



DENSITY BASED TRAFFIC CONTROL SYSTEM USING PLC AND SENSORS

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Abstract: Traffic controlling is very important in the present scenario. Present traffic controlling system fails to control the traffic at busy junctions. Traffic signal controlling is probably the best option to control the traffic as it is very convenient to control the traffic. In this paper PLC (programmable logic controller) plays a vital role in controlling the traffic automatically. The system controls the traffic based upon the density and flow of the vehicles. By using sensors it calculates the density of the vehicles at all the lanes and prioritize the signals according to their density. According to the logic operations and program given to the PLC it controls the traffic by giving appropriate signals based upon their density. If the traffic flow is more then green signal is given to that lane and if the traffic flow is less then the red signal is given to that lane.

Index Terms – Traffic control, PLC, Sensors, Vehicle density, Traffic Signals

INTRODUCTION:

The traffic control is one of the most important public facilities for road users. Traffic lights play a vital role in controlling the traffic accordingly to the vehicles and passengers. As the traffic is increasing day by day traffic control is must. Traffic safety is must so that accidents can be reduced. Traffic lights are one of the safety measure to control the traffic so that the vehicles can flow safely and it is advantageous to passengers also while crossing the road. We can control the traffic using traffic lights as they are very convenient. In the conventional traffic control system it may be observed that the time of signal light glowing for a particular road will be always constant. Sometimes it may happen that, one particular road may be crowded more than any other. In such cases, the conventional traffic control system will fails to give priority to the heavy traffic lanes. In this system we will control the traffic based upon their density and the flow of vehicles by using plc and sensors. We will give the logic operations and programs to the plc so that according to the program given it works. By using the sensors we can calculate the density and flow of vehicles at all the lanes. According to the density and flow of vehicles it shows the signals according.

LITERATURE REVIEW:

C Barz et...al; presents the traffic control system controlled through a PLC which takes the signals from different sensors on roads. The global system developed ensures the coordination of four intersections, setting a path that respects coordination type green light, the integration of additional sensors, the implementation of probes radar to inform traffic participants about recommended speed for accessing the green state located in the intersection that will follow to cross.

Ashwini Y Dakole et...al; The new architecture and design theory of this system is integrated by lot of hardware modules such as ARM LPC 2148 microcontroller as a control unit to combine with global positioning system and CC2500 RF module by the hardware/software co-design, the new traffic control system can be design. The traffic congestion can be caused by large Red light delays in the normal traffic control system. The ARM7 based traffic control system proposes a multiple traffic light control and monitoring system that reduce the possibilities of traffic jams, caused by traffic lights. The system is based on ATmega16 and ARM7.

Roxanne Hawi et...al; describes Inadequate space and funds for the construction of new roads and the steady increase in number of vehicles has prompted scholars to investigate other solutions to traffic congestion. One area gaining interest is the use of smart traffic control systems (STCS) to make traffic routing decisions. These systems use real time data and try to mimic human reasoning thus prove promising in vehicle traffic control and management. This paper is a review on the motivations behind the emergence of STCS and the different types of these systems in use today for road traffic management.

Nikhil R. Chitragar et...al; Traffic signals are the most convenient method of controlling traffic in a busy junction. Present traffic signals fail to control the traffic effectively when a particular lane has got more traffic than the other lanes. The intelligent or "Smart Traffic

Control” is one which would be able to calculate the vehicle density in a lane at a 4-way crossing and then decide the priority automatically using a program.

Rajeshwari Sundar et... al; As a result traffic problems has increased in the last few years and the present traffic light controllers have limitations because it uses the predefined hardware that does not have the flexibility of modification on real time basis. Due to the fixed time intervals of green, orange and red signals the waiting time is more. To make this traffic light controlling more efficient a new technique is emerged called as “Smart Traffic Control System”. The timings of the red and green lights will be smartly decided based on the traffic on adjacent roads.

Varsha Srinivasan et...al; The problem of urban traffic congestion is constantly spreading. The increase in traffic is due to the growing number of vehicles and the limited expansion of roads. We propose a system for reducing traffic congestion using image processing by detecting blobs and tracking them. The system will detect vehicles through images instead of using electronic sensors embedded in the pavement. We also plan to provide a suitable solution for emergency vehicles stuck in traffic to clear the route by using Bluetooth, thus assuring timely help to those in need.

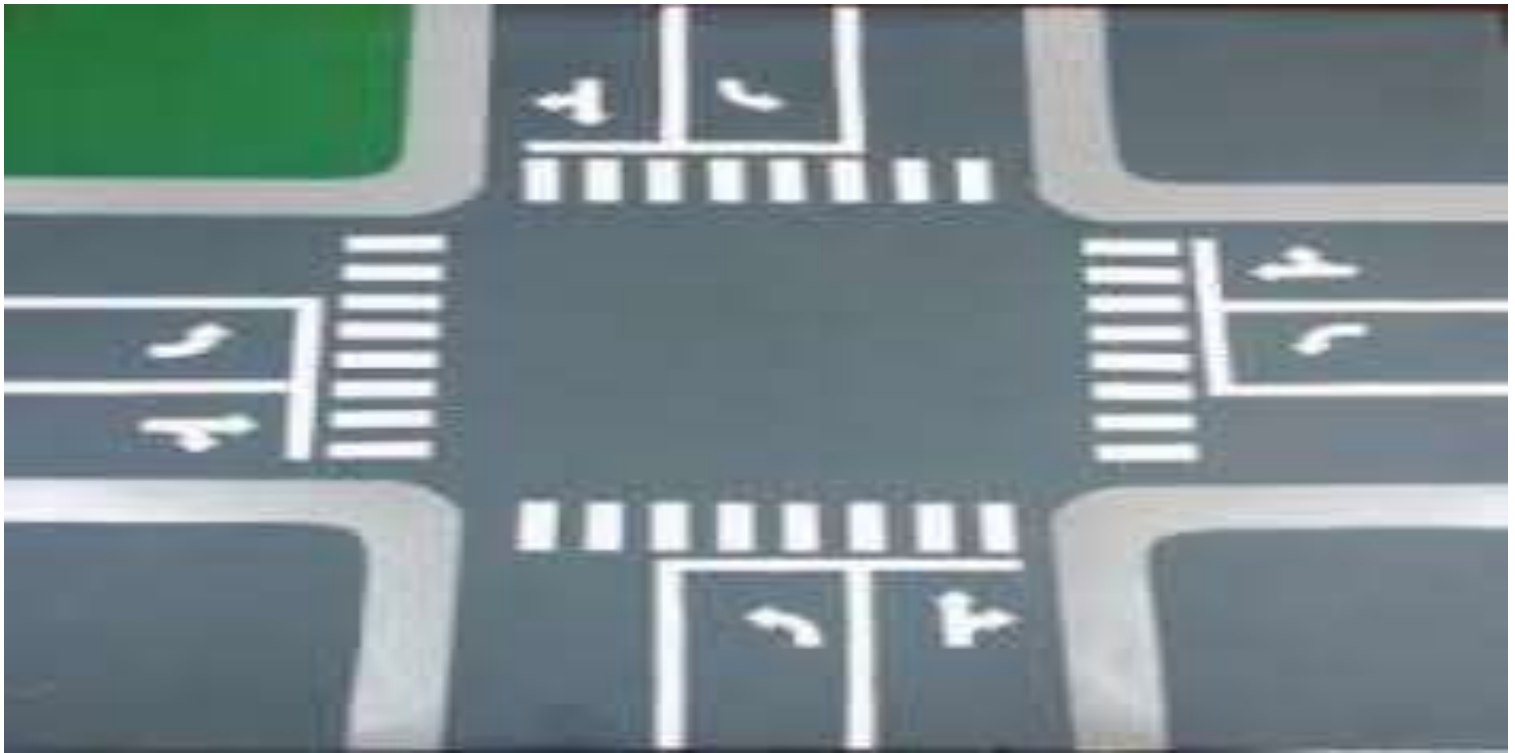
Mrs.E.Shanthini.E et...al; Due to rapid urbanization there is a need for implementing an effective traffic control systems to avoid heavy congestion. And also to make a better solution for ambulance clearance helps to protect the human life. The idea behind the proposed system is to provide effective traffic control systems by the use of embedded technologies. This paper concentrates on ambulance clearance and the stolen vehicle detection. This makes use of RFID, GPS, and GSM along with Embedded technology. Here each vehicle is placed with an RFID tag. Whenever the RFID reader reads the tag of ambulance it turns ON the green light for that particular path till the reader reads the RFID tag. The position of theft vehicle is located with the help of GPS and the information is transferred through GSM to the control room. When the tag of stolen vehicles is read by the reader it turns on the Red signal. This prototype was tested using Simulation tool and the expected results are obtained.

METHODOLOGY:

In present scenario we can see the failure in traffic control which leads to many problems like accidents, traffic jams, to overcome this we have come up with an idea of density based traffic control system using plc and sensors. In this project we develop a system which controls the traffic based on traffic density at the lanes and flow of the vehicles. We also consider emergency vehicles and give the priority to the lane which is having emergency vehicle and then the priority goes to the lane which is having more density and more flow of vehicles. In recent times we can see many accidents due to the fail in traffic control. We control the traffic with the help of traffic lights, PLC and sensors. The vehicles are parked in an automated area where the sensors are kept. Sensors detect the density and flow of vehicles at all the lanes and give the signals to the PLC. We feed the program in the PLC according to the program it works. According to the program given in the PLC it prioritizes considering the factors like emergency vehicles, density and flow of vehicles. The green signal is given to the lane which is having emergency vehicle if there is no emergency vehicle the green signal is given to the lane which is having more density and flow of vehicles and the other lanes are blocked. By this vehicles systematically so we can reduce the traffic jam.

PRACTICAL DESIGN:

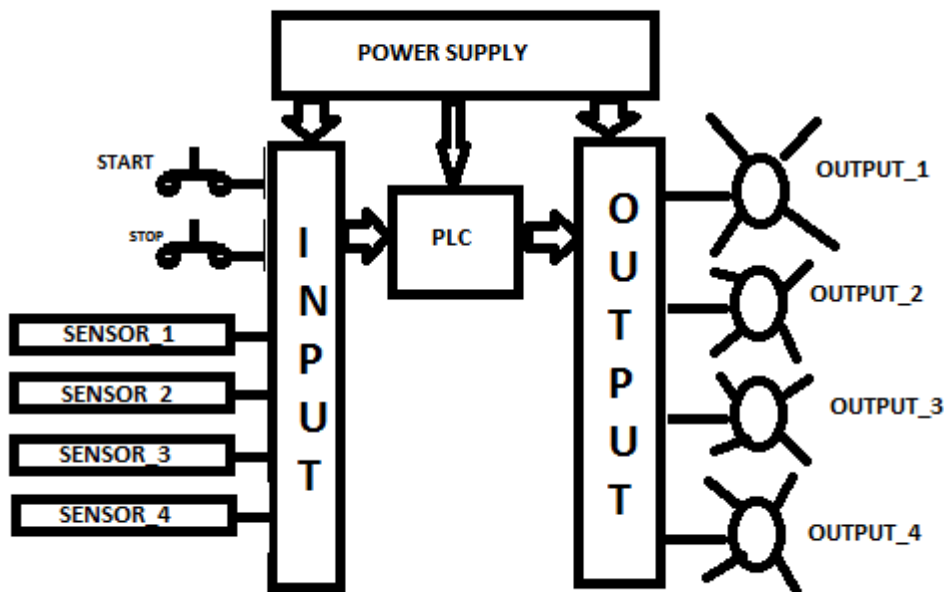
There are generally four lanes at every junction. The sensors are connected to all the lanes at two sides of the lanes the pulses of the of the sensors when vehicles are passed through the lanes are passed to the PLC and the vibration sensor detect the emergency vehicles and pass the signals to the PLC. The ladder program is dumped into the PLC so the system operates according to the program given in the PLC. The input is given by the sensors and the output is provided by the LED signals or traffic lights. Whenever a vehicle comes in an automated area then the IR sensor is activated whenever an emergency vehicle comes then the vibration sensor is activated. The sensor works on PNP principle which means when the object is placed in the range of a sensor then the output is provided.



WORKING PRINCIPLE:

Traffic load is dependent on factors such as time, day, season, weather and unpredictable situations like accidents or construction activity or any special event. The main aim is to minimize waiting time for each lane as well as serving the busy lanes as much as possible.

The first step is to collect the signals from the sensors at all the lanes. Next step is we have to check if there is any emergency vehicle at all the lanes. If the emergency vehicle is not there then the first priority goes to the lane which is having more density and vehicle flow that means the green signal is shown to the lane which is having more density and flow of vehicles and other lanes are kept blocked. If any emergency vehicle is present in any of the lane then the priority is given to that lane which is having emergency vehicle then the next priority is given to the lane which is having more density which means the green signal is shown to the lane which is having an emergency vehicle and the other lanes are kept blocked.

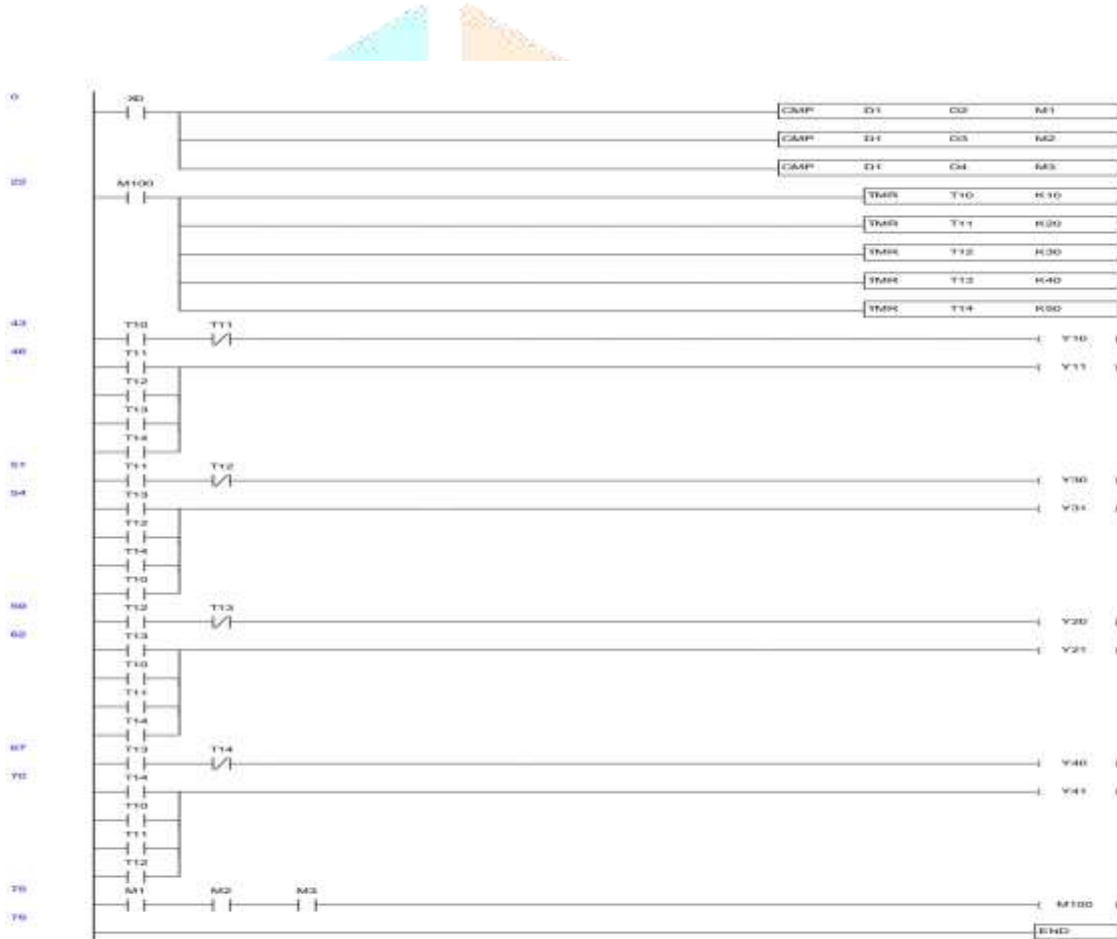


SYSTEM DESIGN:

The sensors are connected to all the lanes which are used to detect the density and flow of vehicles the sensors we generally use are IR sensors. Vibration sensors are also connected to detect the sound of emergency vehicles. The vehicles are parked in the automated area where the sensors are connected to all the lanes. The sensors detect the density and flow of vehicles and pass the signals to the PLC. The vibration sensors detect if there is any emergency vehicle is there at any lane if there is any emergency vehicle at any particular lane then the vibration sensor detects the sound and pass the signal to the PLC. If there is any emergency vehicle then the signal is kept ON that means the green signal is automatically given to the lane which is having emergency vehicle. If there is no emergency vehicle then the signal is kept ON for the lane which is having more density and flow of vehicles and the other lanes are kept blocked that means the red signal is given or the signal is kept OFF to all the other lanes. If suddenly the emergency vehicle has come to any lane then automatically the green signal is given to that particular lane that means the OFF signal is automatically changed to ON signal or the red signal is automatically changed to green signal then the loop continues.

SIMULATION RESULT:

In this paper we use delta PLC and WPL software as it will be easy to use and it is very advantageous. The WPL software has many features like cut, copy, paste, multi window display etc in addition to that it also has comment editing feature. IR sensors in each lane detect the flow of vehicles and pass the signals to the PLC. The vibration sensor detects the emergency vehicles and pass the signals to the PLC. PLC is given a program according to the program the traffic lights are automatically operated. As a result the system operates in a systematic order. The sensors and PLC monitors the whole system. Green signal for all the lanes is given based upon the flow of the vehicles and if there is any emergency vehicle. By this system there are many advantages as they reduce traffic congestion and give the proper time to pedestrians to cross the road . this system can reduce the accidents.



SOFTWARE IMPLEMENTED:

WPL Software is a program editor of Delta DVP series PLC for WINDOWS computers. In addition to general PLC programming and WINDOWS editing functions (e.g .Cut, paste, copy, multi-window display, etc.), WPL Software also provides various comment editing as well as other special functions (e.g. register editing and settings, file accessing and saving, contacts monitoring and setting etc.).

CONCLUSION:

In this system the traffic is successfully controlled by traffic signals and the emergency vehicles are detected by the vibration sensors. This system helps to reduce the accidents and helps to allow the emergency vehicles to pass through the road by automatically converting red signal into green. This system helps to reduce traffic jams at the junctions. The sensors are interfaced with the Delta PLC. The program is given to the PLC and according to the program the system works. By this the traffic can be controlled. This system can make safer to the public while travelling on roads.

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