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Department of Electronics Engineering

Presentation on

SMART TRAFFIC LIGHT SYSTEM

Group No:15

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INTRODUCTION

- In many urban areas, traditional traffic light systems operate on fixed timing schedules, disregarding fluctuating traffic densities.
- This often leads to inefficiencies, particularly during peak hours, as drivers experience unnecessary delays at intersections, even when the traffic flow is low on certain approaches.
- Such rigid control increases congestion, contributes to higher emissions, and wastes fuel due to prolonged idle times.
- The SMART TRAFFIC LIGHT SYSTEM aims to address these issues by dynamically adjusting traffic light timings in real-time, based on the actual traffic density at a four-way junction.
- By implementing sensors to monitor traffic conditions and a microcontroller to process and adjust signal timings, the system prioritizes lanes with higher density, optimizing the flow and reducing wait times.

PROBLEM STATEMENT

To design an effective solution ‘SMART TRAFFIC LIGHT SYSTEM’ and reduce traffic congestions by dynamically adjusting traffic light timings, particularly at a four-way junction, the system improves traffic flow, reduces congestion, and minimizes wait times.

COMPONENTS

- LPC2138 Microcontroller: For processing sensor data and controlling traffic light timings.
- IR Sensors: To detect the presence and density of vehicles on each road.
- Traffic Light LEDs: Red, yellow, and green LEDs to simulate real traffic lights.
- Timer Module: For controlling timing intervals.
- Power Supply: To power the components.
- Connecting Wires and Resistors: Basic wiring to connect the sensors, microcontroller, and lights.

METHODOLOGY

- Density Detection:

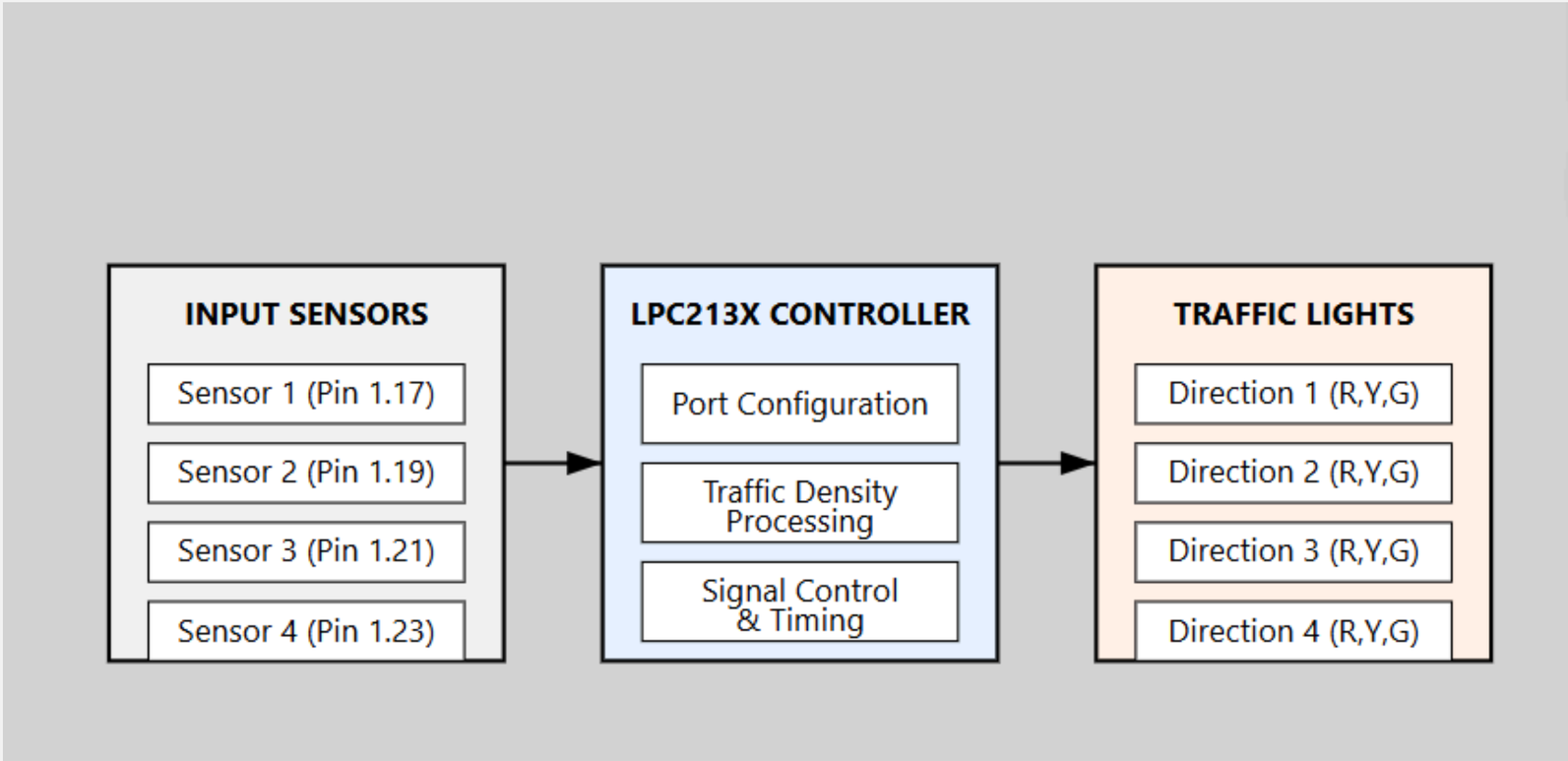
1.IR sensors detect traffic density, and depending on the traffic density it sends data to the microcontroller.

2.IR sensors positioned at strategic intervals along each lane

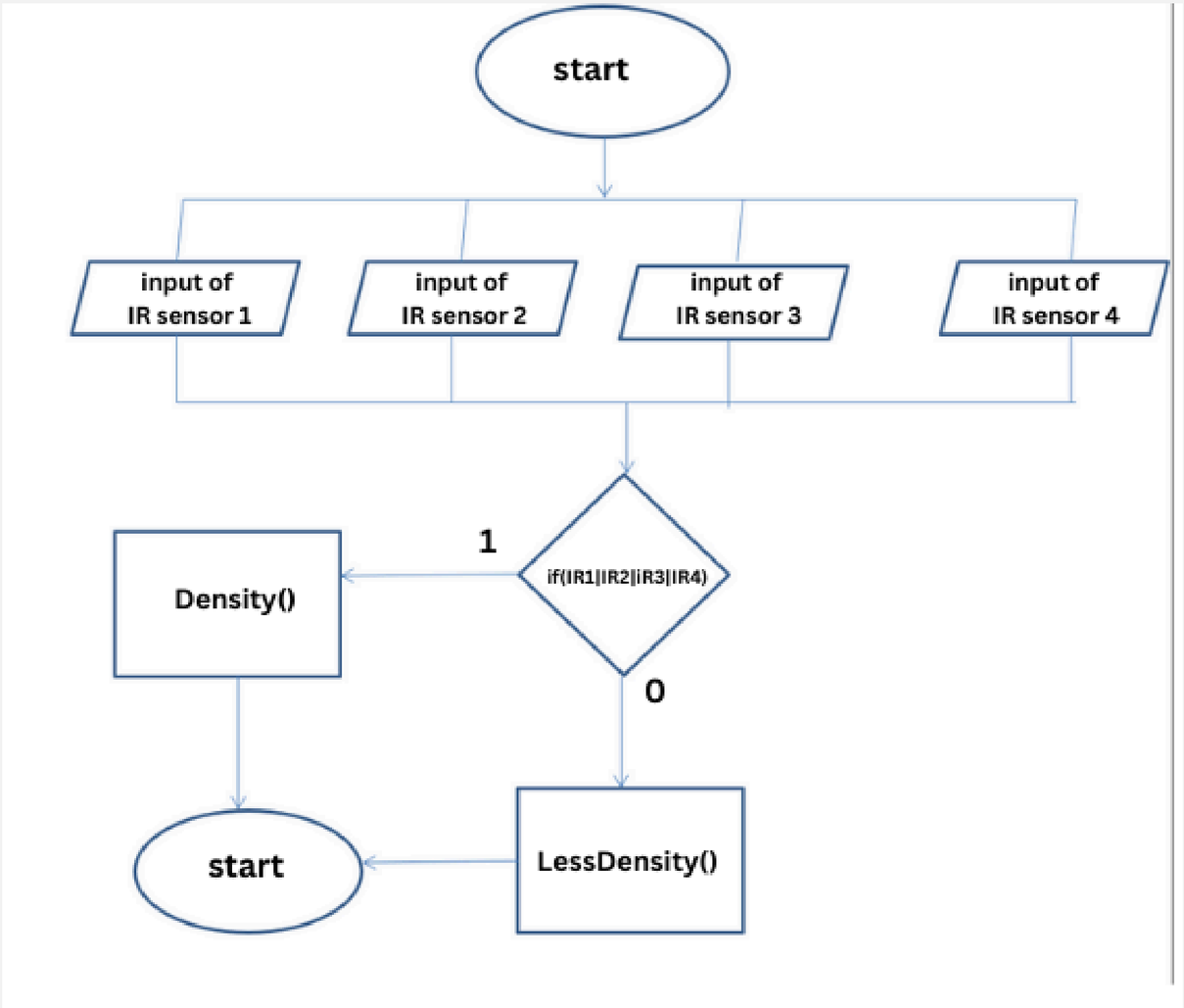
3.Multiple sensors per lane for accurate vehicle counting.

- Timer Adjustment: The LPC2138 calculates timer changes based on traffic density on each road.If density is more it increases the timer otherwise it executes the normal timer delay.
- Traffic Light Control: The microcontroller manages the lights, prioritizing lanes with higher density by extending green-light times.

BLOCK DIAGRAM



FLOW CHART


start
input of IR sensor 1
input of IR sensor 2
input of IR sensor 3
input of IR sensor 4
if(IR1|IR2|IR3|IR4)
1
0
Density()
LessDensity()
start

CALCULATIONS

- C-Clk=60MHz
- P-Clk=1/4*C-Clk=1/4*60=15MHz
- Delay=NOC*1/P-Clk
- Initial Delay:-(2secs)(for less density)
- 2secs=NOC*1/15MHz
- NOC=3000x10^4
- PR=9999 , MR0=3000
- Additional delay(4 secs)(for more density):
- PR=9999 , MR0=6000

ALGORITHM

- Initialize static flag variable as 0.
- In Delay Function:-
  - Reset the timer.
  - Update the value of MR0 with the passed value.
  -Enable Timer Control Register.
  -Initialize PR.
  -Wait for timer interrupt flag bit.
- In ISR of External Interrupt 0:-
  -Update the port 1 values using IOPIN1 register to prioritize the traffic signal 1.
  -Call the delay function.
  -Update flag variable.
  -Clear vector address.

ALGORITHM

- In ISR of External Interrupt 1:-

-Update the port 1 values using IOPIN1 register to prioritize the traffic signal 2.

-Call the delay function.

-Update flag variable.

- -Clear vector address.
- In ISR of External Interrupt 2:-

-Update the port 1 values using IOPIN1 register to prioritize the traffic signal 3.

-Call the delay function.

-Update flag variable.

-Clear vector address.

- In ISR of External Interrupt 3:-

-Update the port 1 values using IOPIN1 register to prioritize the traffic signal 4.

-Call the delay function.

-Update flag variable.

-Clear vector address.

ALGORITHM

- In intr_init() function:-

-Update PINSEL for all the external interrupts.

-Configure all the interrupts as VIRQ.

-Load VICVectAddr and VICVectCntl registers with appropriate value for all the external interrupt isrs.

-Enable interrupts.

-Configure them as Rising Edge sensitive .

- In Intial() function:-

-Load appropriate values for IOPIN register along with delay to continue the initial loop sequence of traffic lights.

- In main function:-

-Call the intr_init() function.

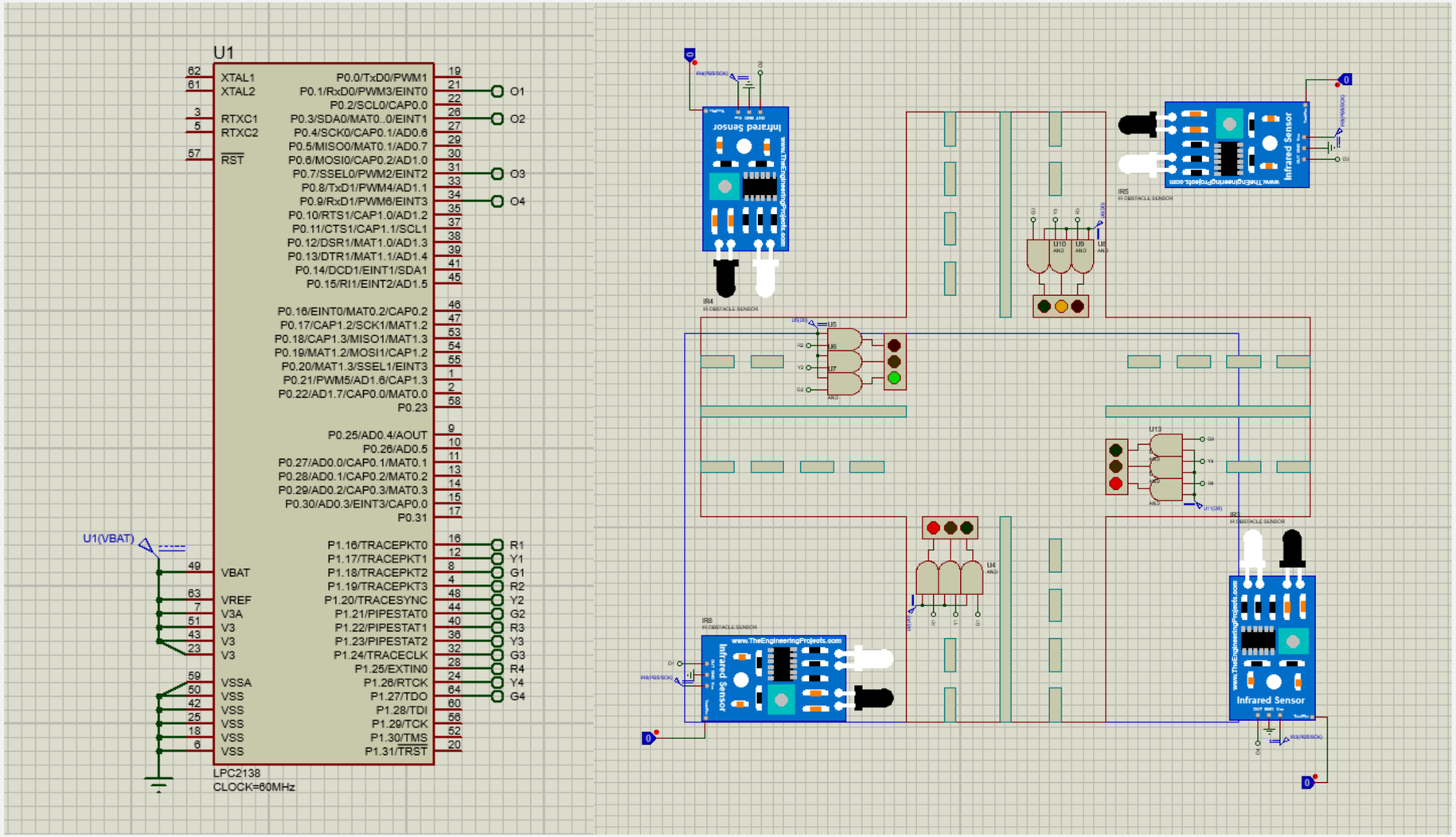
-Use IODIR1 register to configure all the GYR LED pins as output.

-In while loop:-

-Use if else ladder to read values of flg and write code snippets for cyclic rotation.

-In else call the ‘initial()’ function.

CIRCUIT


U1
XTAL1
XTAL2
RTXC1
RTXC2
RST
P0.0/TxD0/PWM1
P0.1/RxD0/PWM3/EINT0
P0.2/SCL0/CAP0.0
P0.3/SDA0/MAT0..0/EINT1
P0.4/SCK0/CAP0.1/AD0.6
P0.5/MISO0/MAT0.1/AD0.7
P0.6/MOSI0/CAP0.2/AD1.0
P0.7/SSEL0/PWM2/EINT2
P0.8/TxD1/PWM4/AD1.1
P0.9/RxD1/PWM6/EINT3
P0.10/RTS1/CAP1.0/AD1.2
P0.11/CTS1/CAP1.1/SCL1
P0.12/DSR1/MAT1.0/AD1.3
P0.13/DTR1/MAT1.1/AD1.4
P0.14/DCD1/EINT1/SDA1
P0.15/RI1/EINT2/AD1.5
P0.16/EINT0/MAT0.2/CAP0.2
P0.17/CAP1.2/SCK1/MAT1.2
P0.18/CAP1.3/MISO1/MAT1.3
P0.19/MAT1.2/MOSI1/CAP1.2
P0.20/MAT1.3/SSEL1/EINT3
P0.21/PWM5/AD1.6/CAP1.3
P0.22/AD1.7/CAP0.0/MAT0.0
P0.23
P0.25/AD0.4/AOUT
P0.26/AD0.5
P0.27/AD0.0/CAP0.1/MAT0.1
P0.28/AD0.1/CAP0.2/MAT0.2
P0.29/AD0.2/CAP0.3/MAT0.3
P0.30/AD0.3/EINT3/CAP0.0
P0.31
P1.16/TRACEPKT0
P1.17/TRACEPKT1
P1.18/TRACEPKT2
P1.19/TRACEPKT3
P1.20/TRACESYNC
P1.21/PIPESTAT0
P1.22/PIPESTAT1
P1.23/PIPESTAT2
P1.24/TRACECLK
P1.25/EXTIN0
P1.26/RTCK
P1.27/TDO
P1.28/TDI
P1.29/TCK
P1.30/TMS
P1.31/TRST
O1
O2
O3
O4
R1
Y1
G1
R2
Y2
G2
R3
Y3
G3
R4
Y4
G4
U1(VBAT)
VBAT
VREF
V3A
V3
V3
V3
VSSA
VSS
VSS
VSS
VSS
VSS
LPC2138
CLOCK=60MHz
Infrared Sensor
www.TheEngineeringProjects.com
IR4
IR5
IR6
IR7
U4
U5
U6
U7
U8
U9
U10
U13

ADVANTAGES

- Reduces congestion and waiting times.
- Prevents accidents by reducing collision risks by optimizing traffic light timings.
- Lowers fuel consumption and vehicle emissions.
- Real-time traffic monitoring and adaptive control.
- Reduced manual intervention in traffic management.
- Efficient coordination between multiple intersections.

DISADVANTAGES

- High initial setup costs.
- Requires regular maintenance and calibration.
- Sensor performance can be impacted by weather or dirt.

CONCLUSION

- The smart traffic light system designed in this project offers an effective solution to traffic congestion by dynamically adjusting traffic light durations based on real-time vehicle density.
- Using components like the LPC2138 microcontroller and IR sensors, this system provides a cost-effective and efficient way to reduce waiting times, fuel consumption, and emissions.
- This approach, while needing regular maintenance, shows promise for scalable implementation across busy intersections and urban centers.