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EMVD: Efficient Multitype Vehicle Detection Algorithm Using Deep Learning Approach in Vehicular Communication Network for Radio Resource Management

Vartika Agarwal
Department of Computer Science and Engineering, Graphic Era Deemed to be University, Dehradun, India
E-mail: vartikaagarwal2015@gmail.com

Sachin Sharma
Department of Computer Science and Engineering, Graphic Era Deemed to be University, Dehradun, India
E-mail: sachin.cse@geu.ac.in

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Abstract: Radio resource allocation in VCN is a challenging role in an intelligent transportation system due to traffic congestion. Lot of time is wasted because of traffic congestion. Due to traffic congestion, user has to miss their important work. In this paper, we propose radio resource allocation scheme so that user can utilize their time by taking the advantage of subscription plan. In this scenario, multitype vehicle identification scheme from real time traffic database is proposed, its history will match in transport database and vehicle travelling history database. Proposed method indicates 95% accuracy for multitype vehicle detection. Subscription plans are allocated to the user on the basis of resource allocation, scheduling, levelling and forecasting. This scheme is better for traffic management, vehicle tracking as well as time management.

Index Terms: FRCNN; Vehicular communication network; Radio Resource Management; Real Time Traffic Database; Vehicle to Vehicle communication.

1. Introduction

Vehicular communication network is the network in which various vehicles are communicating and providing each other safety and traffic information. This network is helpful for avoiding an accident and traffic congestion.VCN prevent an accident by allowing vehicles to communicate with each other. If an emergency occurs with any vehicle, vehicle's driver may simply receive a warning message so that an emergency vehicle have to treat urgently. VCN is very effective for traffic management, providing assistance to drivers as well as improve fuel efficiency. VCN prevent possible crashes. We can minimize up to 70 to 80 % accidents due to vehicular communication network. Radio resources plays an important role in vehicular communication network. Radio resources allows different users to share the same bandwidth so that they can get the message at same time of any emergency, location etc. such resources satisfy user need by providing relevant information and save the time of user. Radio resources includes beacons, bandwidth, and spectrum sensing as well as geo-location database. These resources are helpful for establishing the communication between vehicles. Such resources has a challenging role in an intelligent transportation system due to traffic congestion. Traffic congestion is increasing day by day because of poor road infrastructure and increasing number of vehicles on road. As a result, user have to wait for a long time to reach their destination. So we present the concept of radio resource allocation. This scheme help users to properly utilize their time. In this scenario, multitype vehicles have to identify from real time traffic database, its history will match in transport database (TD) and vehicle travelling history database. On the basis of user's vehicle travelling history (VTH), subscription plan is allocated to the user on the basis of allocation, scheduling and levelling technique. User have to pay charges for it. Main challenges comes in whole process is multitype vehicle detection. Most existing method detect particular vehicle types such as two wheeler, three wheeler etc. but they failed to detect multitype vehicle. Multitype vehicle detection is important so that we can find all information of vehicle just from one clue. So we use FRCNN algorithm. Objective of this research is to help users for effectively utilize their time. Idea of providing subscription plan to the user comes from those cities where there are a

huge number of traffic and user have to wait for a long time. So user can utilize their time by taking subscription plan and get better output.

Main Contribution in this paper is as follows:

- Multitype vehicles have to identify from real time traffic database and match its history in transport database and vehicle travelling history database
- On the basis of user's vehicle travelling history, subscription plan is allocated to the user on the basis of allocation, scheduling and levelling technique.

Table 1. Major Notation Used in the paper

Notation	Explaination
D_{TRR}	Real Time traffic database
Dt	Transport Database
D_{t1}	1 Wheeler
D_{t2}	2 Wheeler
D_{t3}	3 Wheeler
D_{t4}	4 Wheeler
Dc	Commercial Vehicle
Dr	Road Vehicle
Dm	Motor Vehicle
D_A	Agricultural Vehicle
D_h	Heavy Duty Vehicles
Df	Defense Vehicles
D_{VTH}	Vehicle Travelling History Database
D_{RR}	Radio Resource Database
D_{RRm}	Radio Resource Management Database
$D_{RRm(A)}$	Resource Allocation
$D_{RRm(S)}$	Resource Scheduling
$D_{RRm(L)}$	Resource Levelling

The arrangement of paper is as follows: Section 2 examines about the connected work which involved in vehicle detection process. Section 3 describe the summary of vehicular communication network and impact of radio resource management in vehicular communication network. Section 4 highlight about radio resource management. Section 5 provides an overview of RRM schemes. Section 6 describe RRM and its advantage. Section 7 discuss about deep learning technique in VCN for RRM. Section 8 describe about multitype vehicle detection algorithm, system requirements and comparative study. Section 9 and 10 focus on experimental results and conclusion respectively.

2. Literature Review

Radio resources plays major role in different kind of applications such as V2V, V2X and vehicular communication network. These resources are just like frequency band which allocate user for sharing information about traffic or other road entities. Several approaches were proposed by different researchers to solve the radio resource allocation issues and detection of vehicles. . In 2017, Pooja Kshirsagar propose a hybrid model for solving the problem of resource allocation in cloud computing. Experimental results shows that this framework increase CPU utilization of the system [1] In 2017, Haoran sun introduced a deep learning technique for wireless resource management. Main advantage of using DNN is that it offers high computational efficiency as compared to other iterative optimization algorithm [2]. In 2017, Shaoqing Ren introduced a region proposal network for detecting object. It is just like a fully convolutional network and use convolutional feature map. frame rate of this system has 5 fps on GPU [3]. In 2017, Li Wang introduced concept of fast vehicle detection from traffic surveillance cameras, evolving box, a deep learning framework is used to generate anchor boxes [4]. In 2017, Jorge E Espinosa present a study on vehicle detection model using deep learning. Result allow to obtain important conclusion regarding the detection quality, rate of failure and time incurred to complete the detection task [5]. In 2017, Christian Eggert apply faster RCNN for the company logo detection. This approach is evaluating on flicker data set. Eggert examine the issues related to small objects and derive a relationship which describe the size of an object [6]. In 2017, Myung Cheol Roh introduced a refining block for fast RCNN and merge it with faster RCNN into a single network. This scheme is applied to license plate detection and this is applicable only for 4 wheelers and it shows great improvement of RF-RCNN over faster RCNN [7]. In 2018, Anuj Aggarwal deal

with the resource management optimization approach using MATLAB for simulation. Experimental result shows that it has great accuracy and less execution time in comparison of other simulation system [8].In 2018, Changqing Luo propose a CSI prediction technique called OCEAN. It is utilized for verifiable information forecast. Luo proposed a learning system which is a blend of CNN and LSTM. This experiment result shows highly accurate CSI prediction [9]. In 2018, Jia Guo design a deep neural network for predicting behaviour related information from historical data. This model provides optimal solution through prediction. This scheme is heuristic, we have to design deep neural network only once and its results are preliminary [10]. In 2018, Xudong Sun present face detection scheme using faster RCNN approach and proposed several effective strategies for resolving face detection task [11]. In 2018, Yuhua Chen improve robustness of object detection. They use region proposal network in faster RCNN model. They use different datasets including cityscapes, KITTI, SIM10K for implementing this model [12]. In 2019, changqing Cao proposed a modified version of faster RCNN for object detection. This algorithm has good performance on traffic sign [13]. In 2019, K.I Ahmed trained a deep learning technique using network data. This model provides optimal solution within less time [14]. In 2019, Jin Gao propose a deep learning technique for solving the issue of power allocation, they use mini batch gradient descent (MBGD) algorithm for identifying batch size. This algorithm reduces computational overhead and provide good throughput [15]. In 2019, Dingzhu Wen gave concept of the Radio resource management by presenting its principles as well as research opportunities in different directions [16]. In 2019, Zhenwei proposes a multiadversarial faster RCNN framework for unrestricted object detection. This framework has an outstanding performance over other detectors [17]. In 2020 N. Palanivel Ap propose an algorithm to identify the vehicle's owner information from the license plate number. This system detects number plate in the vehicle through surveillance camera and identify the owner's information such as owners name, address, mobile number etc. They capture the video and then applying ANPR (automatic number plate recognition) algorithm. This system is implemented and tested on real video [18]. In 2020, Wang Weihong highlight the problems which occur during license plate recognition. They highlight the license plate deflection, noisy plate images as well as fuzzy licenses plate's issues. This research is basically a review of existing license plate recognition algorithm. It includes advantage, disadvantage and comparison between different detection algorithms etc. [19]. In 2020, Haijun Zhang introduced the concept of deep neural network for sub channel and power allocation. They generate the sample data by using iterative and machine learning algorithm. They propose the Lagrange dual decomposition technique, while deep neural network are utilized to solve the sub channel task and power control in NOMA heterogeneous network [20]. In 2020, M. Shamim Hossain proposed the deep learning model for radio resource distribution. This model is used to predict future traffic congestion [21]. In 2020, Rui Dong propose a cascade structure of deep neural network where first neural network calculate the allocation of bandwidth and second neural network satisfy the QOS requirement of bandwidth allocation. They establish a deep learning framework for solving mixed integer non-linear programming problem. [22]. In 2020, Yifei Shen introduced the concept of graph neural network (GNN) to solve the problems of radio resource management. They use the concept of named message passing techniques for high computational efficiency. This method is highly reliable and can take less time for solving beamforming problem [23]. In 2020, Rui Liu propose remote sensing object detection method. This method improves accuracy of detection and training convergence speed. It increases the accuracy of faster RCNN algorithm for multi-scale object. They use an algorithm named Soft-NMS (non maximum suppression) for object detection [24]. In 2020, Yang Liu reviewed about deep learning techniques. They highlight the challenges and solutions for object detection. Liu compare the performance of different methods of detecting objects such as YOLO V3 (You only look once), faster RCNN or SSD (Single Shot Detector) [25]. In 2020, Bo Xiao develop data set of different images for training deep learning object detection algorithm. They discuss the performance of different object detection algorithm [26]. In 2021, Vartika Agarwal reviewed about various technologies such as Li-Fi, RFID, VANET and LORAWAN. Such technologies establish connection between different vehicles and avoid any kind of traffic [27]. In 2021, Sachin sharma focused on working, executions, implementation and application of IOT in traffic management. This technology helps to reduce accident as well as road traffic [28]. In 2021, Vartika Agarwal highlight secured scheduling technique for network resource management. Such techniques are able to complete the project within specified deadline [29]. In 2021, Vartika et al. investigate deep learning technique to improve radio resource management in vehicular communication network. They trained the model using various algorithm of resource management including network data [30]. In 2021, Emoghene Ogidiaka presents a survey on device to device communication in vehicular communication network. Here the properties of various resource allocation algorithms are reviewed and compared [31].

3. Overview of Vehicular Communication Network

Vehicular communication network is the network in which various vehicles are communicating and sharing information about traffic and safety. Main objective of vehicular communication network is to provide safety and eliminate the excessive cost of traffic collision. In Fig. 1. we can see that we have three vehicles car 1, car 2 and car 3. RSU act as a resource which works for communication between vehicles.

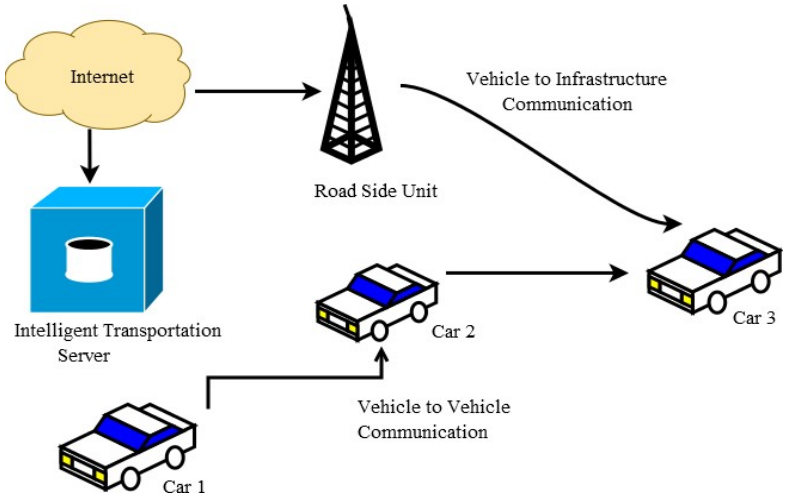

Fig.1. Vehicular Communication Network

Vehicular communication network works for the following areas.

- Route Optimization – This technology help drivers to get their destination with more efficiency. It delivers shortest route for reaching the destination quickly.
- Safety Warning – It enhance the capabilities of driver by monitoring the distance between vehicles it warns the driver if the distance decreases under a threshold.
- Preventing Road Accident – Vehicular communication network successfully manage current accidents on the road. It detects road problems via sensors and inform driver about the road situation.
- Providing Driver Assistance – V2V communication gives drivers adequate control over their vehicles. This technology help with safe parking, providing possible alerts to drivers and avoiding unsafe drifts.
- Improving fuel efficiency – Vehicular communication network provide shortest routes for reaching the destination. It saves time and improve fuel efficiency.

A. Impact of radio resource Management in vehicular communication network

Vehicular communication network is a technology which deliever numerous kind of services such as road- safety, traffic efficiency, comfort driving etc. radio resources plays major role in vehicular communication network. It includes radio resources such as bandwidth, sensors, cellular network, transmitter etc. It concerns multicellular and multiuser network capacity issues.

The RRM is important and it has a great impact on traffic congestion

- Crime prevention – we can easily identify information of vehicle just through license plate number. This information is helpful to police for solving cases.
- Traffic rule violation – if any vehicle breaks traffic rules we can easily identify it.
- Crowd counting – Through multitype vehicle detection we can easily count the no of vehicles in a specified area.
- Tracking vehicle – We can easily track the specific vehicle.
- License verification – Through multitype vehicle detection we can easily verify the license of a vehicle.
- Alerts – Know if any vehicle has broken down and dispatch help.
- Vehicle location – Through multitype vehicle detection, we can easily track the location of vehicle.
- Unauthorized Parking- If any car is parked on an unauthorized area, we can easily identify it.
- Video surveillance system – Multitype vehicle detection can be fused with existing video surveillance system so that we can get multiple result from a single standalone system.
- Decoding Facial Recognition –We can easily identify face of driver in vehicle focusing on particular feature of face such as eye, ear, etc. through face recognition we can compare this data with already present data in database to match face with a name.
- Survey of Vehicles on-demand- we can easily identify the vehicle type which are on demand or mostly used by travellers when they want to travel.
- Autonomous Vehicle Detection – Due to this scheme, we can easily track the record of an autonomous vehicles (driverless car or robo car). These are the vehicles that have capability for detecting current circumstances of road and moving securely without human intervention.
- Public safety and security – We can easily count the number of vehicles on road within a specified time.

- Traffic Analysis – We can easily count the no of vehicles on roads so that we can analyze traffic and take certain actions for reducing such traffic.
- Stolen Vehicle Recovery – Through multitype vehicle detection we can easily detect the stolen vehicle. This is used for crime prevention. By recognizing the face of a thief in stolen vehicle we can easily prevent crime.

4. Radio Resource Management

RRM is the distribution of an electromagnetic spectrum into radio frequency bands. Radio resources are just like radio frequency bands which allocates to the vehicle for an entertainment purpose. These frequency bands may represent one communication channel and we can divide such channel into different frequency range. In this scenario we can allocate spectrum to those vehicles which have 80% allocation of radio resources. These spectrum help users to properly utilize their time. Spectrum unable users to make call from their devices, use unlimited bandwidth, continue their office work and do everything whatever they want. These services are allocated to the users on the basis of their vehicle travelling history. If user is unauthorized or unlicensed, then no radio resource are allocated. User can take services according to their usage and subscription plan. Mobile Telecom Operator, Railways, various defense services as well as governmental and other international organization use spectrum for communication.

There are different types of spectrum allocation:

No one may transmit – Spectrum is reserved for a specific use such as radio astronomy. Anyone may transmit – As long as transmission power limits are respected.

Only authorized users of specific band may transmit – Only authorized user can transmit the spectrum. For example – cellular and television spectrum.

Some organizations working on spectrum allocations are – European Conference of Postal and telecommunication standards, International telecommunication union as well as Inter-American Telecommunication commission.

5. Overview of Radio Resource Management Schemes

RRM plays significant role in controlling power consumption. It includes transmission power management, allocation, forecasting, levelling and scheduling of radio resources. Main function of radio resource management is to effectively utilize radio resources within a network There are different schemes for radio resource management such as traffic control as well as congestion control.

- Resource Allocation - According to International Telecommunication Union, frequency allocation means allocation of frequency bands for the purpose of serving radio telecommunication services under specified conditions. It may vary from country to country. list of frequency ranges may be set by international agreements which is called band allocation. Modes of allocations within each frequency band is called bandplan. Some band plan may not be available or may have restriction on usage in certain countries or regions.
- Resource Scheduling – It means to allocate data packets to the user at each predefined transmission time interval. Main objective of resource scheduling is to focus on throughput, fairness, identifying delay as well as packet loss. Resource scheduling help to optimize the cost and duration of task. It helps to evaluate the efficiency of resources.
- Resource Leveling - It means shifting of resources. If there is a problem occur with transmission of data packets. We have to deal this by arranging additional data packets or resources so that we can avoid the condition of packet loss. It saves time and increase efficiency of tasks.
- Resource Forecasting – It means prediction of future resource requirement. With the help of current scenario, we can predict the future resources needed for communication. It help us to plan in advance about the requirement of resources.

6. Importance of RRM

RRM is important to ensure optimized use of available network resources. It manages, assign and release radio resources in a multicellular environment. RRM is required for interference management, admission control, congestion control, traffic scheduling, power control as well as self-optimizing networks. In Interference management, RRM cover large areas and reuse the same channel frequencies. In admission control RRM is required for traffic handling. RRM initiate packet transmission and guarantee QOS through bit rate and delay adjustments.

A. Advantage of Radio Resource Management

It decreases packet loss, provide higher throughput, identify delay time and increase efficiency of tasks. RRM self-optimize various QOS control parameters. Self-optimize means shifting of resources if any problem occurs during transmission of data packets.RRM works for power allocation and enhancing the system performances.RRM increase network lifetime through optimized energy usage. RRM fulfill various users requirement for bandwidth with limited resource.

7. Deep Learning Techniques in Vehicular Communication Network for Radio Resource Management

Deep learning is a computer software that identify neuron network in brain. It is an AI function which is used for object detection, speech recognition, language translation and making decision. Deep learning works best when we have a huge number of input and output.

Fig. 2. Block Diagram of Deep Learning

In Fig. 2. we see that there are three different layers namely input layer, hidden layer and an output layer. Hidden layer is combination of different types of neurons.

Convolutional neural network: CNN is basically for image as well as non-image data. It can take 2D structure of an image and extract important properties of an image. It represents every image in the form of pixel value.

Let us take an example for more understanding of CNN

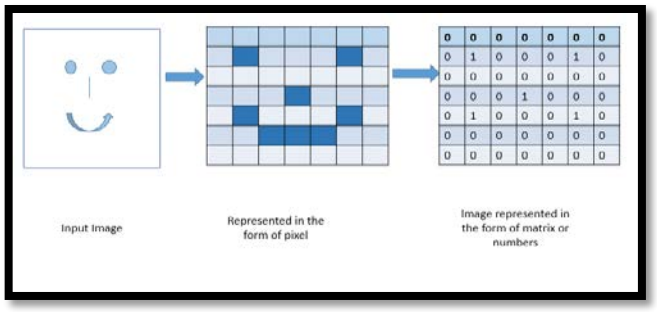

Fig. 3. Convolutional neural network.

In Fig.3, we see that CNN can convert image in the form of pixel values. It denotes 1 where part of an image is fit. If there are no image part. It will denote it as 0. Various techniques for CNN are as follows

RCNN: RCNN stands for “Region based convolutional neural network”. We can enter any image as input and it produce a set of bounding box as output. It is slow and time consuming process. If datasets have 4000 images, entire process will run 4000 times. It takes lot of time to train the model.

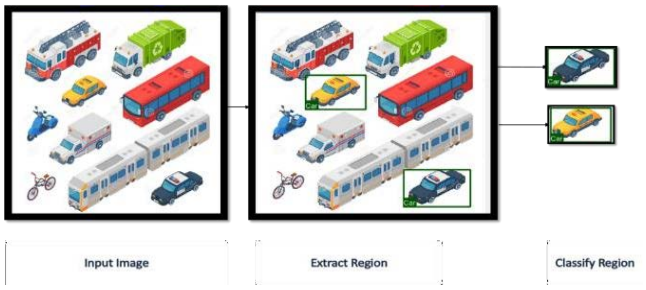

Fig. 4. Working of RCNN

In Fig.4, we see that RCNN takes image as input and extract only the region which have cars, then classify this region and label it.

Fast RCNN: RCNN and fast RCNN both works for selective search. Both use an algorithm called edge boxes to generate region proposals. RCNN detector crop and resize image whereas fast RCNN detector process entire image. It reduces the total number of initial features for CNN. It uses softmax function which takes less time in comparison of RCNN (Fig 5).

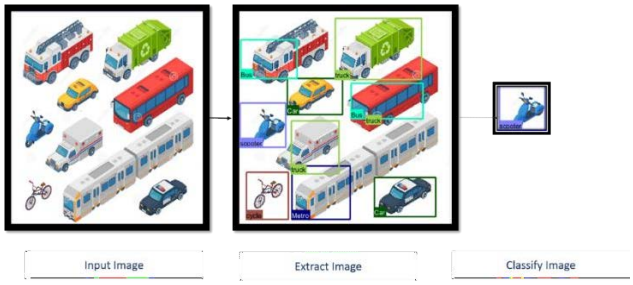

Fig. 5. Working of Fast RCNN.

Faster RCNN – After modification of fast RCNN algorithm. It is known as faster RCNN algorithm. It uses region proposal network instead of selective search. For all region proposals in image, fixed length feature vector is extracted then extracted feature vectors are classified into fast RCNN and then detected objects with bounding boxes are returned. It resizes the input image and convert it into 600*1000 px.

Fig.6. Working of Faster RCNN

In Fig 6, we see that user can input image of any vehicle such as car, truck, auto, tempo etc. Faster RCNN process it and detect license plate no after extracting license plate no from an input image. It can detect the vehicle type. MATLAB is used for implementing such system and its performance is tested on 25000 real image.

8. Proposed Efficient Multitype Vehicle Detection Algorithm Using Deep Learning Technique

Vehicular communication network are the networks in which various vehicles are communicating and sharing information about traffic and safety. Main objective of vehicular communication network is to provide safety and eliminate the excessive cost of traffic collision. Whereas CNN is used to detect objects. With the help of convolutional neural network, we can detect license plate number and identify vehicle types so that service provider can provide subscription plan to the user on the basis of their vehicle type.

A. FRCNN for object Detection:

CNN is used for object classification and detection. CNN, RCNN, Fast RCNN, FRCNN all these are used for feature extraction. Fast RCNN use selective search while FRCNN use region proposal network (RPN).RPN form a unified network which is used for object detection. From Figure. 7, it can be seen that we can detect license plate number and the type of vehicle such as four wheeler, two wheeler, three wheeler, commercial vehicle, Motor vehicle, agricultural vehicle etc.

Fig.7. License plate and vehicle type detection (Two Wheeler).

After validating vehicle type through FRCNN we can allocate radio resources to users on the basis of their utilization

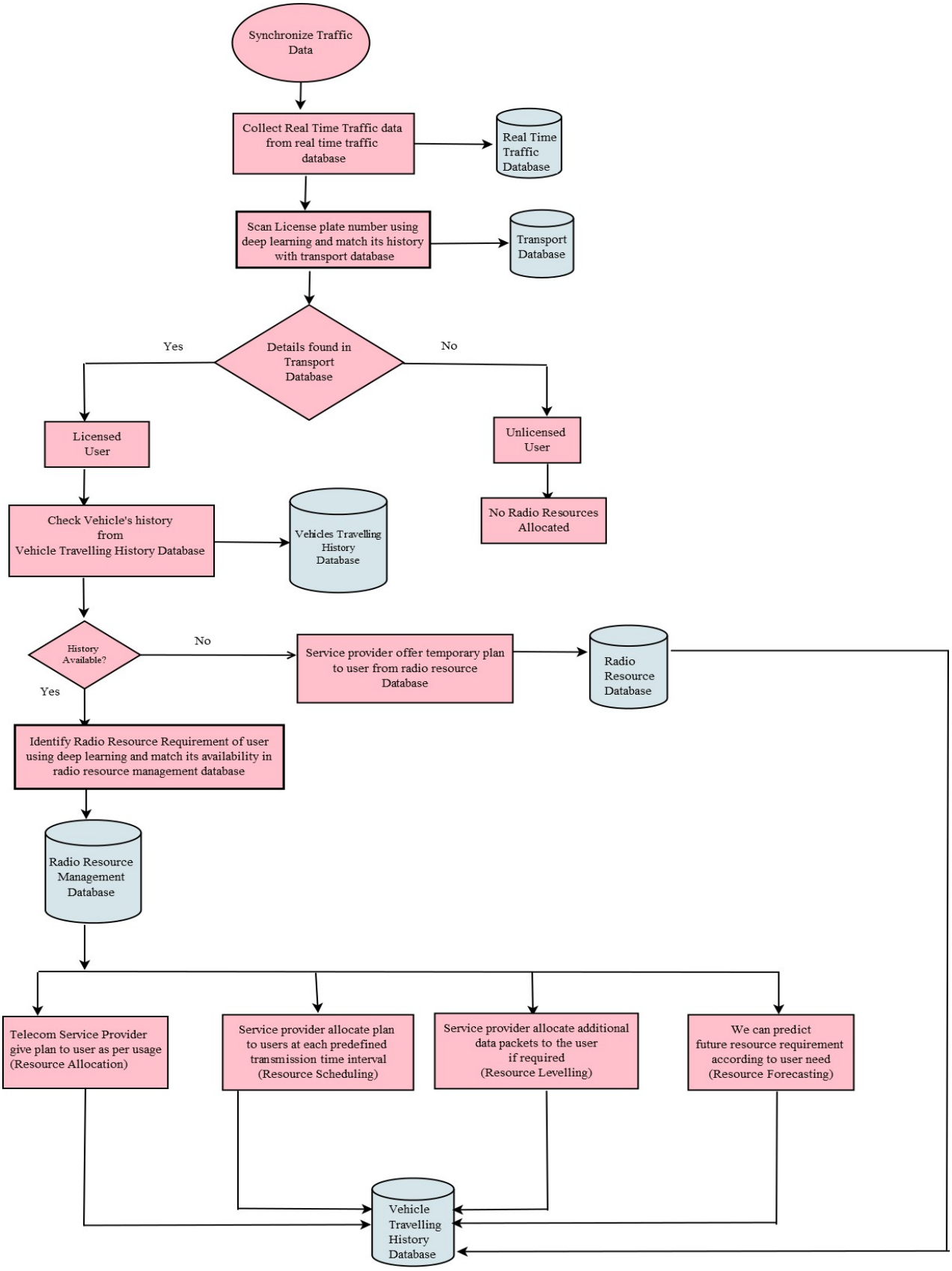

Fig.8. Flow Chart of Proposed Algorithm

B. Pseudocode for Radio Resource Allocation (Figure 8)

- Collect traffic data
- We can identify multitype vehicle such as 2 wheeler, 4 wheeler, commercial vehicle, and agricultural vehicle from real time traffic database.
- Scan license plate number using FRCNN algorithm and match its history in transport database.
- If vehicle's details are found in transport database, it means user is licensed and if details are not found in transport database, it means user is not licensed.
- If user is licensed, check its vehicle travelling history in vehicle travelling database.
- If user is not licensed, no radio resources are allocated.
- If history of vehicle is available in vehicle traveling history database. Then fetch data from radio resource management database about the availability of plan.
- Then telecom service provider give subscription plan to users as per usage. (Resource Allocation). Service provider allocate plan to users at each predefined transmission time interval (Resource Scheduling).
- Service provider allocate additional data packets to the user if required. (Resource Levelling). We can predict future resource requirement of user through resource scheduling and levelling. Then update its history in vehicle travelling history database.
- If history of vehicle is not available in vehicle travelling history database. Service provider offer temporary plan to user and update its history in vehicle travelling history database.
- This work considers the subscription plan proposed in Table 1. Traffic area can be represented by a

Set K = {1, 2 K}. D_{TRR} Update their real time traffic information follows by traffic data. D_{TRR} identify multitype vehicles such as D_{t1}, D_{t2}, D_{t3}, D_{t4}, $D_{c,}$ D_r, D_m, D_A, D_h, D_f and matching its history in Dt. If information about vehicle is available in Dt. It means user is licensed. If user is not licensed it means no radio resources are allocated. After identification of licensed user, we can check its history in D_{VTH}. If vehicle history is not available in D_{VTH}. Then we go to D_{RR}, Service provider offer temporary plan and its history will update in DVTH. If vehicles travelling history is available in D_{VTH}. D_{VTH} follows D_t. Then we go to D_{RRm}. After it we can check again the availability of vehicles in D_{TRR} If vehicle is available in D_{TRR}. D_{TRR} follows D_t We can represent it in form of following equation

$$\begin{cases} \text{Dt= 1, If vehicle is available in } D_{TRR} \\ \text{Dt=0, If Vehicle is not available in } D_{TRR} \end{cases}$$

D_{RRm} follows D_t. In D_{RRm} Telecom service provider give plan to user as per usage (Resource Allocation).

$$\text{DRRm}(A) = {plan\ availability(PA) * Cost\ of\ minimum\ Data\ plan\ (MDP)} \Big/ {Left\ Plan(LP)} \quad (1)$$

Resource Scheduling – It means to allocate data packets to the user at each predefined transmission interval. Initial Plan = 0, d =1

$$D_{RRm}(S) = \text{Initial Plan} + d \quad (2)$$

Resource Levelling – If user need additional data packets, we can add it in resource allocation scheme.

$$D_{RRm}(L) = D_{RRm}(A) + d \quad (3)$$

On the basis of resource allocation, scheduling and levelling we can predict the future resource requirement of a user which is known as resource forecasting.

C. System Requirement

The experimental platform configuration in this paper is shown in table 2

Table 2. System Configuration

Designation	Configuration
Operating System	Windows 7
Memory	16 GB RAM
Deep Learning Framework	FRCNN
Processor	Intel I3
MATLAB	2018

D. Comparative Study

From table 3, we can compare different techniques in terms of accuracy and we can conclude that proposed scheme provide 95% accurate result in comparison of other techniques.

Table 3. Comparative Study

Technique(Citation)	**Accuracy**
Region Proposal Network [5]	73%
RCNN [14]	87%
Supervised Deep Learning Model[15]	86%
Langrage Dual Decomposition Method[21]	75%
Graph Neural Network[25]	80%
Yolo[27]	80%
Proposed Scheme	**95%**

9. Experimental Result Analysis

From Table 4, we can calculate time of detecting vehicle under different environment. Accuracy depend on different vehicle type and environmental conditions such as cloudy, Night, Rainy, Sunny etc.

Table 4. Multitype Vehicle Detection under 4 different conditions

Vehicle Type	**Time of Detection**	**Accuracy**	**Cloudy**	**Night**	**Rainy**	**Sunny**
Two Wheeler	20 Seconds	95%	90%	85%	88%	90%
Three Wheeler	10 Seconds	90%	80%	85%	88%	90%
Motor Vehicle	5 Seconds	85%	80%	80%	85%	83%
Commercial Vehicle	3 Seconds	85%	82%	82%	85%	83%
Equipment Vehicle	12 Seconds	83%	80%	78%	75%	74%
Passenger Vehicle	18 Seconds	90%	85%	80%	80%	80%
Road Vehicle	25 Seconds	88%	85%	80%	85%	85%
Heavy Duty Vehicle	20 Seconds	85%	85%	80%	82%	85%
Defense Vehicle	30 Seconds	85%	83%	80%	82%	85%
Agricultural Vehicle	40 Seconds	90%	85%	80%	88%	90%

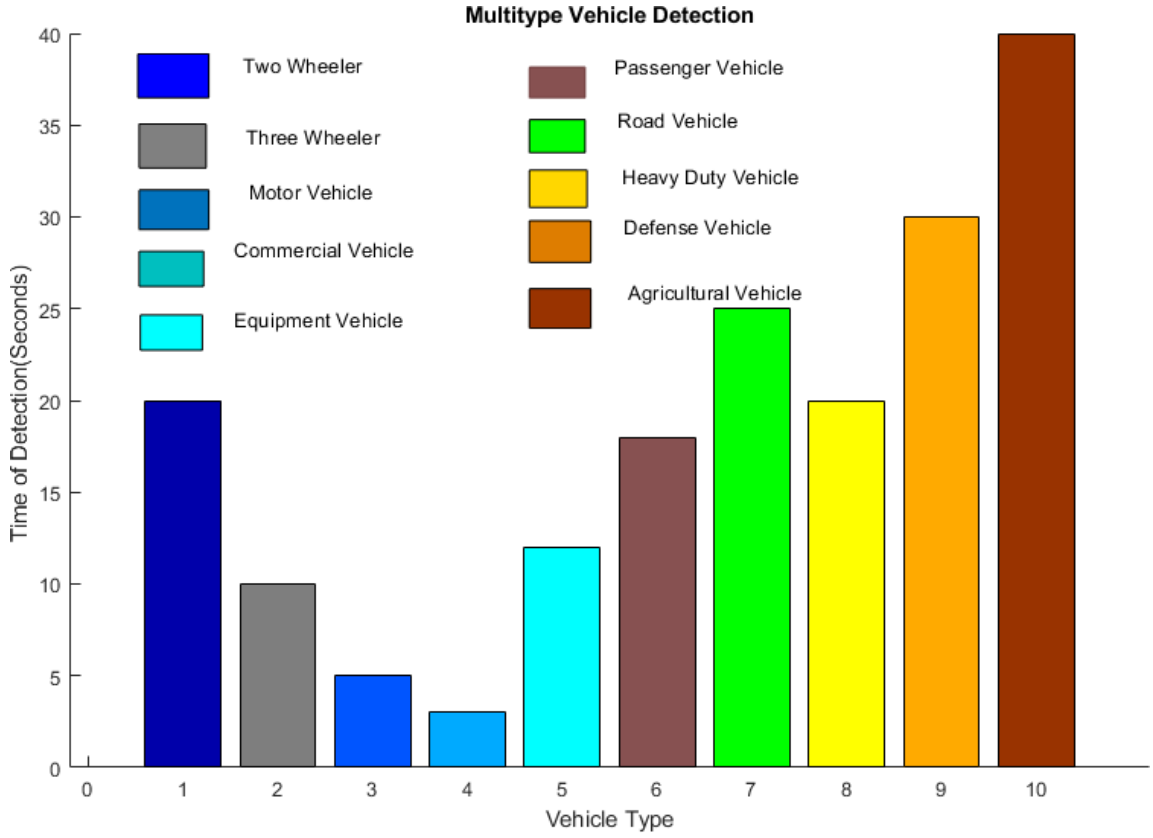

Fig.9. Multiype Vehicle Detection

From Fig.9, we can see the graph of multitype vehicle detection. In our research, 2 wheeler takes 20 seconds for license plate detection. Different vehicles takes different time for detection.

10. Conclusion

In this scenario, multitype vehicle identification scheme from real time traffic database is proposed, its history will match in transport database and vehicle travelling history database. After detecting multitype vehicle, subscription plan has been proposed for radio resource utilization. Success rate of multitype vehicle detection is upto 95% which can vary under different environmental condition (Table 4). FRCNN algorithm takes 20 to 40 seconds for detecting vehicle type. This algorithm offer more accurate result as compared to RCNN, YOLO etc. User can take subscription plan according to their vehicle type and usage. This scheme works well when there are a huge number of traffic. User can take subscription plan depending on their choice and make their time productive. With the help of this scheme we can easily count the number of users with or without license. We can use this record for traffic management purpose.

11. Limitation of Proposed Scheme

- It gives not too much accurate result when environmental condition is rainy. We have to improve this scheme for getting better result in rainy condition.
- It takes 40 seconds for detecting agricultural vehicle. We have to reduce this time.

12. Future Scope

In future, we can merge it with an existing video surveillance system so that we can get multiple results from a single standalone application. For example – If user enter a video, algorithm can detect license plate number, No of vehicles on road, owner information, owner face detection, vehicle speed, vehicle brand, traffic lights etc. we can get all this information at one place. We can use this scheme for traffic control, crowd counting, license verification, crime prevention, traffic rule violation, traffic analysis etc.

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Authors' Profiles

Vartika Agarwal received master of computer application degree from Shree Ram Murti Smarak College of Engineering and Technology (SRMS), Bareilly, India. She is currently pursuing Ph.D. in Computer Science and Engineering Department from Graphic Era Deemed to be University, Dehradun, Uttarakhand, India. Her research interests include Internet of Things, Image Processing etc.

Dr. Sachin Sharma, Associate Dean, International Affairs and Associate Professor, Department of Computer Science and Engineering at Graphic Era Deemed to be University, Dehradun, UK, India. He is also Co-founder and Chief Technology officer (CTO) of IntelliNexus LLC, Arkansas, USA based company. He also worked as a Senior Systems Engineer at Belkin International, Inc., Irvine, California, USA for two years. He received his Philosophy of Doctorate (Ph.D.) degree in Engineering Science and Systems specialization in Systems Engineering from University of Arkansas at Little Rock, USA with 4.0 out 4.0 GPA and M.S. degree in Systems engineering from University of Arkansas at Little Rock with 4.0 out 4.0 GPA. His research interests include wireless communication networks, IoT, Vehicular ad hoc networking and network security.

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