**Chapter 1**

**Introduction**

Vehicular ad hoc networks (VANETs) are created by applying the principles of [mobile ad hoc networks](https://en.wikipedia.org/wiki/Mobile_ad_hoc_network) (MANETs) – the spontaneous creation of a wireless network for data exchange – to the domain of vehicles. VANETs were first mentioned and introduced in 2001 under "car-to-car ad hoc mobile communication and networking" applications, where networks can be formed and information can be relayed among cars. It was shown that vehicle-to-vehicle and vehicle-to-roadside communications architectures will co-exist in VANETs to provide road safety, navigation, and other roadside services. VANETs are a key part of the [intelligent transportation systems](https://en.wikipedia.org/wiki/Intelligent_transportation_systems) (ITS) framework. Sometimes, VANETs are referred as Intelligent Transportation Networks.

While, in the early 2000s, VANETs were seen as a mere one-to-one application of MANET principles, they have since then developed into a field of research in their own right. By 2015,[[4]](https://en.wikipedia.org/wiki/Vehicular_ad_hoc_network#cite_note-textbook-4)(p3) the term VANET became mostly synonymous with the more generic term inter-vehicle communication (IVC), although the focus remains on the aspect of spontaneous networking, much less on the use of infrastructure like Road Side Units (RSUs) or cellular networks.

**1.1 Overview**

Nowadays, number of cars is increasing on road immeasurably. As a result road accident and traffic jam is a growing problem. Hence, research on improving road safety application is a subject of immense concentration. By communicating through wireless networks, safety application can be use to avoid accident. In this field, Vehicular Ad-Hoc networks (VANETs) play the significant role.

Wireless network provide two types of network namely Mobile Ad-Hoc networks (MANETs) and VANETs. Ad-Hoc networks are used to communicate within a certain range of areas. This network also connects large areas through basic mobile station and internet.

A group of moving vehicles is comprehensively capable of communicating with each other using VANETs. It has the ability to extend to a spacious region through basic mobile service and internet facility. Thus, VANETs can be called as special type of MANETs or in other words it is a subset of MANETs. VANETs do not require any base station or switch in mobile network rather itself is capable of forming a network. In this network, communication can be done between various nodes like vehicles to vehicle (V2V) i.e. road side unit (RSU). To form the communication infrastructure there will be Road side unit (RSU) in every intersection point of the road and each vehicle will be provided with one Onboard Unit OBU.

In this project the wireless data communication is provided by using ZIGBEE concept, this ZIGBEE technology is a high level wireless communication protocol using small and low power based wireless networks. And are the standard based communication networks had unique advantages like low cost, low power consumption wireless sensors since these are intensively applicable in modern electronic components these are the ideal choice for secure networking.

So far based on the steady analysis of present day situations we implemented an effective system based on control policies, service differentiation methodologies, and complex emergency warning dissemination.

The ultrasonic sensors are used as a distance measurement device for this system, a low power, high-performance CMOS 8-bit AT89C51 microcontroller is used to control the overall operations systematically. Piezoelectric sound buzzer is used to warn the user.



Fig 1.1 Visual Representation of V2V Communication

**1.2 Literature Survey**

**1.2.1 Existing System**

Traditional collision warning system is developed based on the concept of Intelligent Transportation System. The aim of this paper is to find effectiveness of collision warning system and predict the probability of possible collision based on VANET.

A Differential Global Positioning System (ADGPS) based on vehicle-to-vehicle collision warning system is introduced by H. Tan which requires a simple GPS unit and basic motion sensors to detect a possible collision situation. This system predicts the danger situation using the information of nearby vehicles to provide safety but it invariably covers a very small area around the vehicle so it cannot support traffic leading applications. Formation of cluster is done using Wi-Fi peer to peer channels while the LTE channels are implemented for trans- mitting the Cooperative Awareness Messages (CAMs).

A channel allocation algorithm is also implemented between different clusters that help in reducing the interference of Wi- Fi channels. The performance of the Heterogeneous architecture is not better in terms of the delivery rate as compared to other schemes.

In author proposed Collision Avoidance System which makes use of the latest road information more frequently and provides it to the drivers after detection of traffic density by the safety application in its critical range. Collision avoidance system is fixed in danger zone on road side. It generates an emergency message and transmits it to the drivers, before the vehicle reach the potential danger zone. The proposed model is simulated in ns2 and output is shown by using network animator.

V2V wire- less communication is used to predict trajectory. Vehicle collision can be detected in real time by the collision detection algorithm which is also a part of the interest.

**1.2.2 Proposed System**

The proposed scheme provides us with capabilities of predicting the chances of collision on highway with the use of vehicle-to-vehicle communication by means of ICU communication. First part deals with the road network creation in SUMO and places ICU near intersection. The ICU will start monitoring the location of vehicles in its range and also keep track of the information about these vehicles. Having the current information about the vehicles, ICU will calculate the collision probability of the vehicles approaching towards the accidental zone. Depending upon the information stored and calculated future path of the vehicles the criticality of situation is calculated. The ICU will broadcast alert messages to the corresponding vehicle which are in danger.