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Algorithm for Effective Movement of Emergency Vehicles from Traffic Control Signal

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ABSTRACT
Emergency Vehicles if behind schedule for a couple of seconds can purpose a primary loss for some. In this paper, a method is proposed for motion of Emergency Vehicles that is Fire brigade and Ambulances in least time. The objective is to direct Fire brigades and Ambulances from supply to Destination point in maximum green and powerful time. Movement of those motors ought to be secure and cars need to follow shortest path.
The proposed method can help in selecting Emergency Vehicles from n-number of available Emergency Vehicles, Directing the shortest safest and least crowded path for the vehicles so that it can reach the accident point in least time. To make the movement of vehicles efficient, all traffic control signals should guide traffic to move in favor of clearing the emergency vehicle's route. Check condition are made for assigning priority to emergency vehicles and higher priority emergency vehicles are facilitated first at a particular traffic control signal, if more than one vehicle waiting on a traffic square. The proposed technique avoids problems that usually arise with standard traffic control system. The Large number of vehicles on traffic square requires routing needs assignment of priority number, judgement and decision. Avoiding bottleneck at a traffic control signal, tracking based techniques will help for routing higher priority vehicles first.
Keywords: shortest path, Global Positioning System**,** Priority assignment, Emergency Vehicles, Dynamic Traffic Sequence Algorithm.

I. INTRODUCTION

Public facilities as Emergency vehicles are Fire Brigade and Ambulance. At any time, these vehicles are to be moved from source to destination point in most Effective time. Movement of these vehicles should be in- time and safe. This requires routing the emergency vehicle and making traffic control signal as per these vehicle movements. The proposed tracking technique of using Global Positioning System avoids problems that usually arise with standard traffic control system. GPS (Global Positioning System) can use a 'transmitter' and receiver. The transmitters broadcast time codes and any receiver can receive the time codes from the transmitters and calculate exactly where vehicle is, that is, on the earth or in the sky above the earth. This GPS technique can be efficiently used with a multi emergency vehicle control and road junction area. It provides an efficient time management scheme, in which a dynamic time schedule is worked out in real time for the passage at traffic square. The real time operation of the system emulates and can help the judgment of a traffic policeman on duty. GPS provides identification information on a receiver that may both receive and transmit information. The GPS satellites continuously transmit digital radio signals that contain data on the satellite's location and the exact time to the earth-bound receivers. The strength of the signal from the tag to the receiver may also be used as allocator used with multiple locaters to triangulate the position. This technology is best suited for smaller spaces, where the infrastructure is already in place to use it. GPS requires specialized scanners to read and transmit data.

II. ASSIGNING CODES TO EMERGENCY VEHICLES AND TRAFFIC SIGNALS

Proposed system consists of six main units, which coordinates with each other and make sure that emergency Vehicles (Fire Brigade and Ambulance) reaches the accident place without any time lag. This system is divided into multiple units. Many important units altogether work for moving the vehicles from source to destination in least time using most feasible path. Where source is the current position of the Vehicle and destination is the accident point. The objective is to optimize the movements of „m" number of vehicles in „n" number of roads with in a fixed area as city or town with most optimized path and with least waiting time on a Traffic Control Signal (TCS). Traffic Junction Unit is a combination of GSM Modem, Microcontroller and Traffic Control unit. As per Table: 1 AB indicates ambulances" and FB indicates fire brigades. Further AB[i] means ith number of ambulance FB[j] means jth number of fire brigade.

Table: 1 Emergency Vehicle

AB	AMBULANCE
FB	FIRE BRIGADE

Table: 2 District code number in Chhattisgarh

SNO	DISTRICT NAME	DISTRICT CODE	TRAFFIC CONTROL SIGNAL RANGE
1	AMBIKAP UR	11	001 to 999
2	BALARAMPUR	12	001 to 999
3	BALOD	13	001 to 999
4	BALODA BAZAR	14	001 to 999
5	BAMETRA	15	001 to 999
6	BASTAR	16	001 to 999
7	BIJAPUR	17	001 to 999
8	RAIPUR	18	001 to 999
9	CHAPA	19	001 to 999
10	DANTEWADA	20	001 to 999
11	DHAMTARI	21	001 to 999
12	DURG	22	001 to 999
13	GARIYABAN	23	001 to 999
14	JASPUR	24	001 to 999
15	KANKER	25	001 to 999
16	KAWARDHA	26	001 to 999
17	KONDAGAW	27	001 to 999
18	KORBA	28	001 to 999
19	KORIYA	29	001 to 999
20	MAHASAMUND	30	001 to 999
21	MUNGALI	31	001 to 999
22	RAIGARH	32	001 to 999
23	RAIPUR	33	001 to 999
24	RAJNANDGAW	34	001 to 999
25	SARGUJA	35	001 to 999
26	SUKMA	36	001 to 999
27	SURAJPUR	37	001 to 999

Similarly, Table: 2 consist of district codes of two digits long. There are 27 districts in Chhattisgarh State. In each district let there are maximum 999 traffic control signals and it can range from 001 to 999. For example, in Raipur districts as per Table: 2, first traffic control signal can be coded as 33001 and second traffic control signal as 33002 third will be 33003 and so on. Maximum Traffic control signals will be 33999. Taking another example say Durg district, Code for traffic control signal range from 22001 to 22999. First two digits indicate district code and next three digits indicate the traffic control signal number.

III. ASSIGNING PRIORITY TO EMERGENCY VEHICLES:

Here we are checking the higher priority emergency vehicles on traffic control signal. On the basis of higher priority main server gives the direction to signals of a Traffic Junction Unit.

Q1. Fire Brigade Required? - Y/N

Q2. Ambulance Required? - Y/N

Q3. Major Fire Accident? - Y/N

Q4. Major Accident? - Y/N

Q5. Distance from main hospital?

Q6. Number of People Hurt?

Q7. Place of accident?

Case 1 If AB1 has P1 priority and FB1 as P2 priority and both waiting at a traffic signal, then allow AB1 First with higher priority.

Case 2 If major accident is yes than assign P1 to AB1 and one more accident case with answer as NO than P2 will be assigned to AB2 as lower priority. At common traffic signal First preference will be given to AB1.

Case 3 If ambulance AB1 not available and number of people hurt as N where N>1 than search for FREE ambulance and allot P1 priority to it and others as priority P2, P3 etc.

Case 4 If number of people hurt in an accident is > than other one than higher priority will be assign to first case.

Case 5 If both accidents have minor causalities than we check the **distance** from ambulance point to accident point and if one is very far away said 10km and other is less. Higher priority is assigned to larger distance accident point.

Case 6 If both the accidents are minor. Distance is same than on the basis of number of causalities, priorities are assigned to emergency vehicles.

Case 7 I**f No emergency vehicle is free,** then identification of nearest vehicle is must and Highest priority will be given to it.

Case 8 If Fire Brigade and Ambulance both are in traffic signal. If there is a major **fire** casualty then FB1 will get higher priority

Case 9 If Fire Brigade and Ambulance both are in traffic signal. If there is a major **accident** casualty then AB1 will get higher priority

Case 10. If Fire Brigade and Ambulance both are in traffic signal. If there is no a major fire casualties and accident case then FB1 will get higher priority

From cases 1 to 10 following algorithm will work.

Initialization

Array FB [5]; ----------List of Fire Brigade

Array AB [50]; -------- List of ambulance

Array TCS [999]; --------- List of Traffic Control Signal

Distance is D True-Green False-Red

Number of people hurt as P Big=0

Number of causalities as C Nearest vehicle NV

Main Algorithm for case 1

If Ambulance and Fire brigade Required is true

If TCS[k] is true

Then AB[j] = P1

Else

FB[i] = P2;

Main Algorithm for case 2

If Ambulance required and Major accident is true

If TCS[k] is true

Then AB[i]=P1;

Main Algorithm for case 3

If ambulance AB1 not available and major accident is true

If TCS[k] is true

Then AB[j]=P1;

If N>1 Major accident is true

Then AB2[i]=P2;

Main Algorithm for case 4

If Ambulance required, Major accident and Number of people hurt as P>1 is true

Then AB[i]=P1 If TCS [k] is true

Then AB[i]=P1

If big>1 Major accident and Number of people hurt as p>1 is true

Then AB[i]=P1

Main Algorithm for case 5

If Ambulance required, both accidents have minor causalities people hurt as P>1 is true

Then AB[i]=P1 If TCS [k] is true

Then AB[i]=P1

If D>10 Minor causalities and Number of people hurt as p>1 is true

Then AB[i]=P1

Main Algorithm for case 6

If Ambulance required, both accidents have minor and Number of causalities as D=C is true

Then AB[i]=P1 If TCS [k] is true

Then AB[i]=P1

Main Algorithm for case 7

If No emergency vehicle is free as AB and FB=0 is true

Then NV=P1 If TCS [k] is true

Then NV=P1

Main Algorithm for case 8

If there is a major Fire causalities is true If TCS[k] is true

Then FB[j] = P1

Else

AB[i] = P2;

Main Algorithm for case 9

If there is a major and accident casualties

is true

If TCS[k] is true

Then AB[i] = P1

Else

FB[j] = P2;

Main Algorithm for case 10

If there is no a major fire casualties and accident case is true

If TCS[k] is true

Then FB[j] = P1

Else

AB[i] = P2;

NOTE: - Analyzing all cases one --- generate an algorithm to cover all type cases not only above maintenance ones.

By using above algorithm/or technology we can control the movement of emergency vehicles smoothing and efficiently within a city.

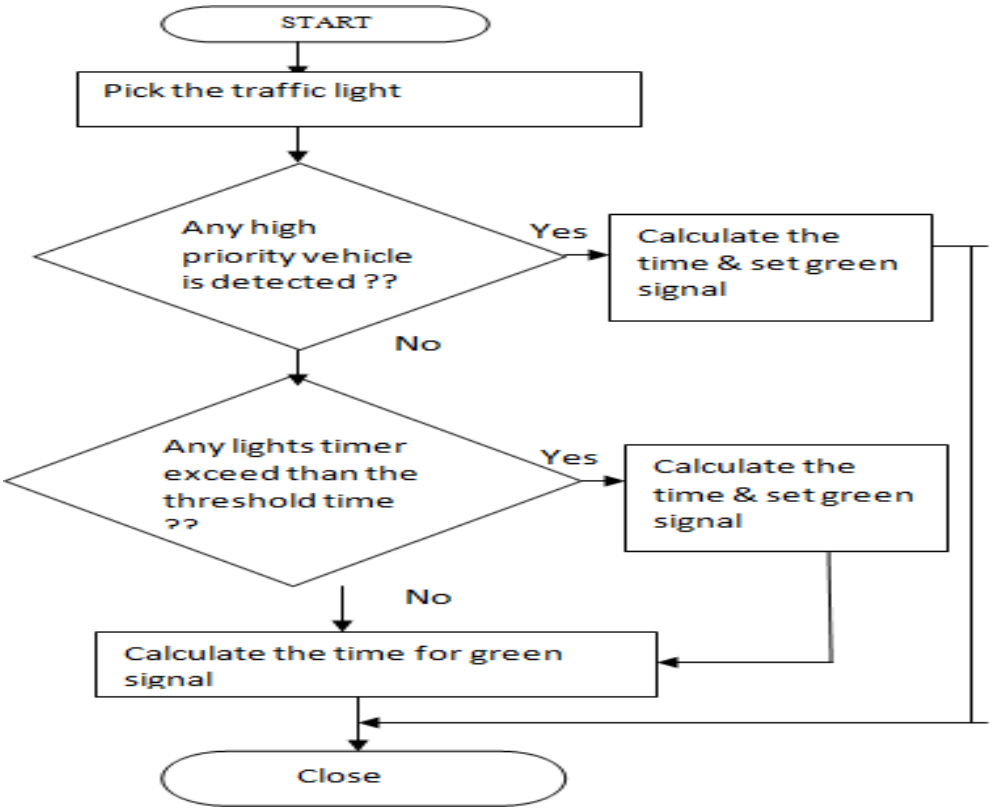

Fig:2 Different Status of Signal Light at a point the flow chart given below represents the

flow of the algorithm. In which after receiving the message from linked lights controller consider the factors like traffic density of the road, priority of the vehicles and queue length and starvation factor to decide the term of the light

To display green signal. The flow chart given below not only works according to the number of vehicles near the traffic light but also solve the problem of starvation that can be arisen. Here the basic purpose of the algorithm is to calculate the green signal time duration and also provide the quality of the service to the Emergency vehicles like ambulance, Fire brigade and authoritative vehicles so that they can reach at their destination as early as possible and reduce the time wasted at the Red Light.

IV. CONCLUSION

This paper proposes a method for controlling the traffic signals in favor of Emergency vehicle movement at the time of emergency call. With this system the emergency vehicle can be reached to the accident spot without time lag. The proposed method proved to be effectual to control not only Fire Brigade, ambulances but also authoritative emergency vehicles. This Higher Priority of Emergency Vehicles System if implemented in state with large population like Chhattisgarh than it can also produce better results. We have implemented GPSF and GPSA to consider the priority of emergency vehicles. We apply Dynamic traffic sequence algorithm for the control of traffic sequence. Chhattisgarh include large number of tribal area and the propose system can be used in providing services to tribal people. Higher Priority of Emergency Vehicles System (HPEVS) is more accurate with no loss of time.

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