

# SWARM Intelligence Based Traffic Management System

<sup>1</sup>Ausarmal Satyajeet Vidyasagar, <sup>2</sup>Dange AltaffHusein Lutupuddin,  
<sup>3</sup>Deokar Swapnil Tukaram, <sup>4</sup>Patil Anil. A.

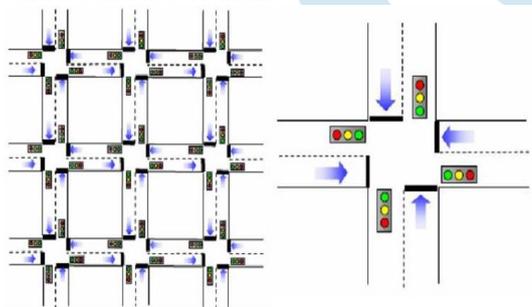
<sup>1,2,3</sup>Research Scholars, <sup>4</sup>Professor

S.V.P.M.'s College of Engineering Malegaon (Bk.), Baramati, Pune.

**ABSTRACT:** Swarm Technology is basically a system which works on real time conditions and the members in the group interact with each other in a decentralized manner to achieve a particular objective via self organization. Swarm intelligence is a field of artificial intelligence. Artificial Intelligence of machine or software is that which studies and develops intelligent machine and software to make day to day life of humans much easier. Now in our project we are implementing this swarm technology for the purpose of traffic control by signal-to-signal control. Currently the systems that are implemented are based on fixed timers or fixed length signals leading to traffic jam. The fixed length timers can be used in smaller areas of low traffic, but for larger area or dense traffic junctions can lead to congestion. Our aim is to reduce this problem by implementing the variable timers. Depending upon the density of traffic, the adaptive timers will be set by using various algorithms. We are developing a scalable and distributed algorithm which can easily adapt the traffic signal plans. This project will also develop a realistic traffic signal development plans. Also safety will be given top priority in our system. One more new feature is added that is android application designed through App-Inventor that helps to locate the least congestion route for a traveller based on his or her destination.

**KEYWORDS:** App-Inventor Embedded System, Swarm Intelligence, Traffic Congestion.

**INTRODUCTION:** SWARM Intelligence (SI) describes the collective behaviour of decentralized, self-organized systems. SI provides a basis with which it is possible to explore collective (or distributed) problems solving without centralized control or the provision of a global model. This removes the need of central server. In SI there are several units working together, helping each other without any central control over them.



Swarm Signal      Individual Signal

FIG.1:- General Overview

Swarm Technology is basically a system which works on real time conditions and the members in the group interact with each other in a decentralized manner to achieve a particular objective via self-organization. Natural examples are ant colonies, schooling of fishes, etc. Swarm intelligence is a field of artificial intelligence. Artificial Intelligence of machine or software is that which studies and develops intelligent machine and software to make day to day life of humans much easier. Swarm behaviour is a collective behaviour exhibited by similar types of species which all together perform a particular task. Now in our project we are implementing this swarm technology for the purpose of traffic control by signal-to-signal control. Currently the systems that are implemented are based on fixed timers or fixed length signals leading to traffic jam. The fixed length timers can be used in smaller areas of low traffic, but for

larger area or dense traffic junctions can lead to congestion. Our aim is to reduce this problem by implementing the variable timers. Depending upon the density of traffic, the adaptive timers will be set by using various algorithms. We are developing a scalable and distributed algorithm which can easily adapt the traffic signal plans. This project will also develop a realistic traffic signal development plans. Also safety will be given top priority in our system. The odd vehicles like ambulance, V.I.P vehicles, Fire brigades, etc. are to be given higher priority and services when they arrive at a crossroad to reach their destination in emergency cases. They shouldn't waste their time getting held up in the traffic signals. However, our approach dynamically deals with the question of which traffic direction shall be synchronized. Decentralized systems, and especially swarm intelligence offer more flexible solutions. So we provide an approach in which each junction (plus its traffic lights) behaves like a social insect goes hand in hand with other junctions which can be considered as other insects, thus collectively as a swarm of insects. Henceforth we use the terms crossing, junction, and traffic light indistinctly. Signal plans are seen as tasks to be performed by the insect. Our aim is to develop a system at signals, this system will have multifunctional operations. Initially the system will measure traffic density at different signals using IR sensors and accordingly change the time delays for traffic lights. The side at which the traffic is high the signal will remain green for more time. Secondly it will also communicate with the adjacent junction signal. Both signals will collectively manage the traffic depending on density. So in the same way all the signals of city will communicate with each other forming a SWARM dedicated system. The whole system is connected to cloud via internet and all the signals will also give information about traffic to cloud using internet. This information about traffic among whole city can be given to the citizen via internet through android application. This android application will show the traffic all over the city & will give a less traffic way or route to user to travel.

**BLOCK DIAGRAM :**

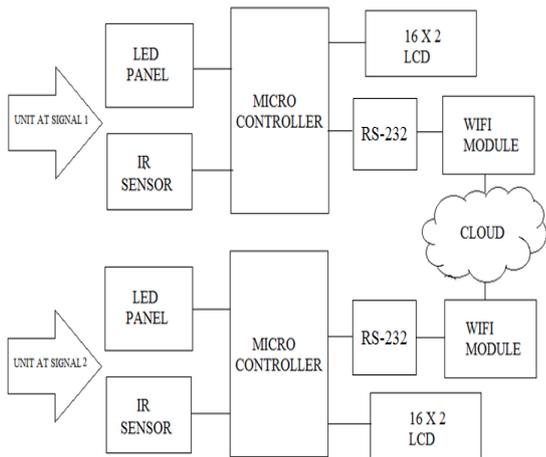


FIG.2:-Block Diagram Of Swarm Intelligence Based Traffic Density Management System

Microcontroller is the heart of the proposed system which is the main control unit of the system. In our project we select the PIC18F452 microcontroller. There are mainly 2 signal units are used. This two signal units are communicate with each other via cloud. The traffic density is measured by using the IR sensors. An infrared sensor is an electronic instrument which is used to sense certain characteristics of its surroundings by either emitting and/or detecting infrared radiation.

WiFi module is used in this system will transfer the data about traffic density to the cloud of the proposed system. Communication among the all signals can be carried out by wifi module. RS 232 is a standard for serial communication transmission of the data. Data is transmitted serially in one direction over a pair wires. Data going out is labelled TX while data coming in is labelled RX. RS stand for recommended standard. The standard was defined to connect computers to the modems.

LCD display is used to display the messages to the public in case of emergencies or suggestions for alternate routes. It can also be used to display the general traffic conditions of the next signal so that the drivers can decide their routes wisely.

In our system, the LED panels are of three LED's i.e. red, yellow and green. Simply this panel is used for the indication purpose. The LED panel forms the visual part of the system which will direct the traffic flow. The LED's are controlled by the micro-controller and based on its control action.

Cloud is the online storage unit. It is used to store any type of data. The data on the cloud is uploaded using the internet. The data on the cloud can be accessed using the internet. In our project we are using the cloud to store the data of each signal. This stored data is accessed using the android app. So using this data we can find a less congested route to travel. Using this data we also get the traffic details of all the city.

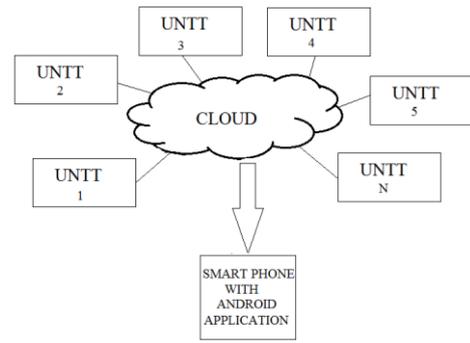


FIG.3:- Block Diagram With Android Application

Android phone is used to receive the traffic updates so that we can select the best route for our faster travel. Block programming is written using App-inventor through which our android phone can measures the less congestion routes and display them on our screen. App-Inventor is a open source web application designed by Google.

**APPLICATIONS:**

- Traffic management of Smart city:-  
A smart city uses information and communication technologies (ICT) to enhance quality, performance and interactivity of urban services, to reduce costs and resource consumption and to improve contact between citizens and government. Sectors that have been developing smart city technology include government services, transport and traffic management, energy, health care, water and waste. Smart city applications are developed with the goal of improving the management of urban flows and allowing for real time responses to challenges.
- Direction of management of traffic:-  
The main aim is to implement a system that would trace the travel time of individual cars as they pass the roadside controllers and compute an average trip time using a rule-based system to decide whether the area is congested or uncongested. If congestion is sensed then system would control traffic signals / generate automatic re-routing messages to selected approaching vehicles.
- Automatic detection of speed and traffic:-  
We can use this technique to calculate the speed of a motorist and to detect if he violates the prescribed/set speed limit. If the motorist violates the rule, a warning message will be sent to the motorist via audio and/or video interface and penalty will be calculated in the server and billed monthly to the vehicle owner.
- Selection of less congestion route:-  
Through our android phone we can select the less congestion routes for our travels.

**CONCLUSION:** This system try to project the concept of dealing with traffic congestion in a smart city. It highly

reduces the modern day problem of traffic congestion that we are facing today. Data on cloud server could be used for analysis of behavioural pattern followed at different signals so help in reducing traffic congestion for effectively and within stipulated time. By this project the problem of traffic can be easily sorted out: the timing of each signal can be automatically adjusted according to density of traffic which is real time operation. It will also clear the path for the ambulance, fire brigade in emergency cases. And also it will help public in taking decisions for reaching their destination in time using auto-routing method.

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