

.Course Project.
DeVry University
College of Engineering and Information Sciences

Course Number: CEIS114

Module 3: Creating the 1-way traffic controller using Wokwi

Background

The development of modern cities and urban areas has brought about an ever-increasing need for efficient traffic management systems. Ensuring the smooth flow of vehicles and pedestrian traffic at intersections is crucial not only for reducing congestion but also for enhancing safety and minimizing environmental impacts. In response to these challenges, the design and implementation of intelligent traffic light systems have become a key focus in the field of transportation engineering. This project aims to provide students with hands-on experience in creating a Multi-Intersection Traffic Light System using Wokwi Lab, offering them a valuable opportunity to explore the intersection of electronics, microcontroller programming, and traffic engineering. By delving into this project, students will gain insights into the principles behind traffic signal control, as well as practical skills that can contribute to more efficient and sustainable urban transportation systems.

Scenario

Design and develop a two-way traffic light controller with a pedestrian crossing and an emergency signal. The pedestrian crossing will have an LCD display messages whether the pedestrian can or cannot cross the street. When they can cross, the LCD will count down from ten (15) to zero (0) indicating the amount of time they have to cross. The emergency signal will force red lights to turn on in all directions and the blue light will be flashing. The final step is to secure the system so that it could be controlled remotely via a web browser. The alternative final step is a non-internet connection using a motion sensor to allow traffic to continuously flow on major street and only switches to slow traffic street when motion is detected.

Introduction

Traffic Light

The purpose of this part of the project is to execute a program to simulate a traffic light controller. In the first step, we will control a one-way light with Red, Yellow and Green LEDs.

Electricity Basics

An electronic circuit is composed of components where electric current can flow. Some of the components might be resistors, transistors, capacitors, inductors, diodes, etc. A circuit is a closed loop through which current can flow. A simple electric circuit may contain a battery, LED, and wire to connect them. Voltage is the difference in charge between two points whereas current is the rate at which the charge flows. Resistance occurs when a material resists the flow of charge. Ohm's law is $V=IR$ or Voltage = Current* Resistance. We will see this applied this Module in

the lab. You can choose to use resistors in your circuit or not. If you do not use resistors the LED light will be brighter since there is nothing resisting the flow of electricity.

Breadboard Layout

A breadboard is designed to give access to the pins of a chip for circuit wiring. Last week the chip was put onto the breadboard. This week additional circuitry will be added; 3 LEDs.

Here is how a breadboard is organized:



Along the top and bottom are the – blue and + red strips.
Those are used for – blue for Ground and + red for Power (3.3v)

In the very middle is the well and it separates the top row of pins labeled - abcde (top left) from the bottom row of pins labeled - fghij (bottom left). This allows the two rows of pins on the chip to be separated from each other. If the well was not in the middle, the pins on the top would be connected to the pins on the bottom and it would not work.

Software Reuse

Most of the large software projects such as Linux, Windows have tens of millions of lines of source code. Rewriting every single line of the code for each new release is impossible. Reusing most of the existing code is necessary.

Code reuse does not mean simple copy and paste. To reuse the existing code correctly and efficiently, one must understand the code being reused. If the code is well documented, it will be much easier for the programmer to understand and reuse it properly. Once we are comfortable doing that, then we will add more complexity by controlling three LEDs at the same time. This in turn will allow us to simulate a traffic light controller.

Deliverables

- Complete the Module 3 Project Deliverable
- Screenshot of your Circuit Simulation from Wokwi
- Screenshot of Code Simulation from Wokwi

Parts List

- ESP32 Board in Wokwi
- Colored LEDs: Red, Yellow and Green in Wokwi
- Half and Full Breadboard in Wokwi

Procedures

Start with Wokwi

1. Create a new project:
2. Go to <https://wokwi.com>
3. Let's create a new project. Click the ESP32 image.



4. Scroll down the page, under Start Templates click the ESP32 image