephaestus grants a human voice to his golden mechanical handmaidens" (I assume that the fabrication of something non-human which imitates the human properties can be as old as the time when people started reflecting on their human nature and that the construction of an artificial human-like nature was an unconscious way to understand their human condition.

Ferrando (2014) the futures do not appear out of nowhere: they are based on the presents, the pasts, and the ways they are being envisionedObserving how the future is conceived offers an additional perspective on how the present is interpreted and experienced. What AI evolution had showed us so far is that knowledge and our perception of it is something that constantly changes, something that we have to reconnect and perhaps to release it from the strictly human properties. On the other hand, social media as major agents of nowadays' communication are forming future interaction day by day with us collaborating in it. Social media has a potential which is not yet realized and which is limited –for now- to the fact that it offers a common space for everyone to connect or, as it is often described, to communicate. The way of communication applied though, is not the kind that functions as that which is substantial to humans.

Vassilis S Kodogiannis and John N Lygouras (2008) If the game designers give the full information of the game world to the non-playing character then there would be no fun in playing the game. This is an example of NPC Decision making. In this AI is needed to make the nonplaying character to act in a human like way. When the player enters the building from the other side, the monster will be unaware of the presence of the player because of the wall between them. If the player enters causing a noise disturbance, then the monster will sense the player and will start negotiating the shortest path as discussed in the NPC movement using path finding. One AI technique that is used to implement this is a Bayesian Network. It helps NPC to perform complex reasoning in a human like fashion.

3.0METHODOLOGY:

Intelligent Agents and Telecommunication Networks:

One of the most important research areas in telecommunication networks is network Management. Network management determines the allocation of network resources (such as data storage, processing

power, and memory), fault diagnosis and repair, system administration, routing communications among network components, etc. One of the goals is to have balanced loading and reliable loading on the network such that connections in the network can be established quickly without noise, delay, or numerous trials. In addition, network management also aims at housekeeping the networks so that they work efficiently and effectively, adapt to changes, and respond to problems such as traffic patterns. Thus, in this section and also in this chapter, we will emphasize network management for telecommunication networks.Management systems for telecommunication networks usually come in four architectures: (1)centralized network management, (2) hierarchical network management, (3) peer networkmanagement, and (4) distributed network management. In a centralized architecture, a singlemanager handles the housekeeping of the whole network. It checks the network componentsregularly to ensure the smooth working of the network. It also responds to any warnings anderrors issued by the network components. The information and data regarding the networkcomponents are stored at a centralized database warehoused by the manager. Thus, the centralmanager coordinates all network responsibilities from top to bottom. Once a network becomeslarger and more complicated, a single centralized management is sometimes not sufficient orefficient. Hence, the hierarchical network management approach is used. In this strategy,managers are arranged in a hierarchy. On top of the hierarchy sits the central manager thatadministrates a group of assistant managers. Each assistant manager in turn overlooks a group ofassistant-assistant managers and so on. In addition, each assistant manager communicates onlyto its parent manager, with no or minimal same-level interactions. Each manager maintains alocalized database with the higher level managers having access to lower level databases. Notethat usually these assistant managers are not application- or task-specific; instead, they manage aregion of the whole network. Thus, in this architecture, each parent manager coordinates anddelegates tasks among its children managers, providing an indirectly cooperative environmentamong the lower-level managers. In a peer-based network, there exist individual managers thatare able to communicate among themselves. Each manager administrates a different domain ofthe network, interacts with its neighboring managers for information and data, and controls itsown database. Hence, there is an increasing sense of cooperation. Finally, in a distributednetwork, the individual managers are application- or task-specific in terms of their specialtiesand responsibilities, and each has its own knowledge and databases.

A Design of An Intelligent Structure:

There are numerous designs of structure in the literature. This is due to various functions

That the agent technologies apply in the area of telecommunication networks, as described above. In this section, we present a design of one such intelligent agent in the context of telecommunication networks. The following discussion is aimed to provide a general idea on

how one such agent structure can be designed and, therefore, some issues related to telecommunication networks are only briefly touched upon. a general design of an intelligent agent. There are six integral modules within the agent: (1) Event Monitor, (2) House Keeping, (3) Adaptive Learning Mechanism, (4) Message Interface, (5) Task Interface, and (6) Manager. The network support for the creation of an agent is provided through the Network Management module.

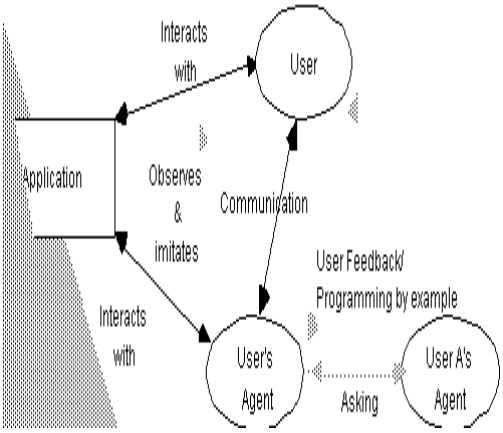

Figure:A design example of an intelligent agent structure for telecommunication networks

At the creation of an agent, the Network Management module supplies the agent with itsprofile, its model of neighboring agents, and a set of task directives. The Profile includes a set of parameterized attributes such as name, origin, priority, attitude, category, class, role, etc. These attributes will later be used in guiding the behavior of the agent in task planning, decision making, and interactions with neighboring agents.

Artificial Neural Network (ANN) in PSS:

In the power systems the most applications of the artificial neural network use a multilayer feed forward network. In the neural adaptive PSS, a feed-forward neural network with a single hidden layer is proposed which includes two sub networks: adaptive neuron-identifier, in which the dynamic characteristics of the plant are tracked and adaptive neurocontroller to damp the low frequency oscillations. Radial basis function network (RBFN) has three layers: input layers, hidden layers, and output layers. The hidden layer find centers and widths of the radial basis functions for individual pattern units and the output layer finds the weights between the pattern units and the output units using an unsupervised learning algorithm. A recurrent neural network (RNN) stabilization controller is proposed to improve thetransient stability of power systems in which both the governor and AVR is used. The weight of the proposed controller is adjusted on-line. The signal output of the first RNN is added to the PSS signal output for excitation control. The signal output of the second RNN is used as a stabilizing signal for the governor system. ANNs are intelligent controllers to control nonlinear, dynamic systems through learning, which can easily accommodate the nonlinearities and time dependencies.

Application of Artificial Intelligence:

Techniques in network Intrusion Detection Intrusion Detection Systems (IDS)uses the various Artificial Intelligence techniques for protecting computer and communication networks from intruders. Intrusion Detection System (IDS) is the process of monitoring the events occurring in network and detecting the signs of intrusion.Artificial Neural Network in IDS: ANN is a mathematical model that consists of an interconnected group of artificial neurons which processes the information. In IDS ANN are used to model complex

relationships between inputs and outputs or to find patterns in data. In this a neuron calculates the sum by multiplying input by weight and applies a threshold. The result is transmitted to subsequent neurons. Basically, the ANN has been generalized to

$yi=f(\sum wik_{xk}+\mu i)/k$--- (1)

Where wik are weights attached to the inputs, xk are inputs to the neuron i, μi is a threshold, f (•) is a transfer function and yi is the output of the neuron.

Artificial intelligence techniques are used for diagnostic sciences in biomedical image classification. Model-based intelligent analysis and decision-support tools are important in medical imaging for computer-assisted diagnosis and evaluation. CAD helps radiologist who uses the output from a computerized analysis of medical images as a second opinion in detecting lesions, assessing extent of disease, and improving the accuracy and consistency of radiological diagnosis to reduce the rate of false negative cases.

4.0 RESULTS:

Artificial intelligence in telecommunication databases:

The use of artificial intelligence is investigated as the basis to mitigate the problems of accounting databases. The following are some difficulties with existing accounting database systems. The needs of decision makers are not met by accounting information. Humans do not understand or cannot process the computerized accounting databases. Systems are not easy to use. There is focus on the numeric data. Integrating intelligent systems with accounting databases can assist (either with the decision maker or independent of decision maker) in the investigation of large volumes of data with or without direct participation of the decision maker. Thus, the systems can analyze the data and assist the users understanding or interpreting transactions to determine what accounting events are captured by the system With the artificial intelligence we store and retrieve knowledge in natural language. There are some artificial intelligence tools or techniques that help in the broader understanding of events captured by the accounting system. There is more emphasis on symbolic or text data rather than just numeric data to capture context. The artificial intelligence and expert system builds intelligence into the database to assist users. Without users direct participation such models help the users by sorting through large quantities of data. Such models also assist the decision makers under time constraints; suggest alternatives in the searching and evaluation of data.

Application of Artificial Intelligence Techniques in the Computer Games:

Playing games is one of the most popular uses for computer technology. In the evolution of computer games, they have grown from modest text based to the three dimensional graphical games with complex and large worlds. The systems as graphics rendering, playing audio, user input and game artificial intelligence (AI) when put together provide the expected entertainment and make a worthwhile computer game. Artificial intelligence is the most important part of every computer game and playing the game without artificial intelligence would not be any fun!. If we remove artificial intelligence from computer games, the

games will be so simple that nobody will be interested in playing the computer games anymore!. Without the game AI, the winning would not be difficult at all. Artificial intelligence is used to solve common problems in the computer games and provide the features to the games. Specifically, non-playing character (NPC) path finding, decision making and learning are examined. There are several ways that AI contributes to modern computer games. Most notably are unit movement, simulated perception, situation analysis, spatial reasoning, learning, group coordination, resource allocation, steering, flocking, target selection, and so many more. Even context dependent animation and audio use AI

Forecasting TelecommunicationEquipment Failures from Time SeriesData

The previous section described how combining object-oriented and rule-basedtechnologies improved the development and maintainability of telecommunicationbasedexpert systems. The example described in this section shows how data miningcan improve the quality of the domain knowledge to be incorporated into such systemsand also minimize the manual effort required to acquire this knowledge.Reliability is a critical factor in the design of telecommunications networks. Errorsmay occur during the transmission of data over the network, but these errors can bedetected and the data rerouted through alternate paths. The effect of the failure of asingle component is limited due to the redundancy in modern large-scaletelecommunications networks. The failure of a singular, major component, like anentire switch or a major component in a switch, is a very rare, but catastrophic event.In order to help diagnose and prevent problems before they occur, moderntelecommunication equipment contains self-diagnostic testing capabilities. When anyof these tests fail, an alarm message is sent to a centralized site, where it may behandled by a human or by an expert system The main objective of the data mining effort describedin this section is to identify patterns of alarms that can help predict catastrophicequipment failures.

Artificial Neural Networks

Artificial neural networks (ANNs) are one type of statistical learning models inspired from the biological neural networks of human brains ANNs are generally presented as systems consisting of interconnected "neurons" within numerically weighted values which can be tuned for making ANNs adaptive to inputs and capable of learning Therefore, the neural network paradigm assures the ability to learn from the unsupervised environments, and thus exhibits an effectiveness in applying to HetNets for estimating or approximating functions that depend on many unknown input Conditions

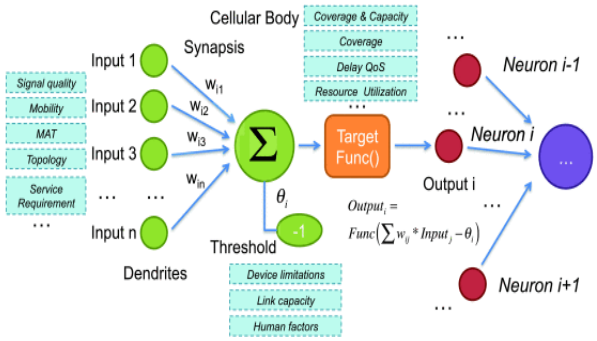

Figure: Illustration of artificial neural networks for HetNets.

Proposes self-optimization of antenna tilt and power by using a fuzzy neural network optimization method based on RL, which is one of the most important tasks in the context of SON and can meet the need of practical applications of self-optimization in a dynamic environment because of its rapid convergence ANNs can be also utilized for addressing the vertical handoff problem for user QoS enhancement and HetNets system performance improvement as research in which proposes an adaptive parameter adjustment algorithm based on neural network model by which user parameters can be determined optimally.

Conclusions

We have presented an overview of the application of intelligent agents to telecommunicationnetworks. We have discussed the properties of an agent and its intelligence. Again, we have notattempted to define what constitutes an agent and its intelligence. We have talked about howintelligent agents can be of help in managing telecommunication networks in various aspects

such as reliability, security, control, routing, and fault diagnosis. In addition, we have discussedagent technologies and research areas in telecommunication networks and cited a number ofcontemporary research activities around the world.Artificial Intelligence will continue to play an increasingly important role in the various fields. This paper is based on the concept of artificial intelligence, areas of artificial intelligence and the artificial intelligence techniques used in the field of Power System Stabilizers (PSS) to maintain system stability and damping of oscillation and provide highquality performance, in the Network Intrusion Detection to protect the network from intruders, in the medical area in the field of medicine, for medical image classification, in the accounting databases, and described how these AI techniques are used in computer games to solve the common problems and to provide features to the games so as to have fun. There is bright future in the analysis of Network Intrusion Detection and there is also definite future in the area of Power System Stabilizers. We conclude that further research in this area can be done as there are very promising and profitable results that are obtainable from such techniques.

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