# Communication in the vehicle cluster of intelligent transport systems

**Abstract -** In the last few years, traffic flows are being recorded via the global positioning system over the Internet, which has yet to become ubiquitous. A novel technology for the intelligent transport system is being proposed, which will reduce the congestion that will be unavoidable in the near future. This system uses a magnetic sensor to identify the type of vehicle and the exact number of vehicles in the traffic environment based on the fluctuations in magnetic flux. This information is transmitted to the cloud server via nearby proximity services using clusters. An intelligent agent using gain learning will be implemented in the cloud server to learn real-time traffic flow from multiple sources to predict a valid and optimized route proposal for registered users. This work will be implemented and the implementation results show that the proposed work will achieve an accuracy of 98.36%. Therefore, this intelligent method for VANETs will certainly lead to improved traffic forecast for vehicle transport, it can reduce waiting times in traffic and minimize fuel consumption, and it will create an environmentally friendly environment with reduced carbon dioxide emissions in urban cities.

## Smart approach to communication

This model describes the complete system architecture of the proposed work as shown in Fig. 1. The magnetic sensor is embedded in the vehicle and can retrieve vehicle type information from its coverage area. Such useful information is sent to the cloud server using a cluster header via Proximity Services to determine the traffic flow. Based on this information, a cloud-based agent efficiently provides an optimized route to the registered user.

This section deals with clustering and the selection process for cluster head selection procedure, which aims to ensure faster and more reliable communication in a dynamic transport system. Vehicles with other wireless devices such as mobile phones, laptops and other Internet devices connect to a cluster group that is capable of transmitting the data to the cloud server. Clusters consist of a wireless network that provides Pro-Sec proximity services that ensure reliable vehicle communication with the cloud server. Among the units in the cluster, one of the devices is selected as cluster head due to its initial residual energy.

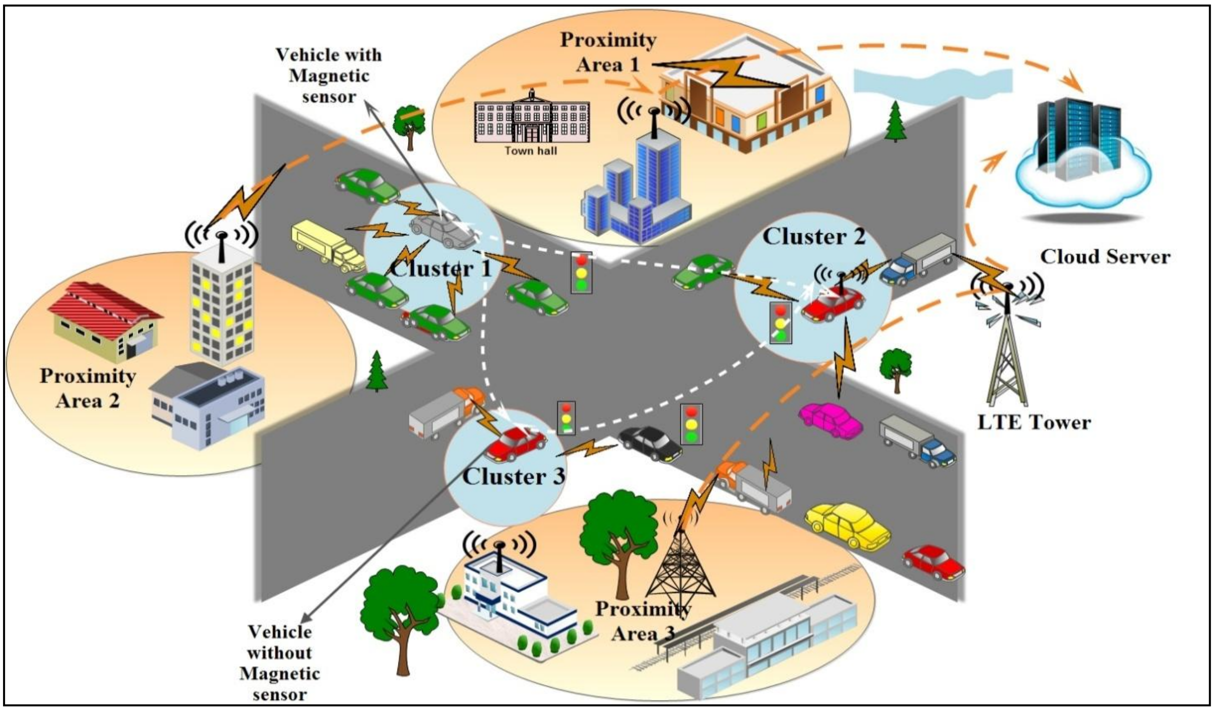


**Fig. 1: Scenario of the communication of intelligent transport systems**

In this section, the clusters can select relay members for fast and reliable communication. The main difference between the cluster head *CH* and the relay members is that the *CH* has a higher residual energy than the relay members. The relay members within the same cluster have a low residual energy. To achieve a fast transmission between two cluster heads, a vehicle is selected as the relay member that has the transmission capacity. It can play an important role in the selection of relay members according to the relay selection algorithm. The relay system is carried out where the cluster leader *CH* begins to transmit the vehicle counting information to the destination via Proximity Services. If the source CH and the destination CH are not in the communication area, the relay members can act as CH for the transmission of the traffic information to the destination. Therefore, the relay members are selected when the data transmission takes place between two CH at a long distance. To select the relay member, a member is selected who is nearest to the cluster head and has the ability to transmit the data that is depicted in Fig 2. In this way, the relay member is selected and it begins to transmit the data with the knowledge of the source cluster head.

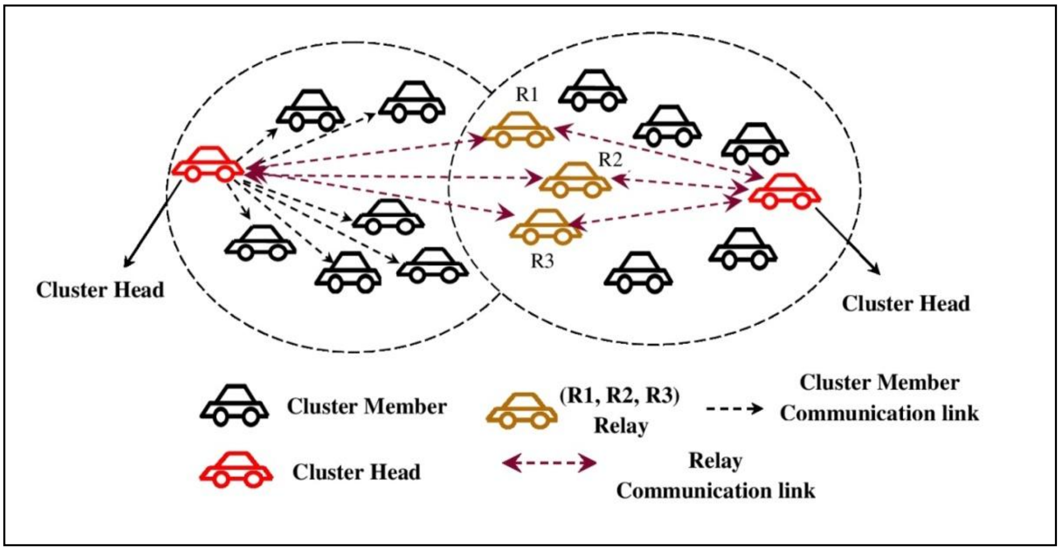


**Fig 2. Vehicle Cluster Head and Relay Selection**

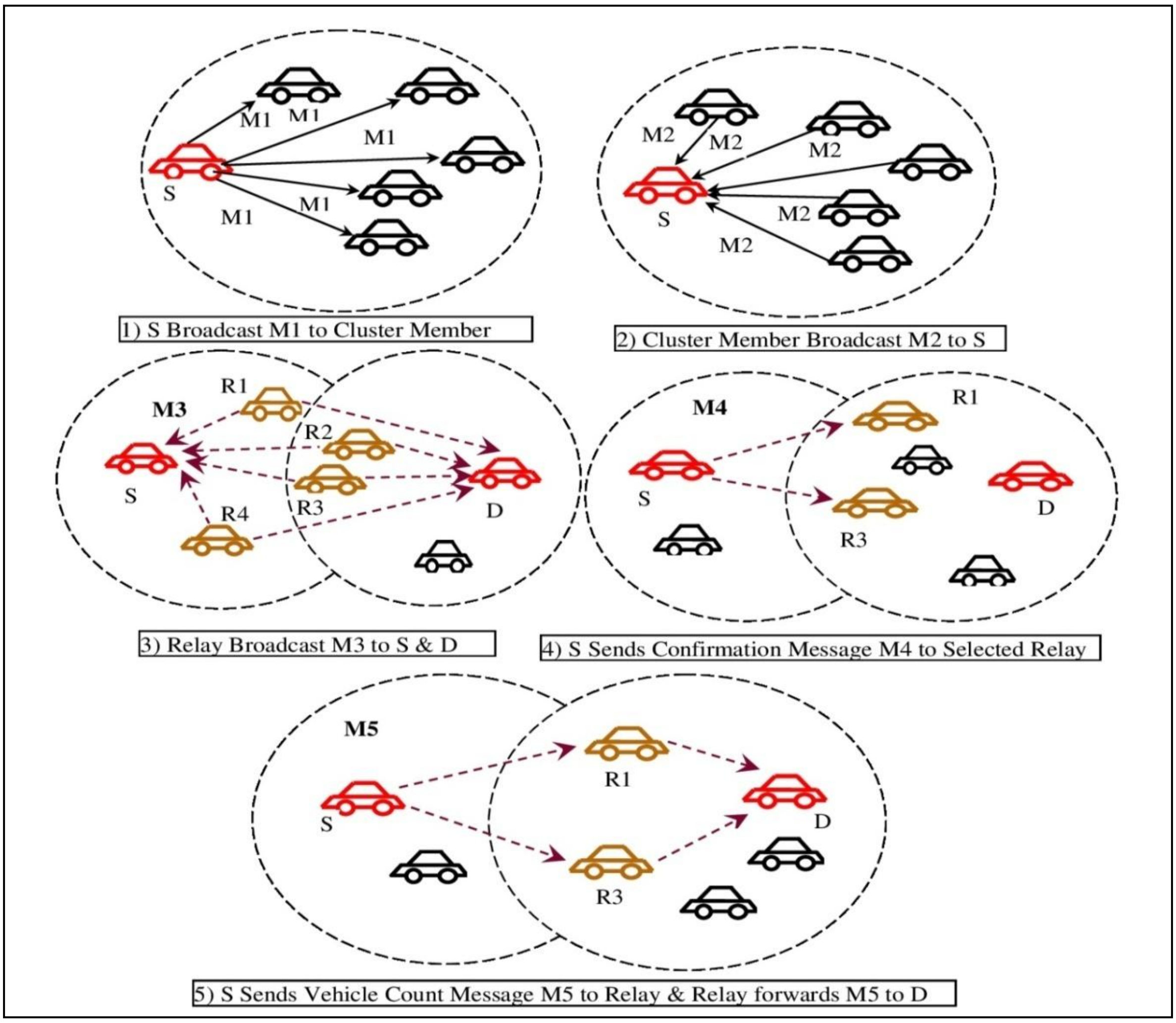


Fig 3. Communication Scenario

1 At the beginning of the relay selection, the source *CH*, *S* sends a message from the relay probe to its neighbors and waits for confirmation from each intermediate member who can act as a relay member, as shown in the first step of Fig. 3.

2 After all cluster members receive the probe message from the source in response, they send their status message as an acknowledgement in a response probe message containing the location and unique address of the members, as shown in step 2 of Fig. 3.

3 Some of the cluster members receive probe messages from more than one and therefore send response and probe messages to all cluster heads, as in step 3 of Fig. 3. These response messages include the address and its distance from the *CH* with a join request to source and target cluster heads.

4 When a company receives more than one membership request from its members, it selects a number of relay members based on their residual energy. Accordingly, the company sends the message from the acceptance relay *M4* to only a minimal group of cluster members who relay the messages between the cluster heads.

5 The *CH* source now sends the message *M5* containing the vehicle counting information to the relay members. The relay member in turn forwards the message M5 to the *CH* target.

**6. Conclusion**

This proposed work includes an improved calculation method for the number of vehicles based on magnetic sensors, a cluster relay selection algorithm for reliable and fast message transmission, and the amplification learning algorithm used to suggest the optimal route to the registered user in a dynamic transport system, which improves potential service suggestions such as hotels, hospitals, emergency services, banks, etc for the registered user. This can be a promising solution to many real-time traffic flow prediction problems, as it offers multiple ways to present and deliver the optimal route to the user, which in turn minimizes the overall travel time of urban transportation systems. Obviously, this improvement is intended to save the environment from vehicle pollution, and nominal fuel consumption saves fuel for the next generation. After all, it is relatively simple and can save people's lives in scenarios for the transport of emergency vehicles, in order to suggest better and optimal routes to minimize the overall ambulance journey time in an urban transport network.

**Reference**

## Journal Publications


1. **S.C. Rajkumar**, Jegatha Deborah L, Vijayakumar. P, "Optimized traffic flow prediction based on cluster formation and reinforcement learning" International journal of the communication system, Nov.2019, DOI: 10.1002/dac.4178. **[Annexure –I, Impact Factor: 1.319]**

2. **S.C. Rajkumar**, Jegatha Deborah L, "An Improved public transportation system for effective usage of vehicles in intelligent transportation system", International Journal of the communication system, 2021 **Accepted for Publication. [Annexure –I, Impact Factor: 1.319]**


## International Conference Publication


1. **Rajkumar. S.C**, Jegatha Deborah. L "Intelligent Request Grabber: Increases the vehicle traffic prediction rate using social and taxi requests based on LSTM", Proceedings of the ICCBI - 2019 part of the Lecture Notes on Data Engineering and Communications Technologies book series LNDECT, Springer, March 2020, volume 49, pg 778-788.

2. **Rajkumar. S.C**, Dr.L.Jegatha Deborah, "Survey: Handling on Difficulties in Internet of Things (IoT) Applications and Its Challenges, Second International Conference on Recent Trends and Challenges in Computational Models (ICRTCCM)", to IEEE Xplore article no. 8057505, Pg 37-42, 5 October 2017, DOI: 10.1109/ICRTCCM.2017.80.


## Book Chapter Publication


1. Jegatha Deborah L, **Rajkumar. S.C**, Vijayakumar, P, "Medical Decision Support System using Data Mining an Intelligent Health Care Monitoring System for Guarded Travel., in Handbook of Computational Intelligence in Biomedical Engineering and Healthcare, Chapter no. 4 to Elsevier books, ISBN 9780128222607, 8 April 2021.