

Reduction in Travel Time of Ambulances using Simulation and Scheduling

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Abstract - India is now the second most populous country in the world. It is also one of the fastest developing economy. However, the emergency response is not on par with the Global Standards. In medical world, the term 'Golden hour' refers to the first hour after the traumatic injury, when the emergency treatment is most effective. This in turn means, the ambulances must reach the victim very quickly. Management of traffic is a major obstacle in these urban cities. In this ever-changing environment of traffic situations it is important that we provide priority to ambulances and in-turn human life.

In this paper, we firstly discuss the current scenario of the ambulance services. The primary objective is to design and develop a model that can significantly simulate the flow of ambulances without getting stuck at traffic lights. With this project, we have tried to improve the response time of ambulance in urban area.

Key Words: Traffic Management, Ambulance, Simulation.

1. INTRODUCTION

The initial motivation came after travelling the city of Bangalore, and witnessing the sorry state of ambulances stuck in traffic, especially during peak hours. It is also the general opinion of the public that traffic management infrastructure is not in best state, currently. And the driving habits showcased by most of the drivers are that they deny the right of way to the ambulances. And in another scenario, an ambulance has to pass through a number of signals in order to reach their destination. Sometimes it is impossible for vehicles to pave way for ambulances due to choking traffic.

By using techniques of simulation, we can realize the real world traffic situations and can make necessary changes to them.

1.1 EXISTING SITUATION

Many of the roads in the city are operating above their capacity, and the volume: capacity ranges from 1:2, 1:3 and 1:5 Below is the list of roads that are heavily congested.

Sl. No.	Name of the Road	V/C ratio
1	Nrupatunga Road	3.62
2	District Office road	2.51
3	K.G Road	2.51
4	Lalbagh Fort Road	2.67
5	Puttanna Chetty Road	2.45
6	Richmond Circle	2.26
7	M.G. Road	2.26
8	Chord Road	2.51
9	Tumkur Road	2.62
10	Sankey Road	1.52

- The average speed of vehicles during peak hours dropped to around 15 kmph.
- Parking of vehicles is a huge problem.
- Lack of alternate modes of transport.

1.2 Sub Heading 2

The main purpose of ERS is to provide medical assistance as soon as possible to the ones in need. It is because of the congestion in traffic, the ambulances are not able to reach the patient. In medical terms, the first hour after the accident or a traumatic injury is known as the **golden hour**. It is the time when the treatment is most likely to be successful.

2. OBJECTIVE

We have chosen the route from Bhagawan Mahaveer Jain hospital to M S Ramaiah Memorial Hospital. We need to provide optimal route for the ambulance to reach its destination in shorter duration. Now, the ambulance takes exactly 14 minutes to travel a stretch of 6.6 kms. We have to reduce this time, by simulating the model and schedule the timings of traffic lights.

3. DATA Collection

The signals that fall on the route from Sri Bhagwan Mahaveer Jain Hospital to M S Ramaiah Memorial Hospital are:

- Cantt. Signal
- Burial Ground Signal
- Fun-World Signal
- TV Tower Signal
- Mekhri Circle Signal
- SadashivNagar Signal
- M S Ramaiah Signal

The time required for the last vehicle when the signal turns red to cross the signal is recorded.

Table -1: Example of data Recorded at each signal

Time of the day	SU N	MO N	TU E	WE D	TH U	FR I												
0800	42	27	30	23	31	17												
0900	47	62	57	32	38	38												
1000	37	57	61	44	47	42												
1100	28	65	62	44	51	62												
1200	32	46	43	32	36	51												
1300	29		42	30	27	22												
1400	31	42	35	18	19	27												
1500	34	39	42	17	19	28												
1600	39	33	31	22	27	35												
1700	40	62	51	39	35	63												
1800	49	71	75	42	43	96												
1900	62	69	62	59	52	89												
2000	57	77	72	63	68	72												
2100	68	71	61	38	49	41												
2200	42	55	47	31	28	17												
2300																		

3.1 CALCULATIONS

From the graphs we can see that, the traffic density is different at different times. So, we take a sample of data from Monday to Friday.

Time:1000Hrs

Table-2

Sl. No.	Name of the signal.	Time Required	Avg. time.
1	Cantt. Signal	57+61+44+47+42=251	51
2	Burial Ground Signal	21+19+21+23+25=109	21
3	FunWorld Signal	41+26+26+47+51=191	38
4	TV Tower Signal	23+26+36+21+23=129	26
5	Mekhri Circle Signal	15+55+48+58+32=208	78
6	Sadashivanagar police Stn. Signal	85+75+68+91+84=403	71
7	M S Ramaiah hospital Signal	54+42+68+56+48=268	54

Let us assume that the Ambulance travels at 60 kmph. i.e. 16.5 m/s

1. Time to reach Cantt. Signal = $51 * 16.6 = 850$
2. Time to reach Burial ground signal = $21 * 16.6 = 350$
3. Time to reach FunWorld signal = $38 * 16.5 = 630$
4. Time to reach TV Tower signal = $26 * 16.5 = 430$
5. Time to reach Mekhri circle signal = $78 * 16.5 = 1250$
6. Time to reach Sadashivnagar signal = $71 * 16.5 = 1170$
7. Time to reach MS Ramaiah signal = $54 * 16.5 = 890$

So, from the above data we can confer that, the signal should turn green,

- When the vehicle is 850 mtrs away from Cantt Signal.
- When the vehicle is 350 mtrs away from Burial ground signal.
- When the vehicle is 630 mtrs away from FunWorld signal.
- When the vehicle is 430 mtrs away from TV Tower signal.
- When the vehicle is 1250 mtrs away from Mekhri circle signal.
- When the vehicle is 1170 mtrs away from Sadashivnagar signal.
- When the vehicle is 890 mtrs away from MS Ramaiah signal.

We build a simulation model in SUMO software, and attribute the values we have from the calculations.

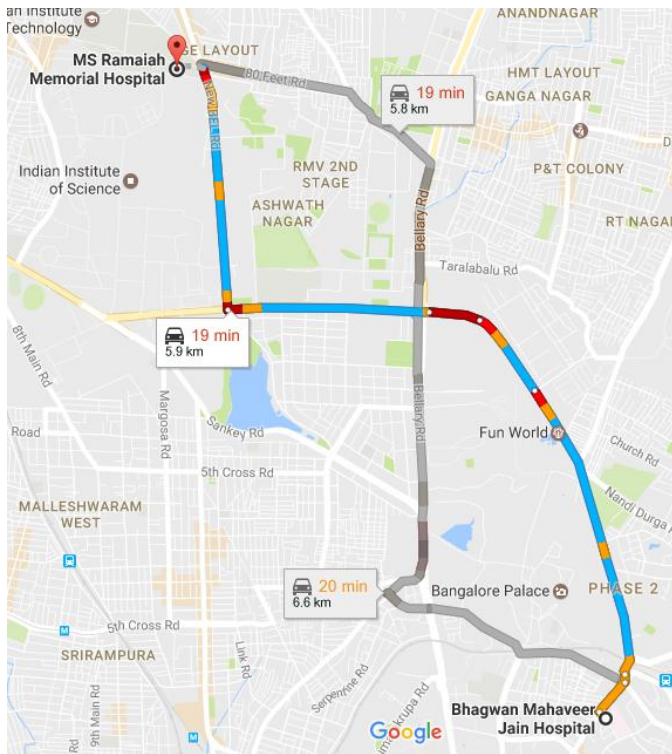


Fig -1: Route map between two Hospital.

4. CONCLUSIONS

After the completion of simulation and experimentation, we can say that there is a significant reduction in the time taken by the ambulance to travel from Sri Bhagwan Mahaveer Jainn Hospital to M S Ramaiah memorial hospital. So, from the experimentation, we can conclude that:

- Simulation helps in realizing the current traffic situation precisely, and gives an insight about the behavior of traffic during different times of the day.
- We can successfully reduce the travel time of the ambulances by managing the traffic signals, as seen in the sample calculation. The ambulance can travel at 60 kmph at an average.
- But, it is difficult to implement these in real life, as the traffic signals are not interconnected and are operated manually by the traffic personnel. This human intervention may cause for the loss in efficiency of the model.

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