

Revolutionary Automatic Traffic Controller

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Abstract— Here, the focus is to control the traffic on bridge as well as on road by using the traffic control optimizer, this setup is provided for the foot path and also the divider of the road which is used to control the traffic by providing extra space on the road during over crowd conditions.

Traffic is a major problem in modern era. Morning to evening, till late night, each one is facing a problem every day. According to the survey, According to “TRAFFIC CORPORATION OF INDIA and IIM KOLKATA” in the year 2012 there is loss of 60,000 crore rupees of India per year due to traffic jam. The study revealed that on 17 big routes of country there is a national fuel mileage of 3.96 kilometres per litre. According to the survey of “Centre for Transforming India” in 2010, there is loss of 2.5 litre of fuel per day in car and 0.7 litre of fuel per day in bike. Due to traffic jam, there is a loss of 90 minutes per day of an average person, if we would calculate it in years, about 23 days an average person wastes in traffic. According to study of IBM the 40% of productivity of the country decreases due to wasted time in traffic jams. Thus the main purpose of making this optimizer is to control the jam by shift down of the footpath (using IR sensor), if there is no crowd on other side of lane then it shifts the divider towards the other side of road at some definite length. In this whole phenomena, IR sensor which sends signal to the microcontroller and operates motorised scissor jack which provides path on the road.

Keywords— IR sensor, Arduino Programmed Microcontroller, Motorised Scissor Jack, Linear Actuator, Fibre Divider Railing, Modified Traffic Light.

I. INTRODUCTION

As we know that traffic is a major problem of the modern age. Population of country is increasing day by day, but our resources are fixed due to which many problems are in existence such as pollution, less space, disease traffic etc. Traffic causes more problems such as wastage of time, consumption of fuel, noise pollution etc. The main factor to which the overcrowded traffic affects is the precious time of man. In today's era, no one wants to waste his time on traffic. Adjusted for the large population, India has less than 3.8km of road per 1000 people including its paved and unpaved & also bridge on the river. The size(width) of the road is fixed according to the free

space. Due to limited space on road and more population, the traffic problems are very common in today's scenario. For this we have tried to introduce a system which can be operated in this limited space for control of the traffic in efficient manner, this set up is designed for the national highways, bridges. This operates when the over traffic is on the road. It distributes the traffic and maintains the stabilisation on the road. By using this, we can save time, heavy consumption of fuel, accidents and jams also. This system helps to circulate the traffic in an efficient way.



Fig1: River Bridge



Fig 2: Road Traffic

II. BASIC DESCRIPTION OF IDEA

Today's heavy traffic on roads is a severe headache for municipal authorities. Due to over traffic, we waste our time as well as some times money also. Today we see that the size of the roads are fixed and also its various components such as divider, footpath are static due to which during jam conditions, the space of footpath are free after some duration when the pedestrian are passed out. Basically jam occurs in two conditions, first, sometime jam is seen on the half of road (i.e. one side) and other half is free (i.e. second side) as compared to the first half and vice versa, and sometimes both sides are completely jam. To overcome this problem, we are going to discuss a solution to control this problem. Our idea is that if the jam exists at half of road and other half is free, then sensor (IR) senses the free & occupied space after which linear actuator shifts the divider towards the other side to a appropriate distance and provides more space. Eventually sensor senses again and footpath track goes

downward side which provides space on road, on doing so we can distribute the jam and can control the disturbed traffic easily. As soon as the traffic is optimised, therefore the traffic light signals to move on from the foot path & also from the divider and comes under the safe line and it toward its original position. This process would occur again if this condition is vice versa.

On the other hand if there is a traffic jam on both sides of road, in that condition sensor senses and then only footpath track moves downward side and divider is kept static in this whole phenomena. This all phenomena is controlled by the arduino programmed microcontroller.

III. DESCRIPTION OF THE ELEMENT

- a) Movable fibre divider
- b) Modified traffic light with two signals
- c) IR sensor
- d) Arduino programmed microcontroller
- e) Linear actuator
- f) Scissor jack

As we know that the road is designed with several component such as divider, footpath railing, traffic light etc. In this approach the old phenomena of the road such as fixed footpath and fixed divider is replaced by the innovative movable divider and movable footpath railing. The working phenomena is given below –

a) Movable Fibre divider - The old concrete divider is replaced by the fibre made divider. The basic work of divider is to divide the road in two parts for up and down motion. The divider is connected with linear actuator, which provides sliding motion to the divider during shifting condition, due to which we can acquire the required space on the road.



Fig.3: Linear Movable Divider

b) Footpath – In the old phenomena of the road the foot path is made of the concrete and at some height, its width is near about 2.5 feet to 3 feet and modified footpath is in the level of road, also it is only separated by the railing, which is made up of cast iron pipe or fibre pipe. This is lifted by the motor operated scissor jack.

c) IR sensor- An infrared sensor is an electronic instrument which is used to sense the certain

characteristics of its surrounding by either emitting or by detecting radiation. Infrared sensor is also capable of measuring the heat being emitted by an object and detecting motion.



Fig.4: IR Sensor

d) Arduino Programmed Control Board – Arduino is used to provide proper interface between the sensors and other electronic and electrical equipment.

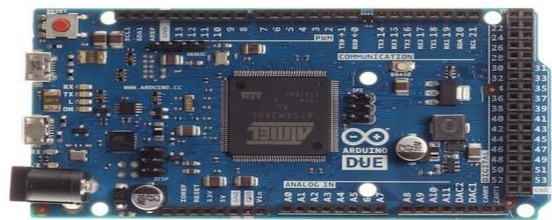


Fig.5: Ardiuno Programmed Control Board

e) Scissor Jack –The scissor jack is mechanical equipment which is used to lift the load. A scissor jack is operated simply by turning the crank which is inserted into one end of scissor jack. This crank is usually of “Z” shape when this crank is turned by the electric motor, the screw turns and this raises the jack. The screw acts like a gear mechanism. It has teeth, which turn and move the two arms, producing work. By only turning the screw thread, scissor can lift load of thousand pounds.



Fig.6: Scissor Jack

f) Electro-Mechanical Linear Actuator- A linear actuator is an actuator that creates motion in a straight line, in contrast to the circular motion of convectional electric motor. Mechanical linear actuator typically is operated by conversion of rotary motion into the linear motion. For accurate and repeatable positioning, index mark may be used on the electric motor. This actuator includes an encoder and digital poisoning readout. These are similar to knob used in the CNC machine and the micrometre, except their purpose is to adjust position rather than position measurement.



Fig.7: Linear Actuator

g)Linear Encoder- Basically encoder is a device, circuit transducer, software program, that converts the information from one format or code to another, for the purpose of standardization, speed or compression.

Linear encoder is a sensor which is read a head paired with scale that encodes position. The sensor reads the scale in order to convert the encoded position into an analogy or digital position by digital read out or motion control. It control in positioning of the object which is attached to the actuator.

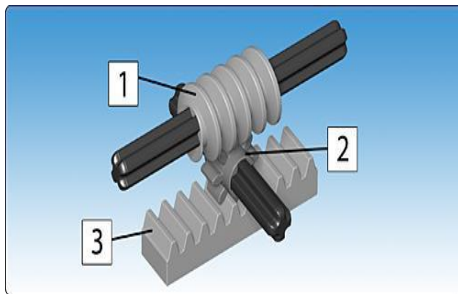


Fig.8: Mechanism of linear actuator

IV. ACTUAL SET UP AND IT'S WORKING

Now in this, we are going to explain the actual set up of the different component of the system. That is given below -

- 4.1. Divider with its additional component
- 4.2. Modified traffic signal
- 4.3. Foot path railing with its additional component
- 4.4. Programmable Arduino micro control board

4.1. Divider with its additional component

Here the divider is made of the fibre with the moving wheel in its base. In the divider, we had provided IR sensor to its both side of the face for detecting the crowd and signalling to the microcontroller to blink the light. And the electromechanical linear actuator is also provided in this set up. The one end of the linear actuator is fixed with the movable divider and other end is fixed with other side of the road at last end of the footpath and further it is attached to the programmable microcontroller.

4.2. Modified Traffic signal

This traffic signal is used for showing the motion of the divider as well as the motion of the footpath railing. This signal is operated by the microcontroller. This shows the motion of different object with different light which

always pays attention from the motion of the object to the traveller. Here, we had given different colour indication which shows the different motion.



Fig.9: Signal indicating the movement of Divider



Fig.10: Signal indicating the motion of the footpath

4.3. Footpath with Additional Component

Here the footpath railing is made of cast iron or fibre. This foot path railing is laced with the IR sensor, the motorised scissor jack and the traffic signal light. This motion occur when there is bumper to bumper jam on the road, at that time the IR sensor senses and signals to the microcontroller which send signal to the traffic light for showing the indication of motion of footpath in downward direction to the traveller, and same at that time the microcontroller sends signal to the electric motor to start and rotates screw jack. For the lifting condition, it rotates motor in clockwise direction and for downward motion it rotates motor in anticlockwise direction.

4.4. Programmable Arduino Micro Controlled Board

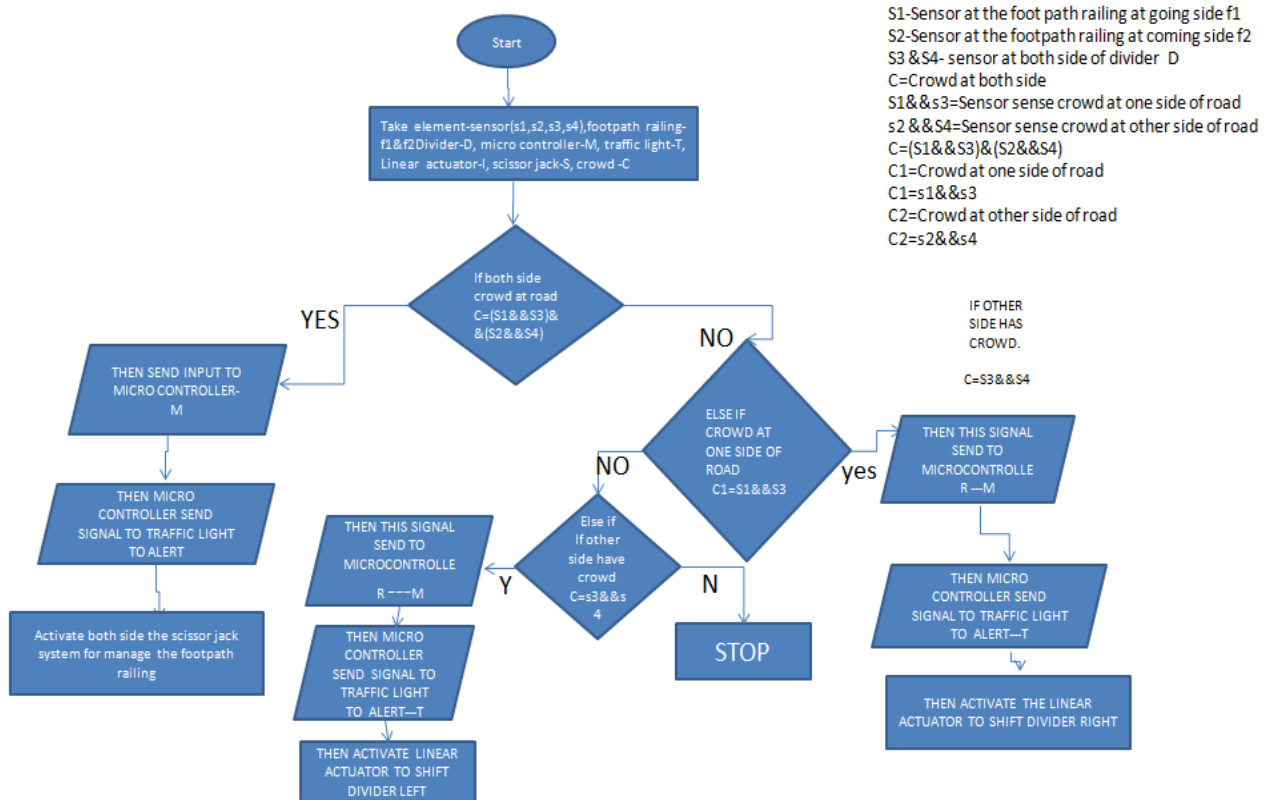
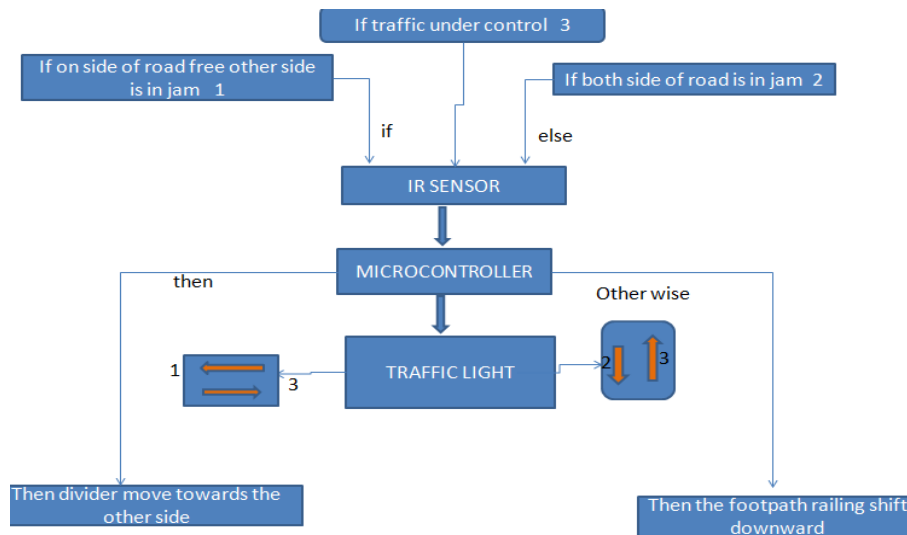
This is the brain of whole system. This whole system is provided to the traffic signal stand. From where it receives the signal of the sensor element and gives the signal to the traffic light & the linear actuator & the electric scissor motor to operate their operations. At the entrance of the bridge as well as road, at both the sides

from up and down side, there is a traffic light which shows the signal of up and down motion of foot path railing. If foot path railing is coming upward side then it gives signal to travellers to not to come in the same direction of the footpath railing. This whole phenomenon is controlled by our programming on the microcontroller. A special instruction is also given at the entrance of the bridge and road, is that, move towards the left side of the road if there is no traffic on the road and to make a proper distance from divider. If at other side of road is

approximately free space then sensor senses the traffic and linear actuator shifts the divider to other side as it feed during programming duration of microcontroller.

Model is working on the following condition-

- When one side of road is free and other is in jam condition or vice versa.
- When the both side of road is filled with traffic.



S1-Sensor at the foot path railing at going side f1
 S2-Sensor at the footpath railing at coming side f2
 S3 & S4- sensor at both side of divider D
 C=Crowd at both side
 S1&s3=Sensor sense crowd at one side of road
 s2 & s4=Sensor sense crowd at other side of road
 C=(S1&S3)&(S2&S4)
 C1=Crowd at one side of road
 C1=s1&s3
 C2=Crowd at other side of road
 C2=s2&s4

When one side of road is free and other is in jam and vice versa-

In this condition the sensor, senses the position of the vehicles on the free road and send signals to the microcontroller which in turn gives the signal to traffic light to show the motion of divider in pictorial form, and when the vehicles are away from divider at that duration the microcontroller send signals to the linear actuator to provide the linear motion in the divider. Due to this we have some space on the other side of road, but for further increasing the space on the road the footpath sensor senses and give signals to microcontroller, which in turn gives signals to traffic light to show the pictorial motion

of divider in led and then after that the microcontroller send signals to the electronic scissor jack to come downward side and hence footpath comes in the level of road and the vehicles can easily pass over them due to which, we can distribute the traffic easily. After some time when the traffic is optimised, the sensor senses and send signals to microcontroller and again it sends signals on the entrance traffic signal, which shows the upward motion of footpath railing. Due to which vehicles are not allowed to come over the footpath. And it gives the signal of motion of the divider on its original position which is shown by the line of blue paint.



Fig.11: Shows basic motion of vehicle on the road



Fig.12: Shows the moment of divider towards the rightward

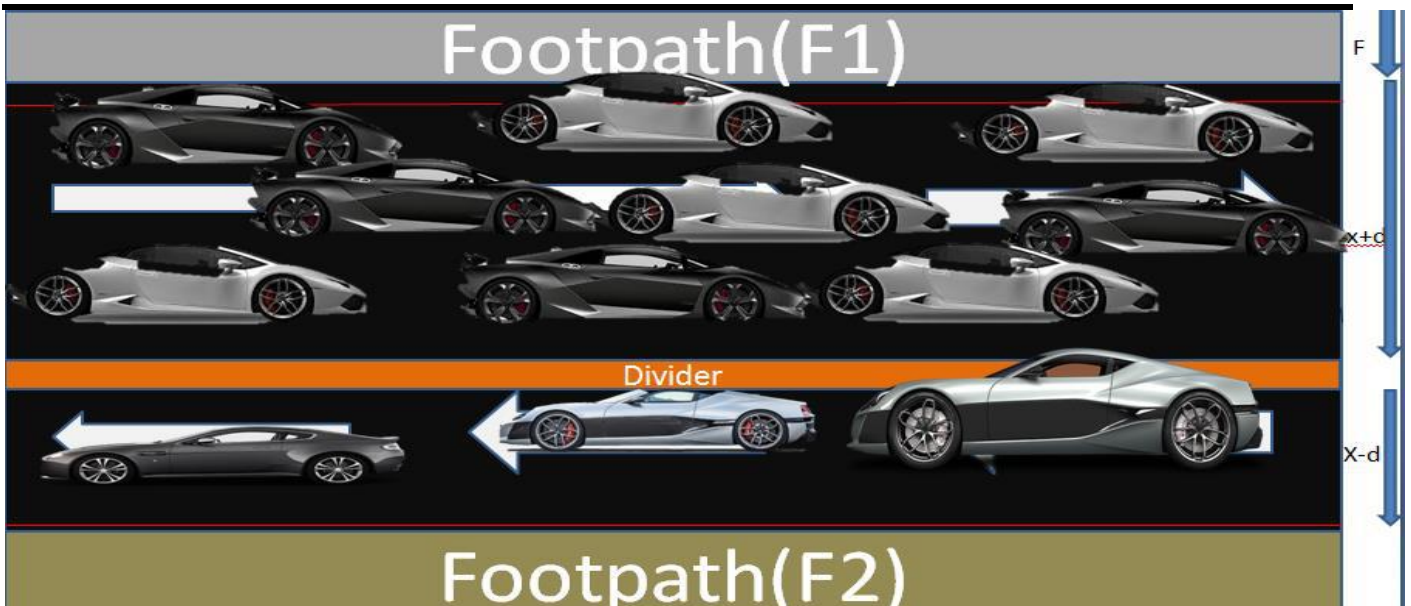


Fig.13: Shows the moment of divider towards the left side

For producing more efficiency, we can also put down the footpath railing and get extra space on the road. As shown in the fig.

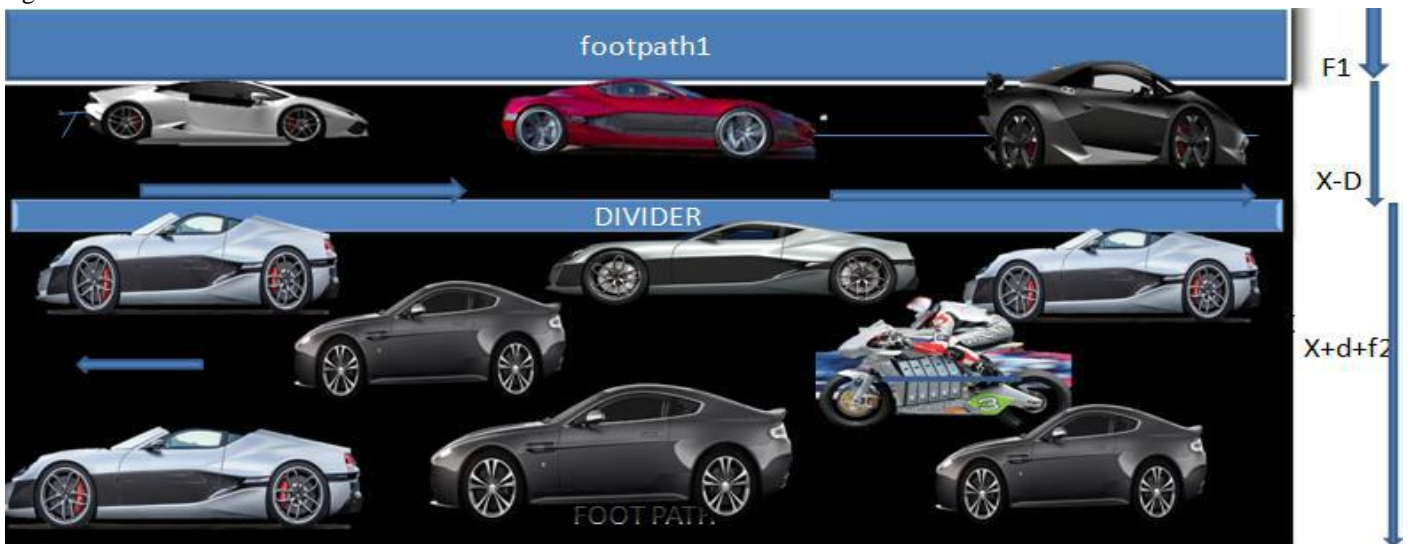


Fig.14: Shows the moment of divider towards right side and motion of foot path downward

When both the side of the road is filled with crowd

In this condition, the sensor of divider as well as the sensor of the footpath sense traffic on the road. In the condition when the both side of the divider is completely filled with jam then in that condition microcontroller does not allow to start the linear actuator. It is totally based on the programming of the microcontroller. But the sensor of the footpath sends signals to the microcontroller which allows the traffic light to show the sign of downward motion of footpath, with orange light starts blinking and the microcontroller is allowed to start the electric motor

of scissor jack which moves downward the footpath railing, due to this we can get extra space at both side of road for coming and going both side. For getting extra space vehicle shift towards the free space. By doing so vehicle can easily pass. After controlling of jam the microcontroller send signals to the both sides of the traffic control light which is present at the entrance of the road to show the sign of coming up the footpath which indicates to be away from the foot path. After that microcontroller send signals to the electric scissor motor to operate for lifting the footpath.

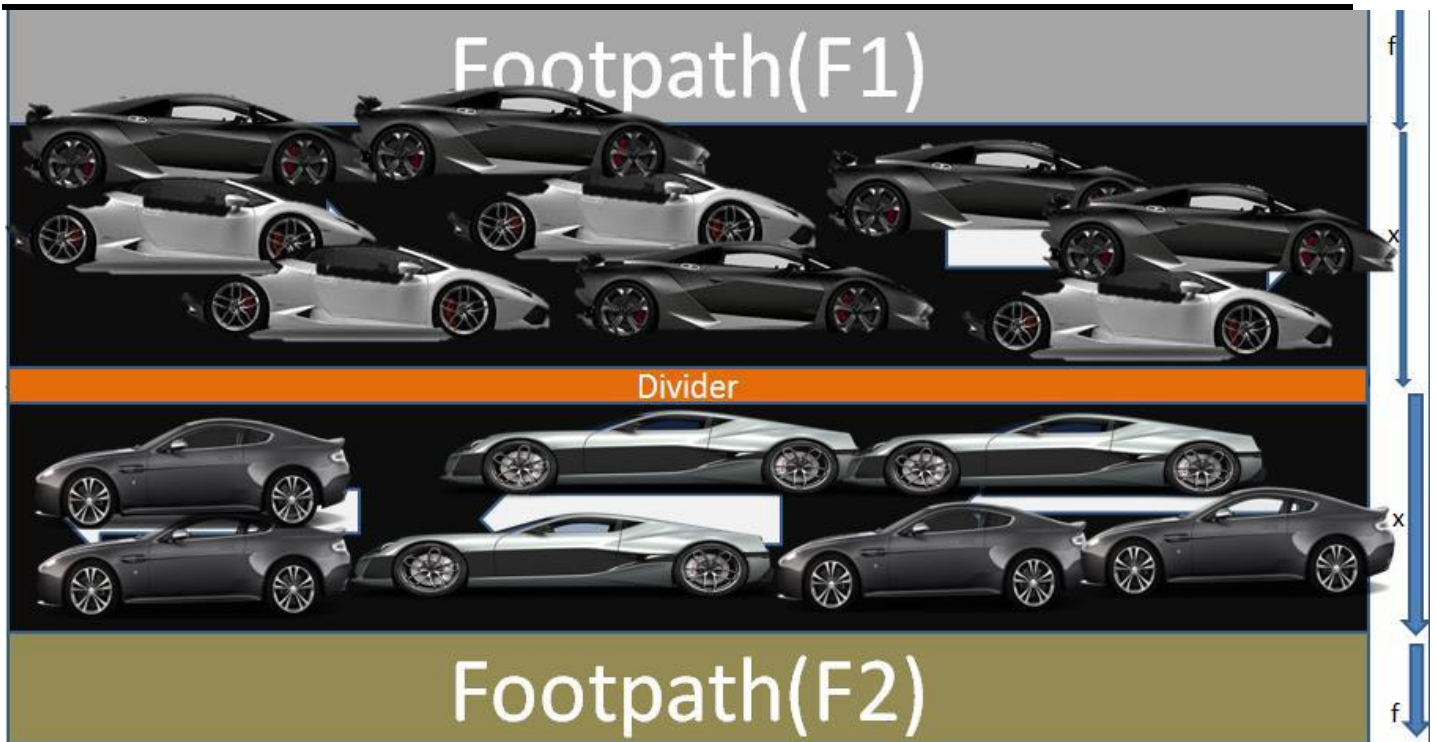


Fig.15: Shows traffic on both side and all components on its basic position



Fig.16: Shows the motion of foot path on both side of road

V. CONCLUSION & RESULTS

➤ We can shift our upward footpath in downward motion so that the extra space is provided by the

road. Around 3 feet will be helpful for the control of the traffic.

➤ If the condition is still not in control or over loading on the road then we can use the extra space provided

by the divider and approximately 4 feet extra space could be provided. Around 27 feet of the road will be helpful to control the traffic.

- The same procedure will be done for the morning shift when no. of vehicles coming decreases, the road will increase, we will follow the same procedure or vice versa for above mentioned point.
- The controlling of traffic should be totally depended upon the signal light. We have to provide the different types of relevant signal light for the movement of movable divider or foot path.
- As we already use three lights for the different purpose for the traffic control, so we have to apply different coloured lights, say orange with up and down motion.
(Specially, for particular inspection done on HAZRATGANJ SQUARE, Lucknow)
- Timing: 5:00 pm to 7:00 pm the no. of vehicle from one lane is approximately 80,000.
- If we consider the parts of the road is on its relevant position then the time lag is 2 min, but if we use the extra space then the time lag may be decrease up to 1min.
- Time lag is depended upon the no. of vehicles passing on the same road, if the no. of the vehicle increases so that it will be helpful for decrement of traffic and finally we can have a power full traffic control system.
- The main question arises in our mind that 'what will happen when footpath is converted into the road then where the pedestrian would walk then we can shift both side pedestrian into one side with the help of zebra crossing at the equal distance before or after of roundabout.
- When one side footpath is converted then with the help of zebra crossing, then the second side is converted or shifted to another side.
- The same will be repeated for morning downwards motion.

By the use of traffic optimizer, we can control the traffic as well as provide suitable and comfortable environment to the huge crowded cities. By this system we provided the extra space on the road for the suitability of vehicles with zero disturbance, we can reduce the time lag which can impact on the saving of precious time, money, wastage of fuel and as well as to provide protective environment. This complete system undergoes a pre-deformed scenario of the project describe on this for the human suitability and comfort ability. This idea will drastically change the problems of present era to overcome all the grievances and will provide a fruitful environment among us.

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