A picture containing logo

Description automatically generated Logo

Description automatically generated **Faculty of Enigeering** **Cairo University**

**Embedded Systems Project Documentation**

**On Demand Traffic Light Control**

**Presented for ELC 2080 project**

**Presented to:**

**Dr. Mohamed Riyad**

|  |  |
| --- | --- |
| (2nd Year Electronics and Electrical Communication Engineer) | |
| Magdy Ahmed Abbas Abdelhamid | **Section: 3 / I.D: 9210899** |

* **Contents: -**

1. **System Description.**

* System Abstract.
* System Overview.
* System Functionality.

1. **System Design.**

* System Requirements.
* Operating Environment.
* Input, Output & Interfaces Formats.
* User Stories.

1. **Flow Charts & Schematic.**
2. **System Constraints.**
3. **Future Work.**

Section 1

**On Demand Traffic Light Control**

**System Description**

**Abstract**

In the current scenario, vehicular traffic is increasing all over the world, especially in large urban areas. With the ever - increasing number of road users and the limited resources provided by the existing infrastructures, intelligent traffic control will become a very important issue in the future. These needs led to an increased demand for the traffic control system. Therefore, there is a need to improve traffic control to better accommodate this increasing demand and to preserve pedestrians from accidents and to implement the movement of pedestrians first and then cars to preserve the lives of pedestrians.   
In this project, we will show the improvement of traffic light control on the road.

**Overview**

The main objective of this project is to control traffic lights based on pedestrians pressing the control button, and in this system some components installed at a fixed distance are used. All sensors are connected to the microcontroller, which in turn controls the traffic light system according to the pedestrian's pressure on the button, this aspect is given more priority,Refer to the Schematic in Section 3.

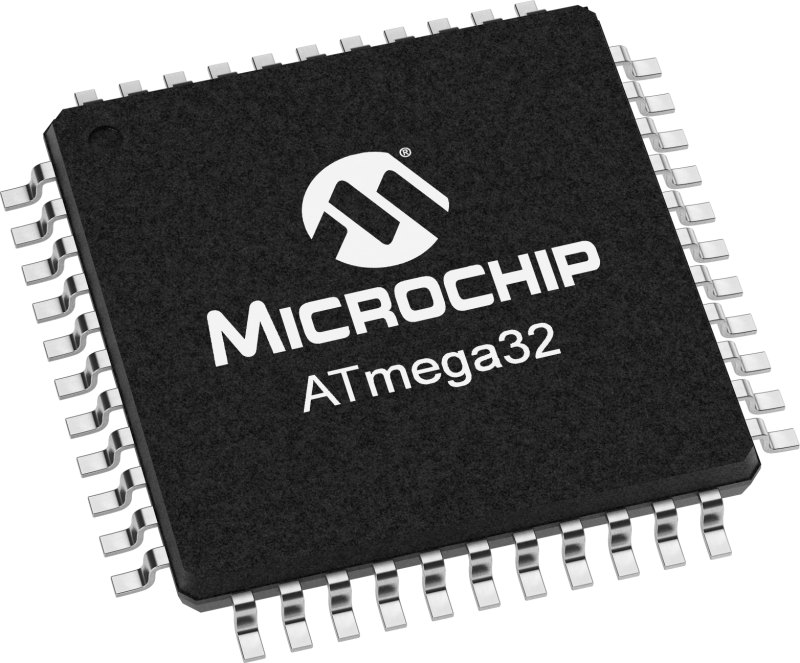
The system can detect when the button is pressed. Afterwards, based on the current state it would decide what to do. It allows pedestrians to walk by making sure cars are stopped first. Refer to the Flow Charts in Section 3.

**Functionality**



**System Design**

Section 2

  
Diagram

Description automatically generated



**Requirements**

The System Consists of:

* 2 Green LEDs.
* 2 Yellow LEDs.
* 2 Red LEDs.
* 6 Resistors : To avoid LEDs Burning.
* 1 Resistor : To make the Signal directed from the Button to its Pin.
* 1 Push Button.
* CPU: AVR Atmega32 (1 MHZ Clock).
* 32 (8-bit general-purpose) Registers + 64 (8-bit input/output) Registers, 2KB SRAM, 1KB ROM (EEPROM) , 32KB of on-chip in system programmable flash memory for program storage.
* Atmel's ATmega32 is an 8-bit RISC processor,

**Operating Environment**



based on Harvard architecture, 32 GPIO Pins.

**Simulation:** The program has been tested on Proteus simulator provided by Lab Center. It should be used in traffic light control systems on streets with a pedestrian push button included to allow for full system functionality.

**Programming:** Drivers and the Application Coded in Microchip Atmel Studio.

|  |  |
| --- | --- |
| Drivers Folders Applying SOLID Principles Items in Folders | |
| Application & | |
| ECUAL (Electronic Control Unit Abstraction Layer)  Button Driver & LED Driver | |
| MCAL (Microcontroller Abstraction Layer)  DIO Driver & Timer Driver | |
| Utilities |  |

Section 2



**Input , Output & Interfaces Formats**

The only system input is in the form of the pedestrian push button.   
When it comes to output it handles 6 LEDs at once given the current state,   
time and push button press state.

|  |  |
| --- | --- |
| Input Devices | In ECUAL Push Button. |
| In MCAL Pins. |
| Output Devices | In ECUAL LEDS. |
| In MCAL Pins. |
| Interfaces | In MCAL Timers (Timer0), Interrupts |



**User Stories**

|  |  |
| --- | --- |
| **CRITERIA** | **MEETS SPECIFICATIONS** |
| **User story 1** | **As a pedestrian when I will make a short press on the crosswalk button while the cars green light is on and pedestrian red light is off, I will wait for the yellow lights to blink for five seconds then the cars red light is on and pedestrian green light is on for five seconds,  so that I can cross the street.** |
| **User story 2** | **As a pedestrian when I will make a short press on the crosswalk button while the cars yellow light is blinking and pedestrian red light is on, I will wait for all yellow lights to blink for five seconds then the cars red light is on and pedestrian green light is on for five seconds,  so that I can cross the street.** |
| **User story 3** | **As a pedestrian when I will make a short press on the crosswalk button while the cars red light is on and pedestrian green light is on,  I expect nothing to be done** |
| **User story 4** | **As a pedestrian when I made a long press on the crosswalk button,  I expect nothing to be done.** |
| **User story 5** | **As a pedestrian when I made a double press on the crosswalk button,  I expect that the first press will do the action and nothing to be done after the second press.** |

IDEA:

**Flow Charts**

Detect A Push From the pedestrians On the Button.

Send Emergency Requests to The LEDs To Make The pedestrians to Pass  
The ROAD.

Glow The Red Signal for The Traffic So that Emergency Vehicle Easily Pass the Traffic Signal Within 10 Seconds.

Glow The Yellow Signal for The Traffic and The Pedestrians So that Emergency Pedestrians Easily Pass the Road Within 5 Seconds.

Glow The Green Signal for The Pedestrians So that Emergency Pedestrians Easily Pass the Road.

Section 3

Section 3

MODES:

Normal Mode:

5 Sec.

Red

Green

Yellow

5 Sec.

5 Sec.

Pedestrians Mode:

Reset Timer and Wait 5 Sec + Yellow for Pedestrians Then Switch Car Red & Pedestrians Green

Reset Timer and Wait 5 Sec + Yellow for Pedestrians Then Switch Car Red & Pedestrians Green

Switch  
Yellow For   
CAR & Pedestrians  
 Then Wait 5 Sec  
Then Switch Car Red & Pedestrians Green

CAR Red

CAR Yellow

CAR Green

Diagram

Description automatically generated

Section 3

**Schematic**

Section 3

Diagram

Description automatically generated

The Unuse of Stop Sign or Walk Sign for Pedestrians use Only LEDs.  
 The Unuse of Stop Sign or Walk Sign for CARS use Only LEDs.  
The Unuse of Communications Protocols in Embedded Systems.  
  
  
  
Instead of Return Void for All Function Will Set A Value Return For   
 ERROR Handling in the Application in the Future.  
Use LCD to Counts the Remaining time of the Transitions between LED States.

**Future Work**



Section 5



**System Constrains**

Section 4

Use A sensor is used to see if someone is walking slowly, an old man,   
 or someone who has fallen, to increase the walking time.