ANN BASED OPTIMIZATION TECHNIQUES FOR TRANSPORTATION PROBLEMS: A REVIEW

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Abstract—This paper presents new objectives to understand the optimization techniques using Artificial Neural Network for various transportation problems. Simply, it is rear to define optimization techniques for transportation problems using Neural Networks. There is a lot of research has been done by many researchers. In this manuscript, an attempt has been made for literature and reviewing of papers. Also I will make an effort to describe Neural Networks, Artificial Intelligence, Optimization Techniques and Artificial Neural Networks.

Keywords—Artificial Intelligence (AI), Neural Networks, Optimization Techniques and ANN (Artificial Neural Networks).

I. INTRODUCTION

Artificial Intelligence (AI) is an area of computer science concerned with designing intelligent computer systems or automation of intelligent behavior. Artificial Intelligence spans a broad spectrum of areas which are mainly a neural networks and genetic Algorithms. A neural network also called artificial neural network, is a mathematical model or computational model that is stimulated by the organization of biological neural networks. A neural network is a highly interconnected network of a large number of processing elements called neurons in an architecture inspired by the brain. Artificial neural networks exhibit characteristics such as mapping, capabilities or pattern association, generalization, robustness, fault tolerance and parallel and high speed information processing. It is also used for finding the best solution from a given range of approximate solutions. [10-15]

In present scenario, several optimization techniques are available. But every optimization techniques is deals with the finding out the best and most suitable condition which may be either maximization or minimization type problems. In present, every industry wants to maximize the profit and minimize the expenditure.

Queuing theory is apprehensive with the statistical explanation of the behavior of queues, that is, finding, the probability distribution of the figure in the queue from which the indicate and difference of queue size and the probability distribution of coming up time for a customer, or the distribution of a server’s active periods can be established. In operational research problems concerning queues, investigators must measure the accessible system to build an intention evaluation of its individuality, and must conclude how changes may be prepared to the system, what belongings of various kinds of changes in the system’s individuality would be, and whether, in the light of the costs incurred in the systems, changes should be made to it. [15-20]. A model of the queuing system under learning must be constructed in this variety of examination and the outcome of queuing theory are necessary to get the individuality of the model and to evaluate the possessions of changes, such as the addition of an spare server or a decrease in suggest service time.

The market globalization has changed extremely because a lot of competitors are there present in the market. So there is a need to be more aware about the customer requirements and pleasure, which may given that the products at as near to the ground cost as possible and without delay delivery while maintaining the value of the product. The problem of finding the best possible number of service points (loading and unloading centers) and the corresponding waiting time in the
incessantly operating development industry such as wheat flour mill, Sugarcane Industry, Paper mill, Rice mill etc. it is a key parameter in its productivity, which can be solved with the help of application of queuing theory. At present, no standard model is appropriate for such industries and the complexities concerned are high. So some efficient and capable model is required for such industry. Research work will carry in a current industry such as wheat flour mill, Sugarcane Industry, Paper mill, Rice mill etc, which produces and delivers the products.[15-20]

The current industry is facing a problem of high waiting time of services (vehicles) in the queue and giving penalty as waiting time. At present time, there are few service points, when increases the number of services points, then waiting time and waiting cost will be reduce, but service cost will be increase. By this we get two opposite costs and we may have a exchange between two costs to find the best figure of service points. [24-27]

Suppose, the industry is facing the problem of high waiting time in the queue. When the vehicles arrive in industry, they enter in to the entrance gate. If the vehicles want to loading products then it will go to the loading section and if it wants to unloading raw material then it will go to the unloading section. Suppose vehicle want to unload raw material. It will be enter into the unloading section. There is a token office near the unloading section. Driver takes a token and parks the vehicle in the waiting place. There are security guards in the waiting place. The vehicle moves slowly towards the balance in the queue. After coming the turn of particular vehicle according to the token, the vehicle comes to the weighting section. With the help of weight machines, the weight of raw material is measured and vehicle as well. After taking weight slip, the vehicle moves forward to the unloading centre in the queue. The vehicle is standing at the unloading centre. The vehicle is unloaded in to the storage space with the help of machine or with the help of men power. A vehicle takes 10-15 minutes for unloading with the help of machine and 45-90 minutes for unloading with the help of men power. After unloading the vehicle, the vehicle moves to gate pass counter. It will take gate pass. Then the vehicle moves towards exit gate. But it is very time consuming process. Several researchers try to solve such type of time consuming problem using several techniques. Artificial neural networks are used to solve several problems like image processing, optimization satisfaction, risk assessment, economic policy system and so on. It is frequently used to solving complex transportation problems in real life.

This paper deals with following sections:

II. ISSUES

This Section provides some related issues which are based on ANN optimization techniques for transportation.

Neural networks are used to solve several problems like optimization satisfaction, image processing, forecasting assessment, control system and so on. It is frequently used to solving complex transportation problems in real life and provides the facilities to solve the pattern pattern recognition problems.

But several issues are remain unsolve like optimization process in road transport, other type of transportation problems, real time managing transport system and etc. Main problem is to reduce waiting time in transport process and improve the quality of product using artificial neural networks.

III. LITERATURE SURVEY

In this section, we have to find out the literature survey of ANN Based Optimization Techniques for Transportation Problems.

Pamula T. et. al. [1], 2016, presented a paper on “Neural Networks in transportation Research-Recent Applications”. In this paper, the author said that neural networks having the
capability of arranging the non-linear functions of all variables and also explain the behavior of objects. and also given the some examples which show the scope of prediction of road traffic control, road traffic parameters, driver behavior, transport policies and economic policies. The tasks of traffic forecasting parameters are performed for running traffic and be in command of traffic. These parameters are explained by the prediction of time and possible accuracy. In the prediction of road circumstances and ruling and decision making by the drivers are depend upon many factors. And conservative modeling methods are complicated to concern. According to author, feed forward neural networks most commonly used in transportation research. But in the neural network configuration, systematic approach is not reported to achieve good performance level with solving model based tasks.

Sustekova D. et. al [2], 2013, made a research on “Artificial Intelligence Applications especially the neural networks use in the road transport”. In this paper, they described possible use of neural networks and the lots of expansion of artificial intelligence in every possible field like transport and also explain about the current application using AI (Artificial Intelligence) for the road transport efficiency. Artificial intelligence equipments and their ability are appropriate for problematical transport systems. In point of fact, artificial neural networks may be explained as considerable similar computing system release to reduction and following implementation of information when simulating human brain in finding data for the period of learning process and storing of these data using inter-neural associations. Neural networks are general utility approximator. In reality, many problems are not having known functions. So that’s why neural networks develop quickly because it is only to handle such problems. But the main disadvantage of neural networks is that it required enormous hardware support. And also learning course of action can obtain extremely extensive time.

Koncsos T. et. al.[3], 2010 presented a paper on “The application of neural networks for solving complex optimization problem in modeling”. In this paper, the author said that soft computing have different type of tools like neural networks, fuzzy logic, robustness, evolutionary algorithms, providing low price solutions. Neural Networks are considered as a system which used to solve complex models, several equations to a given detail and getting result in high speed but low accuracy and it is also used for optimization in DSS (Decision Support System). The motive of optimization is generally used to find universal minimum value for given function. In this, main objective is to divide the complete problem like waste water plant into the separate biological and mechanical units and plot the network on chemical oxygen demand.

Mishra A. & Garg A. et. al. [4] 2016, presented a review paper on “soft computing and its domains – an overview”. In this paper, they described soft computing with the terms of artificial intelligence and also its domain. They explained three types of biologically inspired domains of soft computing like Neuro computing, evolutionary computing and genetic computing. Here Neuro computing is also refer as Neural Networks.ANN is having two type first on is feed forward neural network(FFNN) and second one is feed backward neural network(FBNN). Main difference between feed forward neural networks (FFNN) and feed backward neural network (FBNN) is flow of information. In FFNN, information flows only one direction but in FBNN, information flows in bi-direction. They also described about the pattern recognition. It may be explained as the act of getting raw data and getting action depend on the data category. It is commonly used in some areas like psychology, ethnology and computer science.

Faghri A. and Hua J. et. al.[6] , 1992, presented a paper on “Evaluation of Artificial Neural Network Applications in Transportation Engineering”. In this paper, Faghri A. et. al. [6] said that artificial neural network is the most interested area among the government, private and business research. Artificial neural networks (ANNs) became a most valuable development in solving areas of various problems. It is known as system which develop artificial neurons and artificial synapses that collect and examine the various activities of the neural network(basically biological). It may be single layer or multilayer which is depending on structure. Increasing research development activity in ANN applications have completed by growth in the business purpose mainstream use of artificial
intelligence. In this, the author also describe about the major difference between artificial neural networks and expert systems and artificial neural networks and biological neural networks.

Dachyar M.et. al.[8] 2012, made a research on “Simulation and Optimization of Services at Port in Indonesia”. In this paper, Dachyar M.et. al.[8] said about two main islands like Java and Sumatra which was facing high population problem. Due to high population rate, these two islands have to be increase in the economic level and other services. Indonesia have a ferry port which is Port of Merak and port of Bakauheni. This ferry port linked the Java and Sumatra islands. The main challenging task is that reduced the service time and waiting time of passengers and ships in queue. The major factors which effected task were number of ships, number of decks, sea waves, passengers, arrival rate and intervals of ships arrival. Thousands of passengers and ships pass through this port daily. But the rush of passengers and ships are depending on the specific day like national holidays, normal working days and weekends. Most of the passengers come to the port in national holiday which is a big problem. Because the services rate is effected due to huge rush of passengers and ships. According to the research, when increase activities between Sumatera and Java Island, extra docs and extra ships are suggested to decrease waiting time.

IV. SCOPE AND FINDING

Scope and finding of this manuscript is given as under:

In present, every industry want to try to optimize the average waiting time of vehicles in the waiting place by the optimization techniques with the help of artificial neural networks and also want to optimize the total delivery time of the ready product from industry to destination points.

Artificial intelligence allows solving several type of transportation problem related to land, road, air and water. And it is used in several areas like real time managing transport system, transport operation systems, develop the new technologies and etc.

Neural networks are mainly used in traffic forecasting, traffic control, evaluation of traffic parameters, driver behavior policy and other part of transport. Koncsos T. et. al.[3], 2012 experienced the possibility of using ANN for approximation to finite the computational models with respect to make them always available for some systems like decision support.

We can explain about the use of soft computing domains and also told that how to soft computing domains relevant to the artificial intelligence. The major scope of soft computing domains like neuro computing, evolutionary computing and genetic computing, to develop a biological phenomenon.

V. CONCLUSION

ANN uses broadly in several areas such as transportation, image processing, control system and so on. Further it may be used in road transport management system such as automatic transport system using computer, intelligent road systems, intelligent highway systems and many others. After reading all the manuscript gathered through various resources, neural network is very efficient for optimization problem in transportation.

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