Development And Implementation Of Improved Rural Transportation System Using Artificial Neural Network

Bhasker Pant Department of Computer Science & Engineering, Graphic Era Deemed to be University, Dehradun, Uttarakhand India, 248002 pantbhasker2@gmail.com

Dibyahash Bordoloi Head of the Department, Department of Computer Science & Engineering, Graphic Era Hill University, Dehradun, Uttarakhand India, 248002 dibyahashbordoloi@geu.ac.in

Abstract- The transportation system plays an important role in the expansion of a country's economic growth. The transport is a way of communication network that makes to import and export goods at different regions. The increase in economic growth depends on the import and export that is done globally. For these networks, the transport system is essential. The advanced transportation system also helps an individual to move from one place to other with lesser cost and time. Each and every facilities are available and increases rapidly in the urban areas. When compared to urban areas, the rural areas are much different and lesser developed in the transportation system. They are due to the lesser population growth and may also cause due to the migration of people from rural to urban areas. Thus the proposed system enhances to develop the rural transportation system using the artificial neural network. This uses the genetic algorithm to obtain the desired optimum output.

Keywords: Transportation system, communication, artificial neural network, genetic algorithm

I. Introduction

The increase in the rapid transportation system is caused due to the advance innovations and the emerging technology. The transportation helps in the mass production and to maintain the stability of the prices. It helps in the overall economic development [1]. The increase in transportation offers numerous opportunities with enhancing the social developments. It also helps in the industrial and agricultural growth of a country [2].

There are several means of transportation that include roadways, railways and airways. The development of the transportation system enhances the sophistication among the individuals [3]. The transportation management system helps to make use of the transport from every corners across the globe but due to uncertain conditions, they are unable to function effectively [4]. The roadways are the most common mode of transportation system. The kinds of transportation system includes traditional transportation and road transport [5]. It gives an improved communication health with economic benefits. Thus the modern transportation system such as automobiles, aircrafts, trucks, ship provide the mechanism to move at vast distance to enable global economy [6]. The rural transportation development helps to play a diverse role in the development of a country. The development in transportation system helps to bring out changes in diverse fields through knowledge sharing and enhancing variations. This rural development is made to improve

innovations in rural areas for developing the technology with lesser computational cost with higher efficiency.

II.Proposed system

The major objective of the system is to provide a smarter rural transportation system with technology enabled to overcome the geographical barriers. To obtain the innovative rural transportation system, it enhances the use of artificial intelligence which functions based on the human intelligence by developing problem solving techniques. This artificial neural network adopts the algorithm to find the finest solution with random numeral of input with hidden layers which produces the output with a lesser computational time. The genetic algorithm is used to develop the rural transportation system due to which the genetic algorithm can solve the complex problem and made it a simple desired value of outcome. Thus by using the artificial intelligence techniques the rural transportation system with higher accuracy and precision with lesser computational time.

III.Methodology

The artificial neural networks simply the neural network functions based on the neuron set. These computing set are stimulated by the natural biological neural networks that organise the function replica of the central nervous system [7]. It is composed of the assemblage of associated parts or nodes. The artificial neural networks are programmed to the machine so that is performs the exact functions of the human brain. It simulates the biological neurons to behave by adding together the values of the input it receives with the hidden layers [8]. The information criteria is processed in the hidden layer and the predefined input is processed which provides the desired output values. The several stages of the artificial neural network includes the image processing, speech recognition and machine translation [9]. The figure 1 represents the functioning of ANN.
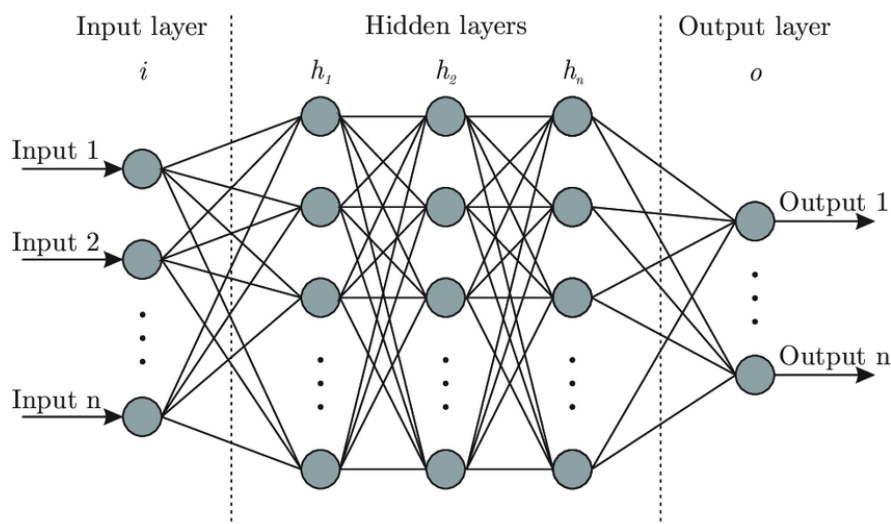

Fig 1: Representation of ANN

The figure 2 represents the stages of the genetic algorithm which arises with the initial population with fitness function, cross-over, mutation and selection and obtaining the desired optimum output.
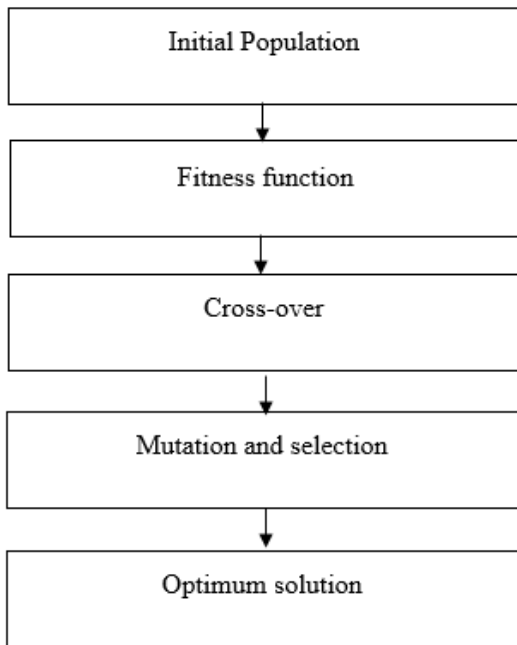
Fig 2: Stages in Genetic algorithm

The stages of genetic algorithm includes initial population, fitness function, cross-over, mutation and selection to obtain the optimum solution. The initial information or the defined data are collected and stored in the database [10]. The stored information is preprocessed to neglect the noise. The noise is eliminated by using filters. The filters provide the exact output without any deviations in the output produced. After the initial population is analyzed, the fitness value is calculated. The optimization is guided by using the fitness function [11]. Cross over is a genetic operator used to programming from one generation to another. The development of the rural transportation system involves the regression analysis, travel forecasting models and econometric models [12]. The commuting flow prediction is done through the gravity model, radiation model and machine learning approaches. The relative change obtained through the genetic algorithm is shown in the given figure 3.
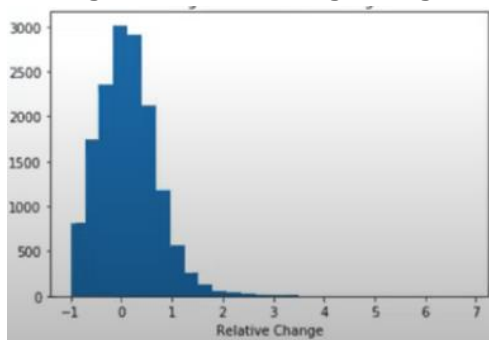

Fig 3: Relative change with respect to time.

The gravity model is used to obtain results for complex nonlinearities. The radiation model uses only population and distribution. The machine learning approaches are good at modelling complex linearity's with reduction in the spatial correlations by using the data of original and the destination. The optimization tool is incorporated with the genetic algorithm [13]. The genetic algorithm first identifies the routes in the rural areas. This identification is done at the transport management system that incorporates with the artificial intelligence. The areas of the location are fixed with

sensors so that the bus drivers can identify the locations given by the sensors. The increase in the number of bus stop enhances the increase in technology for the rural transportation system. The sensors play a significant role in the detection of bus stop to enhance the transportation services [14]. This transportation system helps in connecting the people across various regions. The transportation system is controlled by the transport management database. The instruction are given to the bus system enables through the artificial intelligence. This senses the bus routes and the automatic on and off of the bus doors are implemented. The record of the routes are provided with the transport management database.

The proposed model incorporates the artificial neural network that enables the use of the genetic algorithm that develops to obtain the optimum output. These are done by initialization through mutation and crossover of the individual through selection.

This system incorporates by selecting the important routes in the rural areas by the availability of passengers at the particular period of time. This is done at the transport management with training and testing process [15]. This includes the development of newer routes by the artificial intelligence techniques. The proposed model is represented in the figure 4.
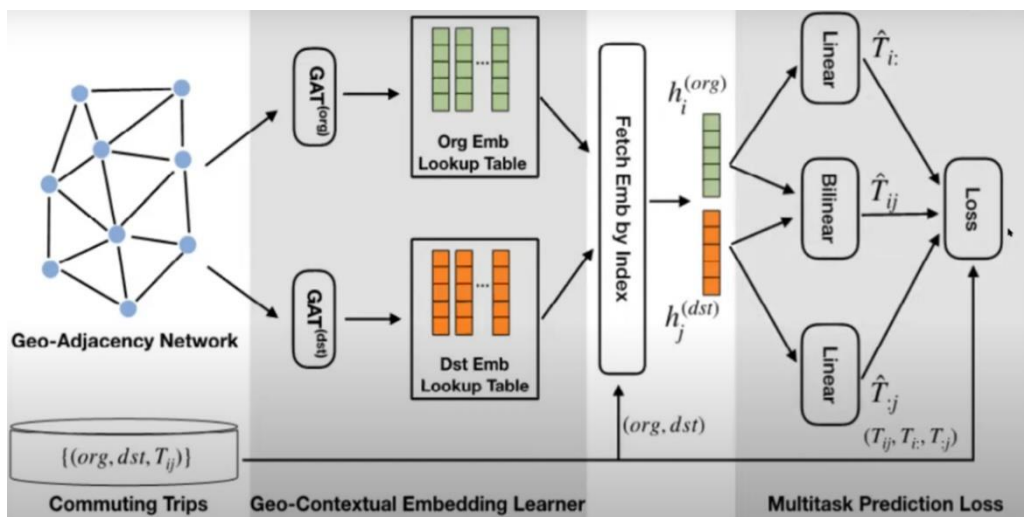

Fig 4 : Proposed model

The proposed model develops and stores the initial data for reference source. It collcts as much data sa possiblme and process it through the traing and testing of the data. Here the number of transport needed are depicted through the availability and necessary condition of the individuals are denotes and then can be predicted.

The data from the area are collected and tested and trained to obtain the optimum results with The scenario planning is the important state in the growth of the rural transportation system.
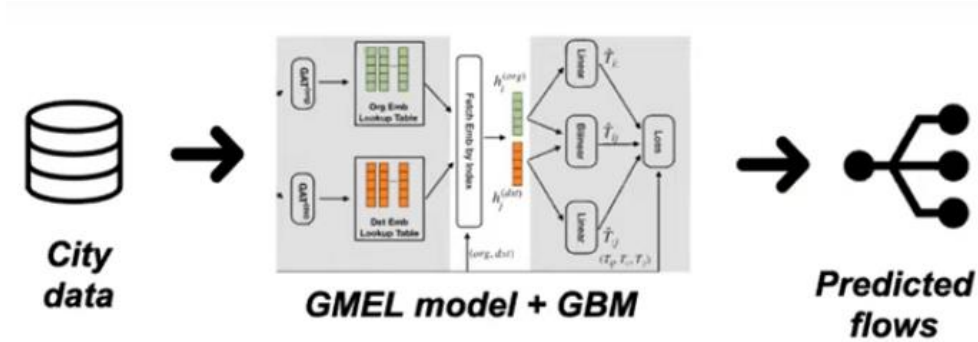
The figure 5 represents the scenario planning.

Fig 5: Scenario planning

The planning and execution of the system with the data changing with urban indicators are prepresented through the figure 6.
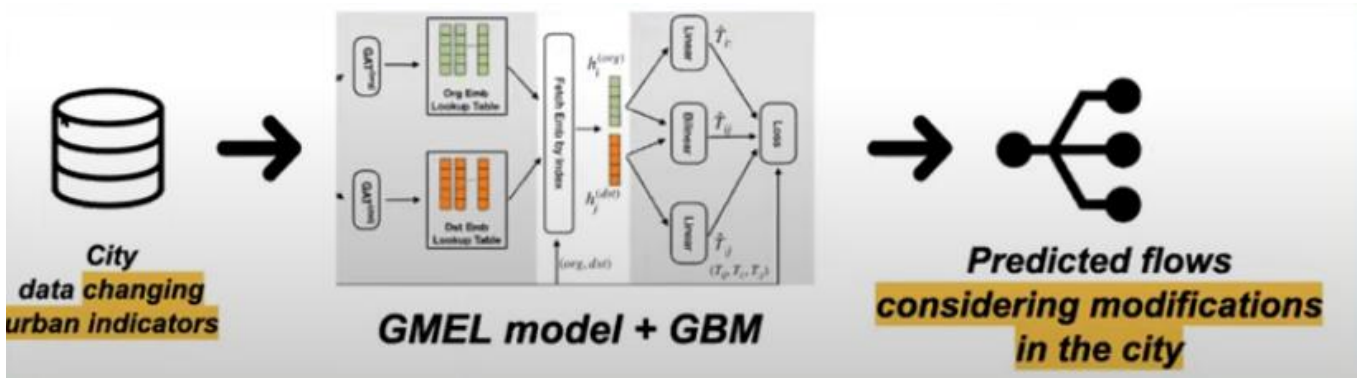

Fig 6: Planning and execution

IV.Real time implementation

The development of transportation system in the rural environment are initiated into an urban setup to create a rural transportation system is developed by using the artficial neural network with genetic algorithm. The visual set up of the rural roadways into an urban setup is demonstrated in figure 6 as shown below.

Fig 6 : Development of rural transportation system through roadways

V.Conclusion

The major purpose of the system enables to provide a better transportation network in the rural areas. This cab be done with advance technology enabled with artificial intelligence that works based on the human intelligence. The artificial neural network with genetic algorithm provides a

complete developed rural into an urban transportation system with advanced sophistications in the environment. Thus the genetic algorithm demonstrates a significant part in the development of the rural transportation management network.

Reference

[1] Sodhro, Ali Hassan, et al. "Quality of service optimization in an IoT-driven intelligent transportation system." IEEE Wireless Communications 26.6 (2019): 10-17.

[2] Barreto, Luís, Antonio Amaral, and Sara Baltazar. "Mobility as a Service (MaaS) in rural regions: An overview." 2018 International Conference on Intelligent Systems (IS). IEEE, 2018.

[3] Li, Wei, Xiaoya Hu, and Tao Jiang. "Path loss models for IEEE 802.15. 4 vehicle-to-infrastructure communications in rural areas." IEEE Internet of Things Journal 5.5 (2018): 3865-3875.

[4] Zhu, Li, et al. "Big data analytics in intelligent transportation systems: A survey." IEEE Transactions on Intelligent Transportation Systems 20.1 (2018): 383-398.

[5] Chen, Lien-Wu, and Yu-Fan Ho. "Centimeter-grade metropolitan positioning for lane-level intelligent transportation systems based on the internet of vehicles." IEEE transactions on industrial informatics 15.3 (2018): 1474-1485.

[6] Thota, Jayashree, et al. "V2V for vehicular safety applications." IEEE Transactions on Intelligent Transportation Systems 21.6 (2019): 2571-2585.

[7] Ouyang, Ruiting, et al. "A Novel Channel Estimation and Phase Compensation Scheme for IEEE 802.22-based Mobile Communication Systems in TV White-Space." IEICE Technical Report; IEICE Tech. Rep. 118.57 (2018): 21-28.

[8] Putra, Arman Syah, et al. "A Proposed surveillance model in an Intelligent Transportation System (ITS)." 2018 Indonesian Association for Pattern Recognition International Conference (INAPR). IEEE, 2018.

[9] Yue, Lishengsa, et al. "The practical effectiveness of advanced driver assistance systems at different roadway facilities: System limitation, adoption, and usage." IEEE Transactions on Intelligent Transportation Systems 21.9 (2019): 3859-3870.

[10] Vamshi, B., and Raja Vara Prasad. "Dynamic route planning framework for minimal air pollution exposure in urban road transportation systems." 2018 IEEE 4th World Forum on Internet of Things (WF-IoT). IEEE, 2018.

[11] Ortiz, Sergio, et al. "A UAV-based content delivery architecture for rural areas and future smart cities." IEEE Internet Computing 23.1 (2018): 29-36.

[12] Akai, Naoki, et al. "Autonomous driving based on accurate localization using multilayer LiDAR and dead reckoning." 2017 IEEE 20th International Conference on Intelligent Transportation Systems (ITSC). IEEE, 2017.

[13] Abedin, Nuren, et al. "Providing safe and affordable transportation to reduce female students dropout: A case study on college girls in rural Bangladesh." 2016 IEEE International Conference on Systems, Man, and Cybernetics (SMC). IEEE, 2016.

[14] Sjoberg, Katrin, et al. "Cooperative intelligent transport systems in Europe: Current deployment status and outlook." IEEE Vehicular Technology Magazine 12.2 (2017): 89-97.

[15] Rhoades, Benjamin B., and James M. Conrad. "A survey of alternate methods and implementations of an intelligent transportation system." SoutheastCon 2017. IEEE, 2017.