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CHALLENGES AND SOLUTIONS OF SMART TRAFFIC MANAGEMENT SYSTEM

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1. Abstract
India is a large populated country most of the population is using there own vehicles. Through the times, there is a unstoppable growth in the volume of vehicles on the road. Smart Traffic Management System is a good option to manage the volume of the vehicles on the road. It helps to manage the traffic on the road by using latest technologies. Camera's and Sensors detects the vehicle and give the green signal for a particular lane which have maximum no. of vehicles.[4] It works on counting algorithm which is mention inside the paper. But there is also some drawbacks of Smart Traffic Management System. In this paper we discussed Challenges proposed Solutions of Smart Traffic Management System. Solutions and their Implementations boost this technology in the future. So that we can use this technology without any error and failure . Couple of advantage is oils are price effectiveness, reduction in waiting/ touring times with price and gasoline performance, point callers surveillance the operation of URL available for clever selection timber is of abecedarian subject.

Keywords – Smart Traffic management system, Object count algorithm, Java Programming, OpenCV

2. Introduction
Smart Traffic Management System is a good option to remove the disadvantages of high traffic. Now a Days Traffic Management System is a very big problem in India. As we know India is a second largest populated country in the world. We face lots of difficulty regarding the traffic jam while driving. There are wastage of fuel, time and mechanical parts of the vehicle due to this high traffic in India.

2.1 Disadvantages of High Traffic
2.1.1 Pollution
Pollution is a very big problem due to high traffic in India. We are facing both air pollution as well as noise pollution due to this heavy traffic. Metropolitan Cities like New Delhi, Kolkata, Mumbai, Chennai, Banglore etc., people faces lots of health issues. Also, air pollution can cause blood pressure to rise and inflame the arteries, increasing heart attack and stroke risk. Whereas, noise Pollution cause stress related illnesses, high blood pressure, speech interference, hearing loss, sleep disruption, and lost productivity.

2.1.2 Time Management

Time management is an issue due to high traffic in our country. Sometimes we can not reach at our destination in the required time. We can see emergency services like ambulance, fire brigade and police vehicle is also effected due to high traffic.[3]

2.1.3 Economically Lost

According to Economic times of India, we lost 1.5 lacs crore rupees per year due to this traffic congestion which is total of 3-5% of our GDP. In this fuel consumption, mechanical parts of the vehicle and many more things are included which impacts our economy also.[2]

2.1.4 Road Accidents

According to Ministry of road transport and Highways of India, there are 1.5 lacs deaths occurs due to road accidents.[1]

In this research paper we are going to discussed the challenges and solutions of smart traffic management system.

3. Literature Review

Introduction part is cover from data which is available on Ministry of road Transportation & highway of India and Economic times of India Explains the total loss due to heavy traffic. Author Ch jayalakshmi and S. kalpna discuss the first challenge which is

The disadvantage of the method is that counting the number of vehicles may give faulty results when space between the vehicles on the road are very small (i.e. two cars very close to each other may be counted as one vehicle) what is smart traffic management system is explain by Jari Haiston Blogs. Author Geethika boddu discussed about STMS using vehicle countingAuthor Basma Murad Discussed how STMS works in foggy weather.

4. Challenges proposed solutions

4.1 Lack of Accuracy

Some Times when the two vehicles are align with each other or Big transportation vehicles like buses and trucks covers the small vehicles like cars, motorbike, e-rickshaw etc. In this case camera which detect the vehicle through the image processing. It may be count single object but reality is that heavy vehicles cover the small one. So accuracy will be less in this case.

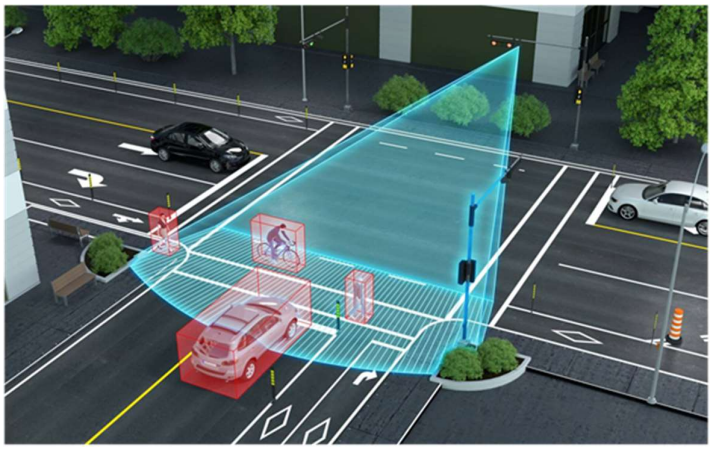

Fig.1.1 if any small vehicle comes under red zone it counts a single vehicle.[13]

4.1.1 Solution

In our country India it is observable that there are lots of congestion nearby the red light area. So we should increase the width of the road at the red light area and make a proper segment for the parking so that cc-tv can easily detect the vehicles through the image processing. And gives the best accuracy.[3]

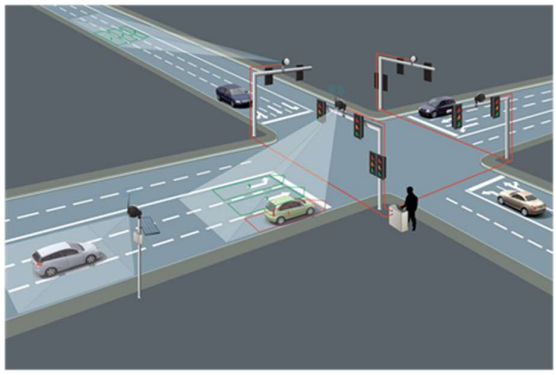

fig.1.2. Less congestion at the red light area.[12]

4.2 Red Light Delay

Smart Traffic Management system works on the counting of the vehicle algorithm. Red light time sets according to it.

- First lane = Total no of vehicle is 30
- Second lane = Total no. of vehicle is 40
- Third lane = Total no. of vehicle is 60
- so, the time required is to the lanes is like
- Green signal for first lane = [30/ (30+40+60)] *120 second = 28 sec.
- Green signal for second lane = [40/ (30+40+60)] *120 second = 37 sec.
- Green signal for third lane = [60/ (30+40+60)] *120 second = 55 sec.

From above example we can observe that the green signal time is more for the lane which has no. of vehicles are more and vice versa for the red light timing for the rest lanes. Country like India it is observe that there is more crowd in one way on the office time in the morning and returning time in the evening.

So, the green light timing will be more for the lane which has no.. Vehicles are more and red light delay for the rest lanes.

4.2.1 Solution

We should mark a maximum time limit (t) for a particular lane. When the no. of vehicles are increasing on that particular lane. Then green signal stay till the maximum time(t). After that its green signal for that lane which has second largest no. vehicle.

- Initial green light t1 = lane which has no. of vehicle is more.
- t1 = (no. of vehicle in first lane+…….+no. of vehicle in fourth lane/no. of vehicle in first lane)*120 second.
- Green light till t1<t
- After that open green light for the lane which has second largest no.. of vehicle.[5]

Implementation

- First lane = Total no of vehicle is 30
- Second lane = Total no. of vehicle is 40
- Third lane = Total no. of vehicle is 60
- so, the time required is to the lanes is like

- Green signal for first lane = [30/ (30+40+60)] *120 second = 28 sec.
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Data Flow Diagram

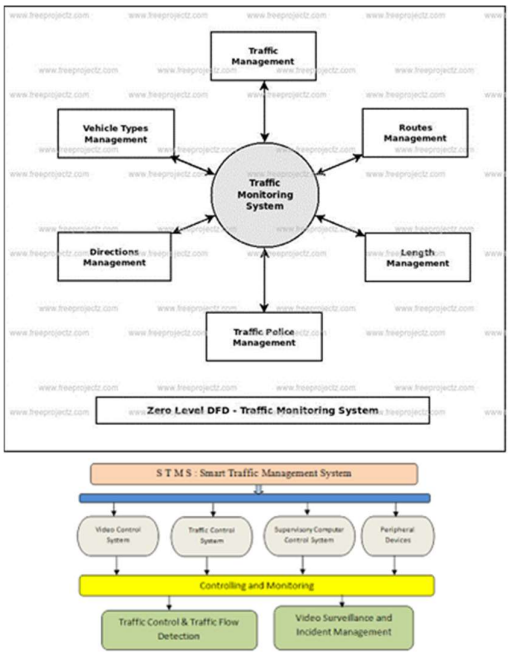

fig.1.3. Data Flow Diagram.[8]

Object count algorithm

Object count algorithm is a process in which we treat the vehicles as a object at the point of intersection. Counting of the objects can be done through the image detecting cameras.

fig.1.4. Counting the vehicles.

Counting of vehicles

Result

Let suppose we have four roads A,B,C,D which meets a point of intersection at point T. if the no. of count of vehicles on the roads A,B,C,D are C1,C2,C3,C4 respectively and C1>C2>C3>C4. Then traffic green time for the roads is also will be T1>T2>T3>T4. Where T1,T2,T3 and T4 is green signal time duration for the respective roads.

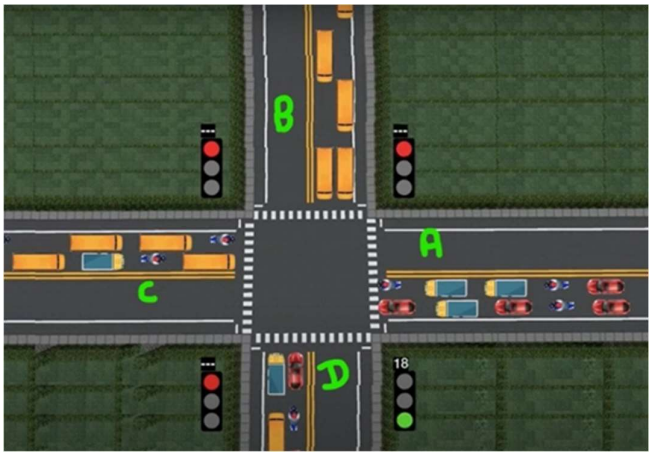

fig.1.5. Implementation Screenshot.

In above output we can see no. of vehicles on road A is more so its showing green signal.

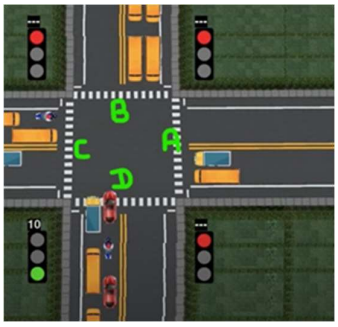

fig.1.6. Implementation Screenshot

In above output we can see no. of vehicles on road D is more so its showing green signal.

Result Table

Situations	Vehicle on lane A	vehicle on lane B	vehicle on lane C	vehicle on lane D	Time calculation (A/A+B+C+D)*120 second	Green Signal for Lane
Situation 1	30	20	10	5	55 second	A
Situation 2	10	30	10	10	60 second	B
Situation 3	10	30	40	10	53 second	C

Situation 4	10	30	40	50	46 second	D

Result Table Analysis

Situation 1

In situation 1 it is observable that no. of vehicles on lane A,B,C,D is 30,20,10 and 5 respectively. So, maximum no. of vehicles are on lane A. Now we calculate the green signal timing for the lane A by using below Algorithm.

Green Signal Time for Lane A = (A/A+B+C+D)*120 second
= (30/30+20+10+5)*120 second
= 55 seconds.

Situation 2

In situation 2 it is observable that no. of vehicles on lane A,B,C,D is 10,30,10 and 10 respectively. So, maximum no. of vehicles are on lane B. Now we calculate the green signal timing for the lane B by using below Algorithm.

Green Signal Time for Lane B = (B/A+B+C+D)*120 second
= (30/10+30+10+10)*120 second
= 60 seconds.

Situation 3

In situation 3 it is observable that no. of vehicles on lane A,B,C,D is 10,30,40 and 10 respectively. So, maximum no of vehicles are on lane C. Now we have to calculate the green signal timing for the lane C by using below Algorithm.

Green Signal Time for Lane C = (C/A+B+C+D)*120 second
= (40/10+30+40+10)*120 second
= 53 seconds.

Situation 4

In situation 4 it is observable that no. of vehicles on lane A,B,C,D is 10,30,40 and 50 respectively. So, maximum no of vehicles are on lane D. Now we have to calculate the green signal timing for the lane D by using below Algorithm.

Green Signal Time for Lane D = (D/A+B+C+D)*120 second
= (50/10+30+40+50)*120 second
= 46 seconds.

4.3 Emergency Services

Smart traffic management system unable to detect the emergency services like Ambulance, PCR vans, Fire brigade etc…

4.3.1 Solution

We should implement the algorithm which detects the siren of the emergency services and open the traffic for it, and also inform the all vehicle drivers present in the traffic through the giving a emergency message to that lane on the screen so that drivers gives the pass accordingly.

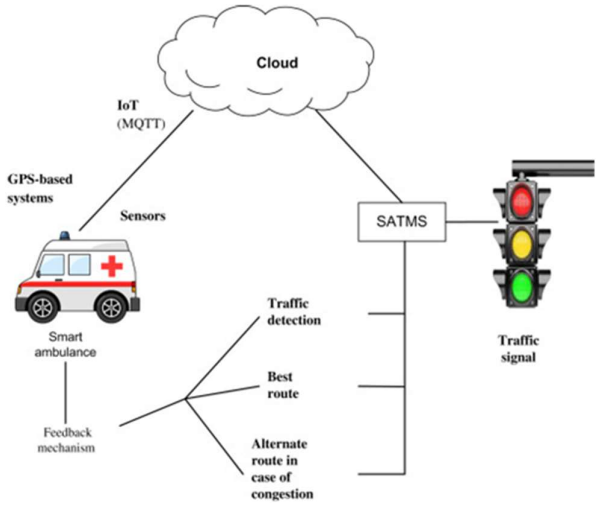

fig.1.7. Detecting the emergency services.[9]

4.4 Server Failure

Server failure is a major problem in the smart traffic management system. Once its fails there will be lots of traffic crowd in the Indian metropolitan cities.

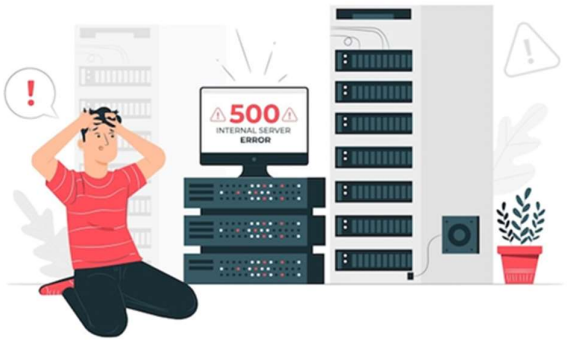

fig. 1.8. Server Failure[10]

4.4.1 Solution

- Server should works 24*7.
- Keep a backup plan.
- Maintain and update the server regularly.

4.5 Maintenance Cost

- Budget of smart traffic management system is more as comparison to traditional one. We need thousand of sensors, cameras, software engineers, server maintenance etc.

4.5.1 Solution

- Countries like US, China and Singapore uses the STMS. Our government should talk on this technology to these countries. So, that we can easily implement this technology on affordable price.

4.6 Bad Weather Effect

- Bad weather effects badly on smart traffic management system. Rainy season can destroy the sensors and other equipments. Which is not gives the proper accuracy.
- In India we can see the lots of fog in winter season so in foggy season cameras cannot detect the vehicles properly.[6]

Fig.1.9. Less visibility in bad weather conditions.[11]

4.6.1 Solution

Special lights called infrared lights that can pass through the fog are placed on both sides of the road posts. The light will be positioned to be intersecting each other like a beam and this beam will hit the cars which are passing through it, so the aim is to see the vehicles which are passing through the light. There will be banner system with overhead video cameras which can automatically capture the image and speed of the vehicle moving through it and display it on the screen.

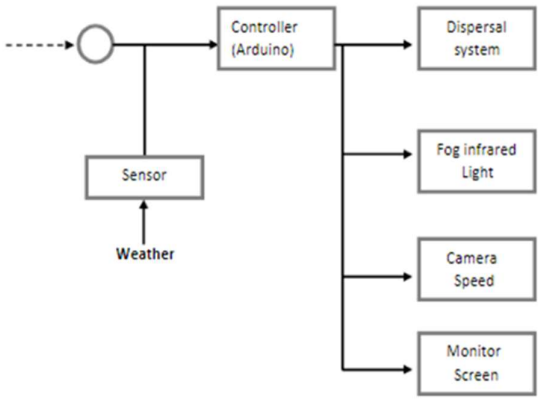

fig. 1.10 Flow chart diagram for the foggy weather STMS.[14]

4.7 Conclusion

Implementation of smart traffic management system is a good option for India to reduce the traffic congestion. But the Infrastructure of our roads, Budget and people awareness is a little bit difficulty for the implementation of STMS. But all the drawbacks can be resolve out. What is the mention above in this research paper about the challenges and their solutions of smart traffic management system. we should work in it accordingly for smoothly traffic in India.

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