Chapter 22
Internet of Things–Based Smart Traffic Light System for Hassle Free Movement of Emergency Vehicles

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ABSTRACT

Given the increasing number of vehicles on the road, the intensity of vehicular traffic in cities has tremendously increased. Because of the heavy traffic, there are often traffic delays on the roads, which can result in the loss of human life when emergency medical vehicles like ambulances and fire engines are stuck in the traffic jam. Traffic congestion is thought to be responsible for 30-35% of mortality in emergency situations, according to data compiled from various sources. In such conditions, it becomes essential that the traffic keeps flowing at a faster rate but in a smooth manner. The authors have devised a strategy to cut the amount of time an emergency vehicle spends at signal stops and the amount of manpower required at each traffic signal. The project's primary objective is to use IoT sensors to detect the arrival of emergency vehicles and reduce the time it takes for the vehicle to pass the traffic lights by favouring the lane in which the emergency vehicle is detected by turning traffic lights green to allow other vehicles in front to give way to the emergency vehicle.

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INTRODUCTION

Given the surge in the magnitude of vehicles on the roads, the intensity of vehicular traffic in cities has tremendously increased. Because of the heavy traffic, there are often traffic delays on the roads, which can result in the loss of human life when emergency medical vehicles like ambulances and fire trucks are blocked in the traffic jam. Due to the static nature of current traffic control technology, vehicles must wait until the microcontroller activates the green signal for that lane after a predetermined amount of time. The traffic police might give the emergency vehicle preference if it is stuck close to the traffic light by giving the vehicles in front of it proper symbols or signs so that the emergency vehicle can exit the traffic as swiftly as possible. However, if the emergency medical vehicles are stopped at a farther distance from the traffic light post and the traffic police cannot hear their siren, emergency vehicles must remain still until the traffic is cleared or rely on other cars to move over, which is difficult in a traffic jam. Traffic congestion is thought to be responsible for 30% to 35% of mortality in emergency situations, according to data compiled from various sources. In such conditions, it becomes essential that the traffic keeps flowing at a faster rate but in a smooth manner.

Road travel is by far the most common form of transportation in India, accounting for the lion's share of both the country's goods and passenger traffic as well as the economic output of the country. During the past ten years, the number of registered vehicles has increased at an annual rate of 9.9 percent, and there were 296 million state registered automobiles in India as of March 31, 2019. Because there are now more cars on the road than ever before, traffic congestion has emerged as one of the most significant challenges confronted in every region of the world. The majority of the traffic control systems that are in use in the current scenario are of the fixed cycle kind. This sort of system provides a standardized transition of red, yellow and green for each signal cycle. In areas with high traffic densities, in addition to the utilization of these controllers, the deployment of an additional traffic policeman is also employed in order to control the flow of traffic. These fixed solutions are unable to make the necessary adjustments to deal with the fluid circumstances, as a traffic controller would in the real world. It is not possible to station a traffic policeman at each and every intersection due to a lack of available manpower as well as financial constraints.

The main goal of the following work is to cut the amount of time an emergency vehicle spends at signal stops and the amount of manpower required at each traffic signal. This is achieved by the use of IoT sensors to detect the availability of emergency vehicles such as ambulances and paramedical vehicles and reduce the time it takes for the vehicle to pass the congestion by favoring the lane in which the emergency vehicle is detected by turning traffic lights green to allow other vehicles in front to give way to the priority vehicles. Also to ensure no error occurs, a safety feature is also installed in order to reduce the error percentage in life matters.

BACKGROUND

Karthik B V et al. (2019) offered a system that employed a GPS module to send the ambulance's location to the cloud server through a Wi-Fi module that would be further sent to a smart traffic technology that dynamically modifies the traffic light sequence. According to their approach, there's a good probability the emergency vehicle was simply travelling parallel to the signal (while in the vicinity of the signal),

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