Intelligent Traffic Light Control System

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Abstract— intelligent traffic system deals with providing the automatic system without the need of any human control over the system.The system provides the ease to ambulances and fire brigades by prioritizing them from other vehicles and allowing to pass first, this system also gives the excellent connectivity with previous junction to notify them about the traffic ahead leading to comfort the commuters.

Index Terms— RFID, ZIGBEE, SWITCHES WORKING AS SENSORS

Introduction

The problem in our basic traffic system is that the system is by default set without considering the traffic on any of the road sides. The basic traffic system does not consider thepriority of any path and irrespective of heavy traffic on any side it works in by- default state. And due to rise in more number of vehicles this has become a problem, causing traffic congestions. Thus in order to overcome the above situation we have designed a system which works according to the status of traffic on any of the paths and depending on the traffic density on either of the paths, the traffic is allowed to pass and the time for the path to be ON is decided by the traffic density. thus if the traffic density is highest say on path1,then it is turned on for more time causing the traffic to resolve, thus improving better traffic conditions and making the system intelligent.

The other problem with the basic system is that the emergency vehicles say ambulance or fire brigades are treated as normal vehicles irrespective of allowing them to pass first, thus creating a serious problem. The intelligent system overcomes this problem by using a technology called RFID (radio frequency identification number). This RFID consist of a RFID tag and RFID reader. This RFID tag is placed on the emergency vehicles, and so as the emergency vehicle comes in the range of RFID reader (RFID range is 70meters approx) the traffic light on all the other three paths are turned off and the path via which the emergency vehicle is detected is turned on giving it the highest priority. Thus the intelligent system works on the priority level basis for the emergency vehicles causing the system to be more effective.

THE MOST IMPORTANT FEATURE OF INTELLIGENT TRAFFIC SYSTEM IS THAT THIS SYSTEM ALLOWS THE COMMUNICATION BETWEEN TWO JUNCTIONS, CAUSING THE TWO JUNCTIONS TO GET THE REAL TIME TRAFFIC ANALYSIS WHICH PRACTICALLY CAUSES THE DATA TO BE TRANSMITTED BETWEEN THE JUNCTIONS WIRELESSLY USING THE TECHNOLOGY CALLED ZIGBEE. THIS ENABLES THE COMMUTERS TO GET THE REAL TIME TRAFFIC ON THE JUNCTION AHEAD, CAUSING THEM TO DECIDE WHICH ROUTE TO FOLLOW.

PROPOSED MODEL

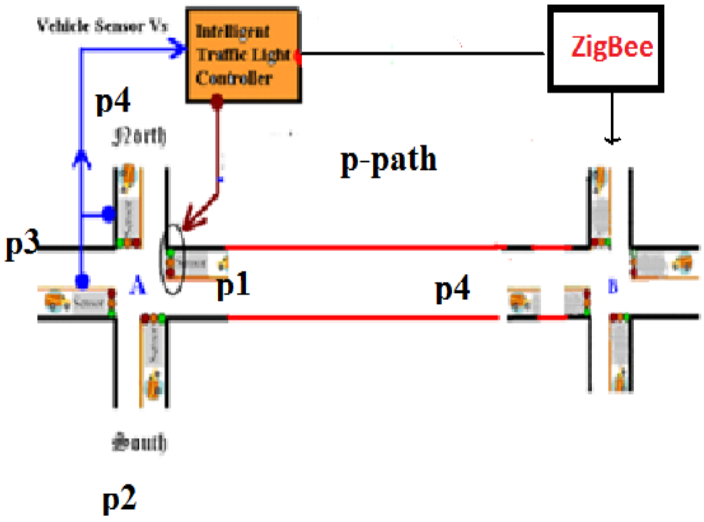


Figure.1 controlling the traffic of two junctions

PROPOSED MODEL WORKING

Consider junctions A and B. Junction A has four paths (1,2,3,4).the sensors are placed on each of the paths and the output of all the sensors(on four paths) are given to microcontroller 89s51 which acts as the heart of the system. Timer on each of the paths is set to 10msec initially (timer decides the time for the path to be green).the maximum count of vehicles on each path in our project has been taken to be 30. Now when the system starts, the system works in a default state. As soon as the vehicles on each of the path crosses the sensors the count (on each path) goes on increasing .as the count increases the timer too increases. Now say at path 1,2,3 and 4 respectively we have 5,6,7 and 8 vehicles. then the timer for path 4 will be maximum compared to path 3 , 2 and 1 ,thus signal for path 4 will be ON for more time.

The other part comprises of transferring the current status of traffic from junction A (path 1) to junction B (path4) via zigbee. LCD is placed on path 4 of junction B displaying the status of path 2 of junction A. The lcd displays “LOW TRAFFIC “when there are less vehicles on path 1 or “ HEAVY TRAFFIC AHEAD TAKE SOME OTHER PATH” when the traffic is very high having vehicles more than 30.

The proposed model of INTELLIGENT SYSTEM overcomes the current issues of basic system making easy for commuters to travel.

WORKING

At Junction A:

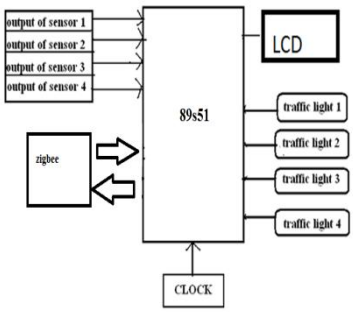
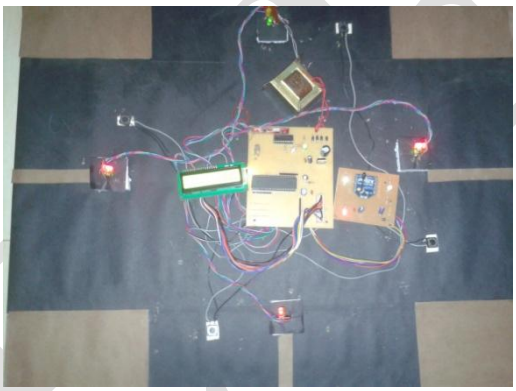


Figure.3



Above circuit is the junction A of our project.

At Junction B:

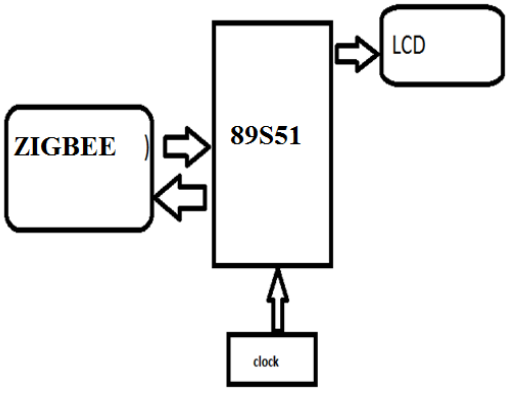
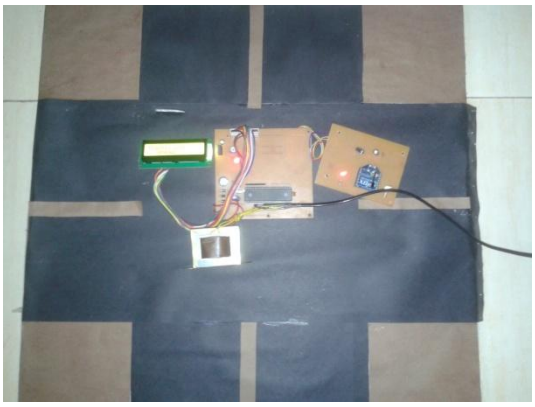


Figure.4



Above circuit is the junction B of our project.

The working of the intelligent traffic control system is divided into three parts:

1) Intelligent system :

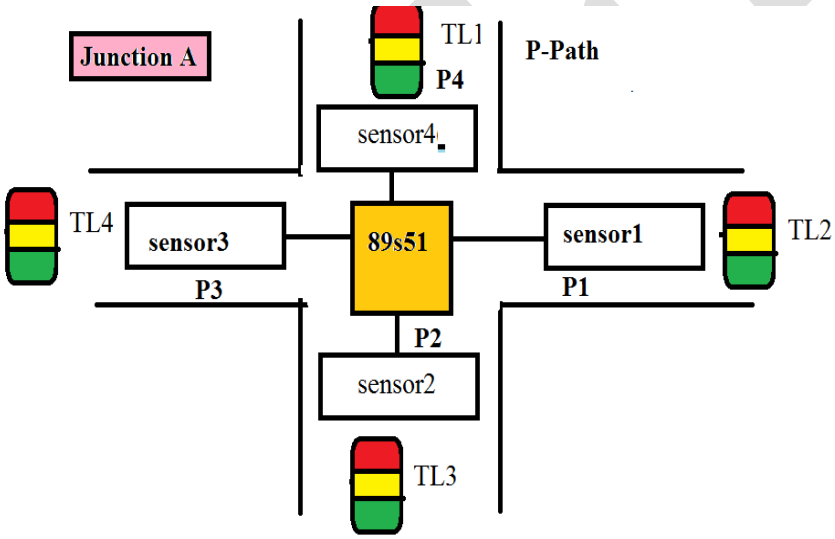
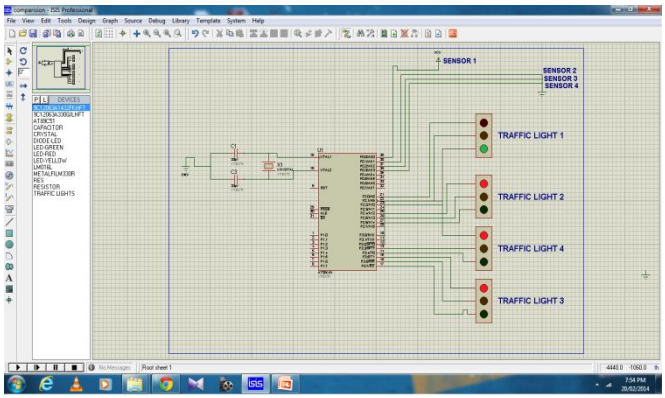


Figure.2 intelligent system at junction A

The proposed model of intelligent traffic control system uses the microcontroller 89s51 which acts as the important part of the system. The microcontroller works on an algorithm of controlling the traffic of all the four paths.the traffic on a particular path is detected by the sensors placed on that path. The sensors are placed at approximate distance of 25meters, as soon as the vehicle passes the sensor, the count of that path is incremented, this process is followed on all the four paths. The 89s51 takes the count from all the four paths after 30msec and depending on the number of counts the timer for the green light to turn ON is decided by the algorithm and the vehicles are allowed to pass. For higher count the timer is increased more and the green light is turned ON. Now the timer starts to decrease and when the timer reaches to 0, red traffic light is turned on for that particular path. This algorithm is repeated throughout, making the system work intelligently.



The above snapshot shows that the traffic light 1(TL1) is ON, which indicates that there is heavy traffic on path2(P2) as compared to paths 1,3 and 5. So as soon as 89s51 receives the data about heavy traffic on a particular path it turns the green signal high for more time on that path.

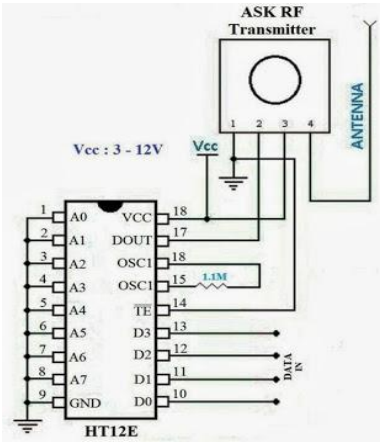
2) RFID:

(A) Working principle:

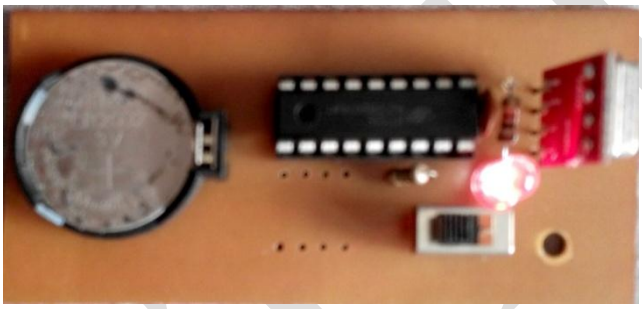
The RFID is a radio frequency identification number which consists of RFID tag, antenna and a RFID receiver. The RFID tag consists of an IC HT12E, this HT12E IC[10] is capable of converting 12 bit Parallel data inputs into serial outputs and consist of address and data pins as shown in figure.5.The address pins are used to have a secure communication between the RFID tag and a RFID reader .Thee data pins(D0-D3) are connected to logic 1 or logic 0to generate a sequence number(tag number).in our project we have grounded all the address pins to 0 to generate 00000000 address. HT12E is capable of operating in a wide Voltage range from 2.4V to 12V and also consists of a built in oscillator. The antenna transmits the data via the antenna. The rfid tag used in our project is passive tag[9] i.e.it turns on and transmits the data only when it comes in the range of RFID reader. The RFID reader consists of HT12D IC[11] as shown in figure.6. The reader receives the address of a particular tag, if the address of tag and that of reader matches then the reader reads the data, and if the tag number is stored in the reader data base it accepts the tag. Used for giving the highest priority to the emergency vehicles. The RFID tags are attached to the emergency vehicles and the RFID reader is given to the microcontroller. The tag number of all the vehicles will be stored in the memory of microcontroller.

(B) Use of RFID in our project:

The passive tag is placed on the emergency vehicle. Now as soon as the emergency vehicle comes in the range of the reader, the reader checks the address and after verification interrupts the microcontroller and thus microcontroller is interrupted. The microcontroller checks the sequence number (tag number) in the database and if it is available it detects the path via which it received the RFID signal, and it turns the green light ON for that path making red signal high on all the other paths.



5[i]. circuit diagram of RFID tag



[ii] RFID tag in our project

Figure5[i][ii[.[12] shows the RFID tag which is placed at emergency vehicle.

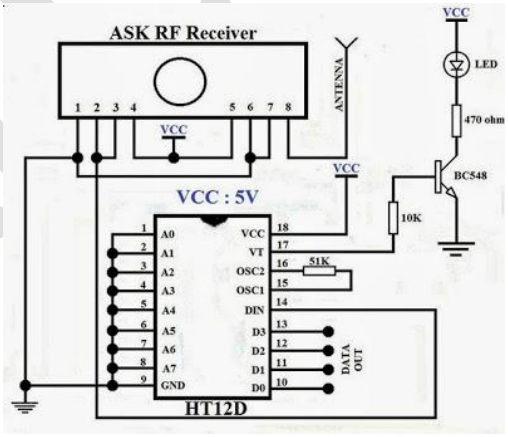


Figure.6[12] shows RFID reader

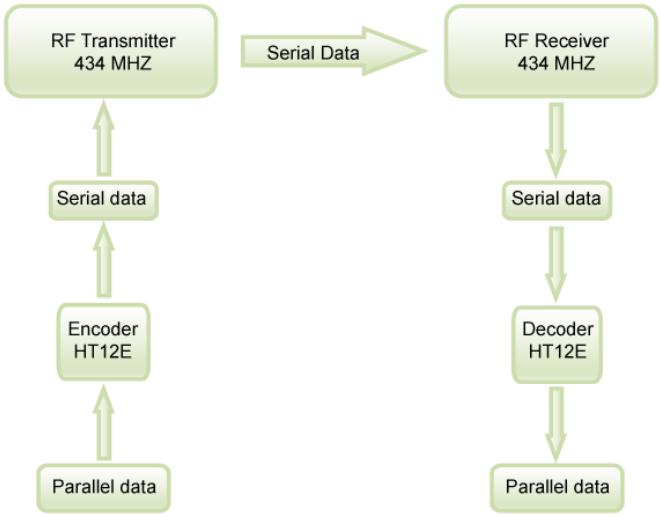


Figure.7[13] transmitter and receiver part of RFID using HT12E and HT12D.

3) ZIGBEE MODULE:

Figure.8 [15] ZIGBEE module(transmitter and receiver)

(A).Role of ZIGBEE:

This module shown in fig.9 plays the role of updating the previous traffic junction with the status of traffic situation on current junction[3]. The zigbee module used is XBee-PRO® ZB ZigBee® RF Modules and it works on 2.4GHZ frquency[16]. *The main reason of using ZIGBEE for communication purpose is [2]: A very low data has to be transmitted on the previous junction Many junctions can be covered by forming a zigbee network Zigbee uses very low power as compared to other technologies Appropriate range of operation (30 - 100 meters) Appropriate and reliable data transfer, bit rate : 250kbps at 2.4 GHz Secure data transfer*

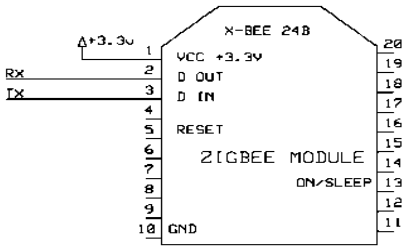


Fig.9 shows the ZIGBEE module XBee-PRO® ZB ZigBee® RF Modules Which works at a frequency of and have a data rete of 250kbps.

(B) Use of ZIGBEE in our project:

The fig.10 shows the pinout of ZIGBEE module which shows that ZIGBEE works on 3.3v. the pins RX and TX are used for communication purpose.Pins RX and TX are connected to TX and RX of 89s51 microcontroller.the microcontroller passes the status of traffic in every 30msec via ZIGBEE.

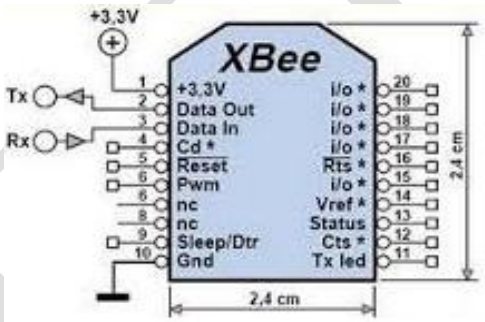


Figure.10[14] zigbee pin out configuration

(4) Swiches as sensors

Figure.11[17] shows the push button switches which acts as sensors.

One sensor each is placed on each path and connected to microcontroller. In our project the count is vehicles is taken by pressing the switches.

OVERALL PROPOSED MODEL

Combination of junction A and junction B.

VI. CIRCUIT DIAGRAM

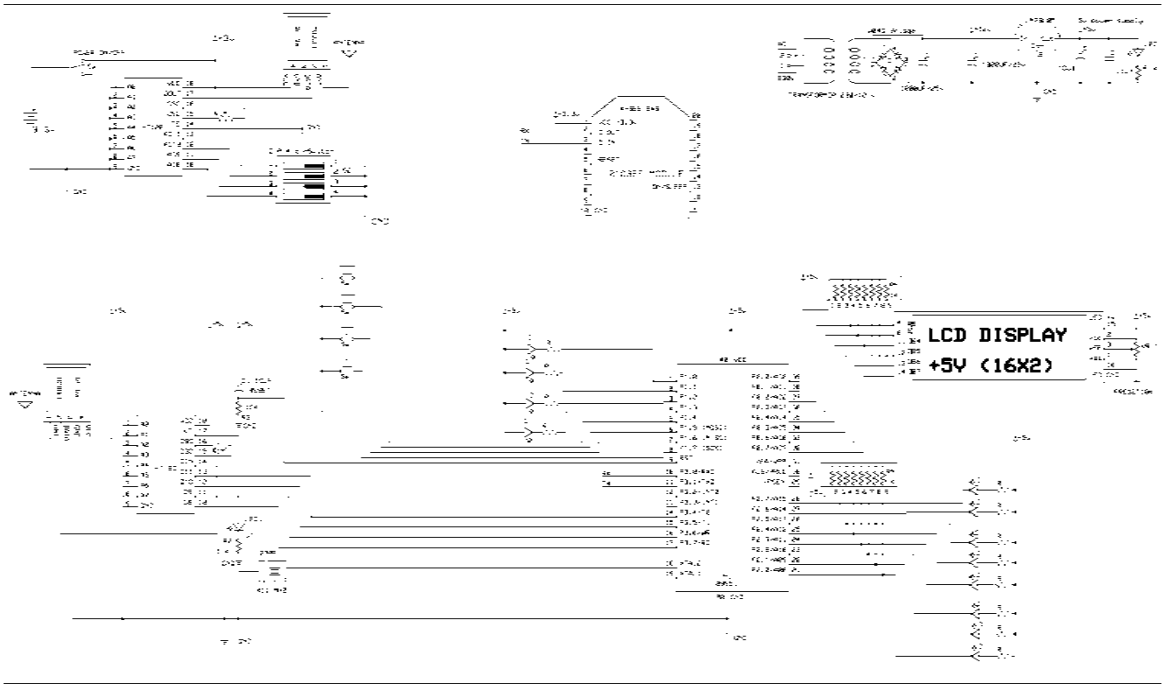


Figure.11 Circuit diagram of intelligent system

The entire system works on 5v which is given by the power supply. The 89s51 microcontroller plays the important role in the system, the sensors (switches) which performs the counting function at each path is connected at P1.4 –P1.7 and these switches are placed on four paths.The traffic lights (Red Yellow Green) leds are placed at P2 and P1.0-P1.3 which forms four traffic lights placed on four paths. The RFID reader is connected at P3. The lcd display of 16*2 is used which is placed at junction A to display the time of green light to be ON and other 16*2 LCD display is placed on junction B connected to port 0. The zigbee module works on 3.3v. ZIGBEE pins RX and TX are connected to TX and RX pins of 89s51. The zigbee is placed on both the junctions A and B.

VII. SCOPE OF THIS SYSTEM

This system will basically overcome all the problems which are faced by daily commuters on signals.This system will in full fledge provide the ease and make the traffic system comfortable. Importantly this system will provide the emergency vehicles the emergency exit giving them the highest priority. The system can be beneficial for the commuters in the previous junctions to get the traffic status too, helping them to take the appropriate path.
This signifance of the intelligent system is that it can also be implemented where there are four parallel paths connecting to a particular junction.

VIII. References

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