

# A Smart Traffic Light System

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## 1) Introduction

### A) Problem Statement

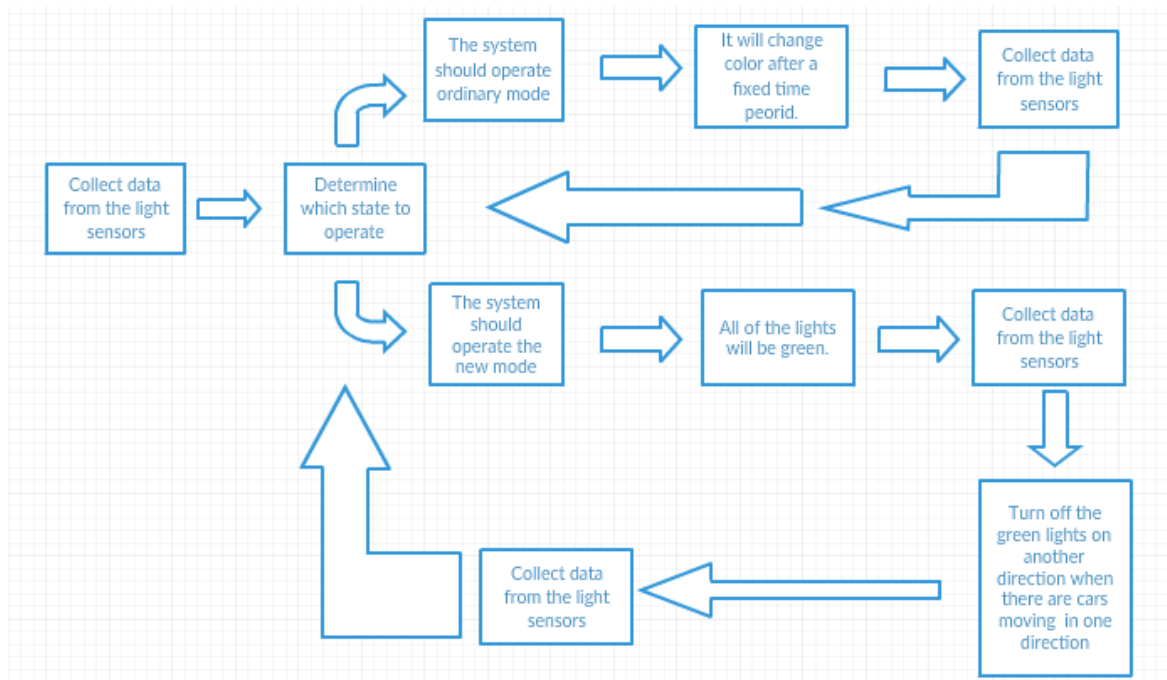
In the real life, the traffic may be red even though there is no cars around. As a result, people may waste time on the crossroad. I hope to build a smart traffic light system that can solve this problem.

### B) Basic Overview of Purposed Solution

First, my system should determine whether there are cars around. I plan to use light sensors to help me collect data from the environment. When there are cars nearby, the light sensors will detect the lights and tell me which direction the car is moving. Then I want to design my traffic light system by building a finite states machine. There will be two states for my system. The first state will be the ordinary traffic system. In other words, it will change colors after a fixed time period. The second state will be my smart traffic system. All of the traffic lights will be green if there is not any cars around. When there is cars moving in one direction, the traffic lights on the other direction will be red. When there are cars moving in both directions, the traffic light system will change to the ordinary traffic light system.

## 2) Design

### A) Block Diagram



### B) Description of Block Diagram

The system will first collect data from the light sensors. Later, it will determine which state to operate by checking if the light sensors on both sides receive lights.

When both light sensors receive lights, the system will operate the old mode. Otherwise, the system will operate the new mode. The old mode will be the ordinary mode that will change color after a fixed time period. However, it will collect data from the light sensors repeatedly and determine whether it should switch to the new mode. The new mode will first make all the lights green. Then it will repeatedly collect data to determine whether there are cars moving towards the crossroad. When there are cars moving in one direction, the system will turn of the green lights in the other direction. When the cars leave the crossroad, my second light sensors will detect the cars light and “ask” my system to turn on the green lights on the other direction. When there are cars moving in both directions, my system will switch to the old mode.

### C) Pictures of Device



### 3) Results

When there are lights on the light sensors, the voltage across the light sensors will increase. When the voltage across the light sensors exceed a particular value (300), the system will believe that there are cars moving towards the light sensors. Two of the sensors will measure the lights from the cars moving towards the crossroad and the other two will measure the lights from the cars moving away from the crossroad. When there are cars moving on both directions, the system will switch to the old mode and the lights will change color after a fixed time period(5 seconds). Otherwise, the system will operate the new mode. In the new mode, the system will turn off the green lights and turn on the red lights on one direction when there are cars moving in the other direction. The red lights will be off and the green lights will be on after the

car leaves the crossroad.

#### **4)Future Work**

I am planning to add two more vibration sensors to help me determine the movement of walkers. People can hit the vibration sensors to let my system know that they want to go across the crossroad. As a result, the lights will be red on the other directions and let the people to go across the road.

#### **5)Conclusion**

##### **A)What Worked?**

The system can switch modes as I expected. Also, the new mode and old mode operate as I expected as well. Almost everything works.

##### **B)What did not Work?**

The system cannot work when the power supply for the system is turned on after being turned off. I need to upload my code frequently to prevent this problem. I believe that this problem occurs because the arduino still stores the data from the previous use. As a result, I believe that initializing the data can help me to handle this problem.

##### **C)What did I learn?**

When coding, I cannot get any information about pointer on arduino. As a result, I choose to use global variable. The data collected from the sensors is global variable in my code. As a result, I can change the value easily. Also, I learn a lot about finite state machine through this project. In addition, I understand the characteristics of the light sensors.