Smart Signal System for Emergency Vehicle

HALLOLI S.D.[1], CHAVAN S.D.[2], JAGDALE S.S.[3], METKARI S.B.[4], PAWAR Y.M.[5]

[1,2,3,4,5]Students Civil Engineering department, Trinity Academy of Engineering, Pune, India

Abstract: From last few decades effective centralization and globalization there is a tremendous growth in population in Indian Cities. Because of that number of vehicle users are increasing day by day. Simultaneously traffic congestion is increasing due to disobeying traffic rules and careless driving. As per world population survey, India's population almost equal to 17.7% of world population. Because of unseriousness of the traffic traveling time is increases this will limits the speed of vehicle. Because of above situation traffic congestion increases and most importantly it is affecting on emergency vehicle which are not able to reach their destination on time (i.e., Ambulance, Fire Engines, Police cars, etc.) The problem adherence of emergency vehicles can be solved by clearing the lane for emergency vehicles travel. In this paper by using 'smart signal system for emergency vehicle we can reduce achieve reduction in critical traveling duration and to save human life irrespective of any aspect.

Keywords: Emergency vehicles, Arduino, GSM, Relay Card, LED.

I. INTRODUCTION

Latest News and studies are informing about drastically increasing rate of death due to traffic congestion which causes the ambulances and fire engines are reaching hospital or other accident spots. So that traffic jam became a huge disadvantage for a development of smart city.

In the India we are observing great growth in population which leads to traffic jam because numbers of vehicles are increasing with increasing population.[1] People are choosing private vehicles instead of public transport. Traffic rules violation in traffic rules along with accidents happens because people are not obeying traffic rules and speed limit. The survey done by government of India states that metro cities like Bangalore, Chennai, Calcutta records 16 death hourlies. Traffic congestion is linked with blocking emergency vehicles such ambulance, fire engines, etc.

Our aim is to reduce traffic congestion by using GSM application along with Arduino controller. The system will share the information about emergency arrival to traffic by switching ON the LED lights mounted on street lights automatically after receiving the Call from Emergency vehicle driver so that traffic will make sure to provide a way to emergency vehicles. In this project GSM system played vital role. Once emergency vehicle reaches their destination system will get switch OFF after receiving command from Emergency vehicle user.

II. LITERATURE SURVEY

An idea about the implementation of GSM technology, the embedded system with a GSM network and control system can control and monitor locally used devices with built-in input and output peripherals. Remotely the system allows to monitor and control of equipment via mobile phone by just sending pre-configured commands.[2]

The working principle and application of an Arduino board is been explained in this paper. It also focuses on the use of this tool for study and research purposes. Arduino is useful in the development of the VLSI test bench basically of sensors. Fast processing it. Technology has entered a new dimension by providing complicated things in an easier and more interesting way with the increase of users of open-source software and hardware nowadays this is efficient to supply free or low cost, more reliable and affordable technology Arduino board, working principle, implementation of software and applications are been discussed priority in this paper.[3][1]

RFID and GPS-based Automatic Lane clearance system for ambulances. This paper also focuses on the reduction of delay in departure and Arrival of emergency vehicles for this it terms traffic signal to green seeing ambulance from a certain distance RFID distinguish between emergency and non-emergency conditions. Transceiver and GPS help in connecting both ambulance and traffic signals. It does not need human intervention so it is a fully automated.[4], [5]

III. BACKGROUND WORK FOR SYSTEM

a) Global System for Mobile Communication (GSM)

GSM system is developed by the European telecommunication standard institute. The purpose is to describe the agreement for second generations (2G) digital cellular network which is used by mobile device such as mobile phones and tablets. The GSM standard originally described a digital, circuit switched network optimized for full duplex voice telephony. In GSM geographical area is divided into hexagonal cells whose sides depends upon power of transmitter and

load on transmitter. It is more suitable network with wholesome features with worldwide connectivity and having large-scale coverage. The phone works based on the SIM card so that it is easy to interchange the different varieties of phones by users. [6]

Working of GSM:

GSM is a combination of TDMA (Time Division Multiple Access), FDMA (Frequency Division Multiple Access) and Frequency hopping. SIM800L is a small-scale cellular module which permit for GPRS transmission, sending and receiving SMS and making and receiving voice cells. Low cost and small footprint and quad band frequency support make this module absolute solution for any project that need long range connectivity.
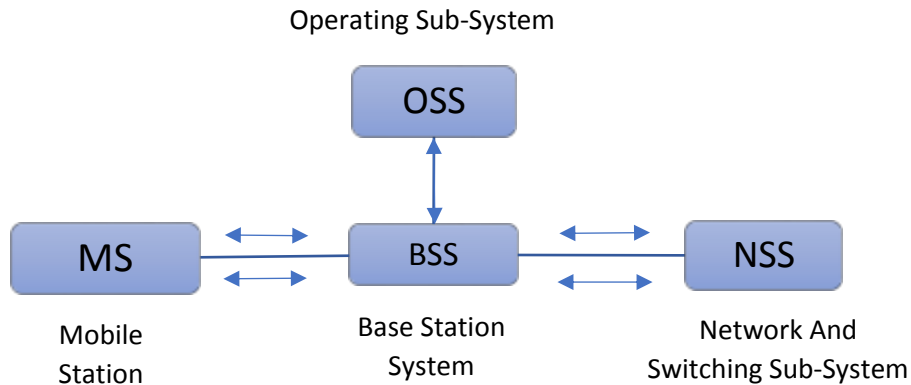
Flow chart of GSM working

Architecture of GSM:
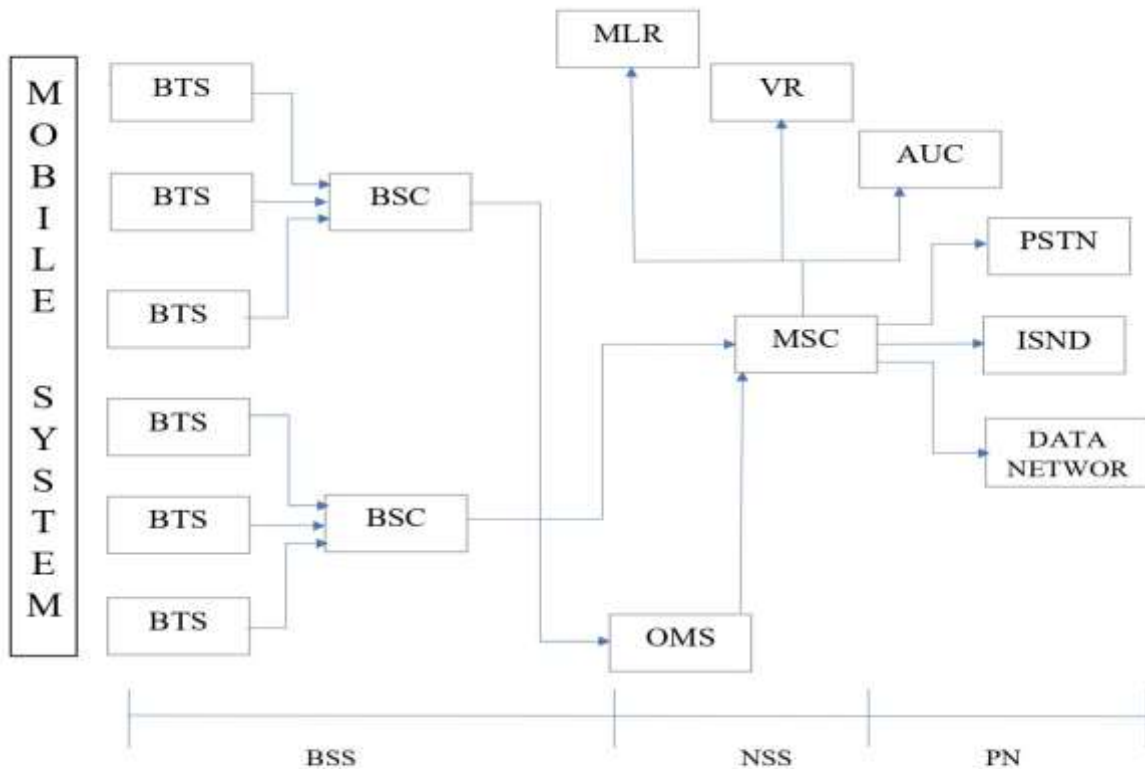
BTS – Base transceiver system

BSC – Base station controller

HLR: Keeps the data base of all users who reside in the same geographical area.

VLR: Visitor location resistor keeps the track of all users roaming customer.

AMU: Authentication Center; authenticates the SIM by checking their SIM number sends required information to MSC.

Every Mobile System (MS) get connected with Base transceiver System (BTS) of that area. This BTS sends signal to Base Station Controller (BSC). Many BTS get connected to single BSC.

In network and switching subsystem; mainly consist Main Station Controller (MSC). MSC is backbone of entire network operation. Its function is to setting up call handoff procedure.

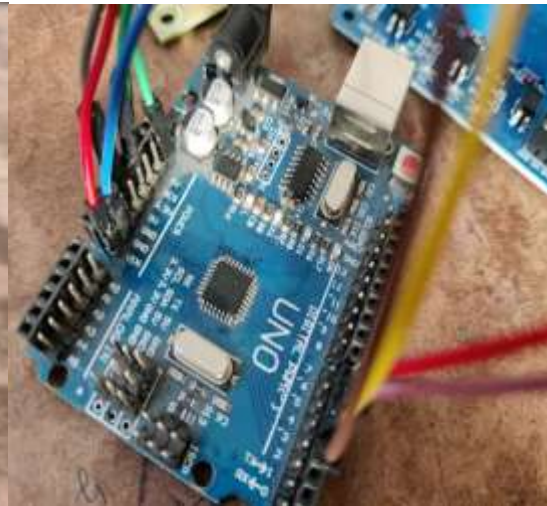FIG.1. Appearance of GSM   FIG.2. Appearance of Arduino Controller Kit

b) Arduino UNO: Arduino UNO is an open-source electronics platform based on easy-to-use hardware and software. The Uno board is the first in a series of USB-based Arduino boards. It is used in Do-it-Yourself projects prototyping. The cost of Arduino UNO is a low and it is very flexible to use and feasible as well. The operating voltage is 5V and the recommended input voltage will range from 7V to 12V. In above FIG.2 we know the general appearance of Arduino controller kit.[7]

c) Relay Card: A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof. Relays are used where it is necessary to control a circuit by an independent low power signal, or where several circuits must be controlled by one signal. The commonly used in an electromagnet to operate their internal mechanical switching mechanism. When a relay contact is open, this will switch power ON for a circuit when the coil is activated.[8]

d) LED: A light-emitting diode (LED) is a semiconductor light source that emits light when current flows through it. LEDs work on the principle of Electroluminescence. On passing a current through the diode, minority charge carriers and majority charge carriers recombine at the junction.

IV.   METHODOLOGY

GSM SIM800 12volt 2Ampere supply for GSM module is used. GSM module is connected Arduino UNO controller along with coding language C++, controller and GSM module both are connected to 220-ohm resistor as well as controller is connected with 4 channel relays. Relay is used to switching ON/OFF LED lights. LED lights are connected to wires drawn through relay along with 230volt Alternate Current (AC) supply.

When emergency vehicle driver calls on the GSM number then DTMF (Dual Tone Multi Frequency) command get activated which contain selection of routes (have to dial 1 for first route and dial 2 for second route, etc.) as well as 1 for system ON and two for system OFF. After selecting route and system condition (ON/OFF) GSM signal get activated that activation gives command to LED.

Example – If route 1 is selected along with ON system all the LED's fixed on street light will get ON till the dialing of 2 to system off.

Advanced Signal System Mechanism:
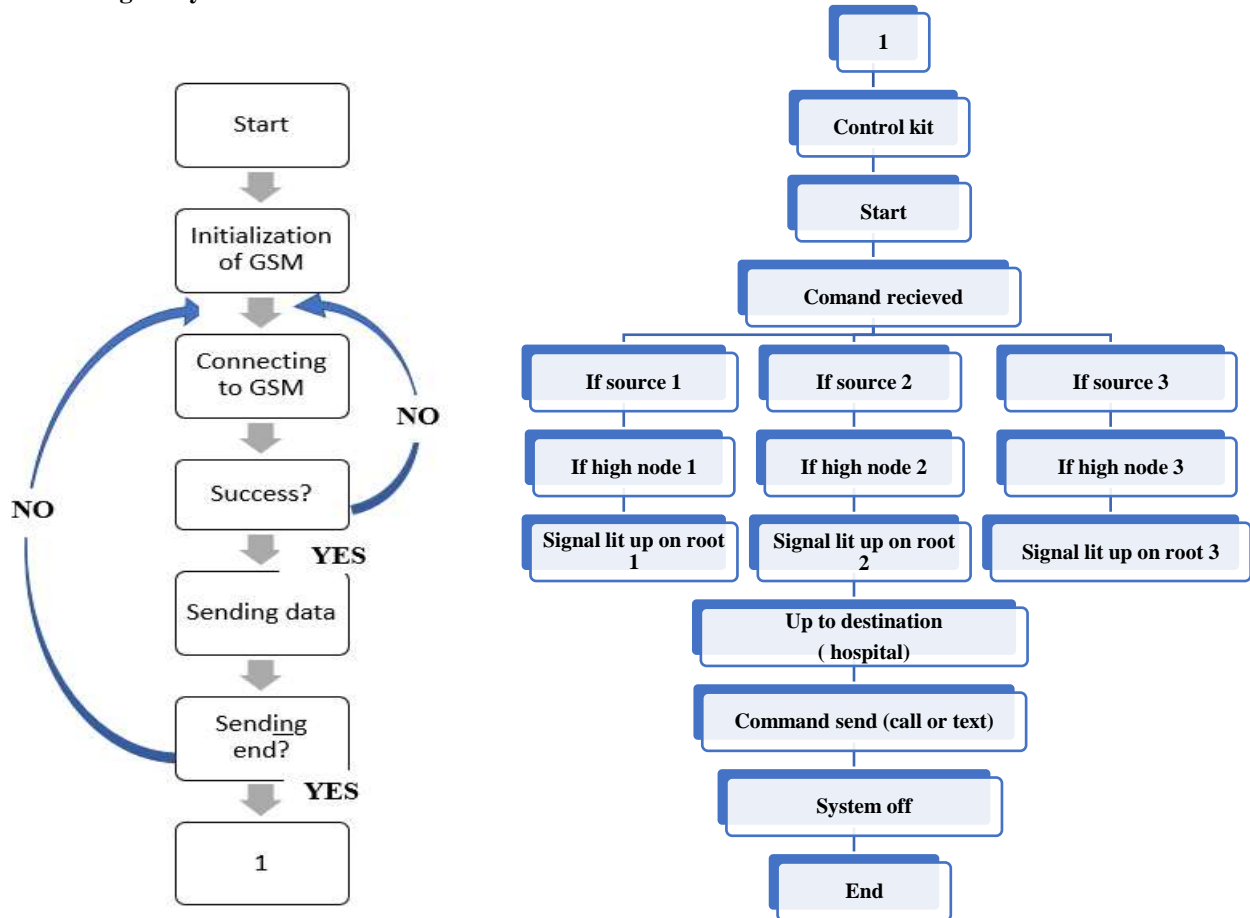
V. RESULT

In this paper we presented that using GSM system for emergency signalling from any of the authorised phone to help high priority individual victim reaching to their destination by emergency vehicle. This system will work efficiently in high frequency trafficable area by minimal used low frequency traffic with higher connectivity and accurate attention. Wired connection signal gives euthenist of signal transaction to further private vehicle.

The working of GSM. after data entered in GSM system, system get activated and traffic will know about Emergency Vehicle and they will clear a lane for Emergency Vehicle. By using this system, we can achieve minimizing death rate.

VI. CONCLUSION

Every emergency vehicle can arrive at its recommendable destination on time by using GSM module with appropriate connectivity. The traffic congestion can be merged easily with less manpower. This system will help to create habitude practices of helping other by spreading information about arrival of emergency vehicle. Most important aim will be achieved which is reducing death rate and prioritized life.

REFERENCE

[1] K. Dhakate, S. Kambe, and S. Meshram, 'A Review on Arduino Based Smart Irrigation System', vol. 4, no. 2, pp. 623–630, 2018.
[2] A. Dixit, A. Garg, and A. Professor, 'A Study on Cellular GSM & CDMA -Based for New Generation Mobile Radio System', IJCAT -International J. Comput. Technol., vol. 1, no. 8, 2014, [Online]. Available: www.IJCAT.org.
[3] I. Haq, Z. U. Rahman, S. Ali, and E. M. Faisal, 'GSM Technology: Architecture, Security, and Future Challenges', Int. J. Sci. Eng. Adv. Technol., vol. 5, no. 1, pp. 70–74, 2017.
[4] U. Sharma, M. Alam, U. Tyagi, A. Kushwaha, and R. Chaudhary, 'Research Paper on GSM based Home Automation', vol. 7, no. 8, pp. 16–22, 2021.

[5] N. . Spoorthy.C, 'Traffic Light Priority Control For Emergency Vehicle', Int. J. Innov. Eng. Technol., vol. 2, no. 2, pp. 7–10, 2013.

[6] I. Pasha, 'Ambulance management system using GIS Master Thesis in Geoinformatics Ambulance management system using GIS By Imtiyaz Pasha', no. October, 2016.

[7] R. Hegde, R. R. Sali, and M. S. Indira, 'RFID and GPS based Automatic Lane Clearance System for Ambulance', Int. J. Adv. Electr. Electron. Eng., vol. 2, no. 3, pp. 102–107, 2013, doi: 10.1214/IJAEEE/125.

[8] A. Sharma and A. Goen, 'A Review paper on Smart Home Security System using GSM Module', no. January, 2019.

[9] S. K. Singh, "Road Traffic Accidents in India: Issues and Challenges," in Transportation Research Procedia, 2017, vol. 25, pp. 4708–4719, doi: 10.1016/j.trpro.2017.05.484.

[10] M.-C. Gogu, "Developing emergency medical transportation services for a turbulent future," Glob. J. Sociol. Curr. Issues, vol. 8, no. 1, pp. 13–21, May 2018, doi: 10.18844/gjs.v8i1.3401.