System Design Tech Devils



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Date: 08-17-2019

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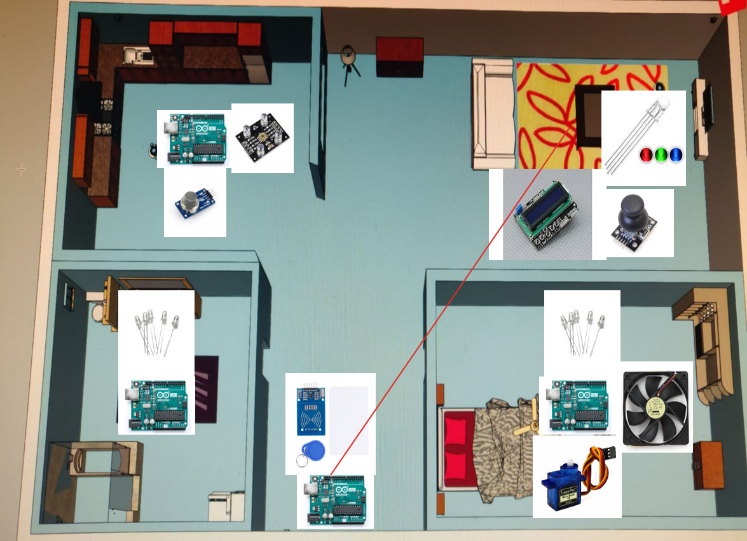
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# **Description**

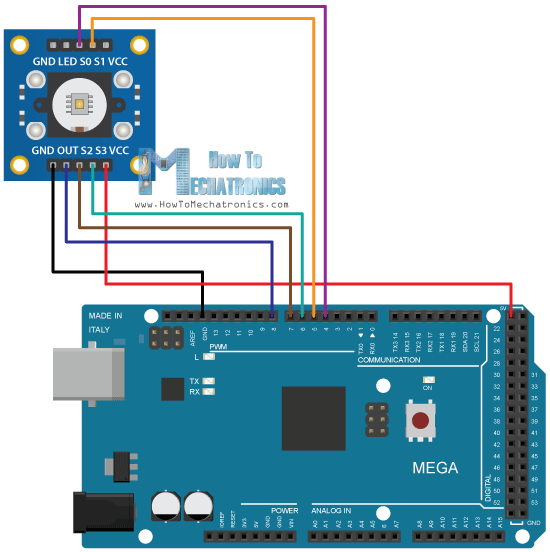
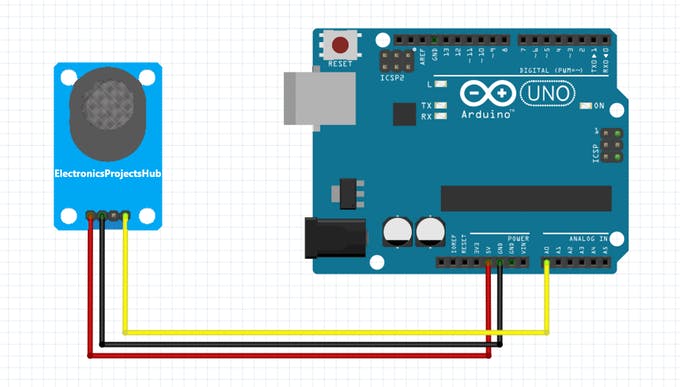


The project system will consist of multiple subsystems. In total there are going to be 4 subsystems that are divided according to the rooms they are going to be installed in (an optional subsystem is the bathroom system). The 4 subsystems are the kitchen system, the bedroom/living room system and the door system (RFID). Each system is going to have different sensors and actuators in order to automate the student’s room. The kitchen system is going to use the MQ-2 gas sensor and the TCS-230 color sensor. The living room/bedroom system is going to use an LCD (16\*2) display, a joystick (as a button), RGB lighting, a PIR motion detection sensor, a 12v. Pc fan and a servo (to control curtains). The door system is going to use an RFID sensor and keys. When all these Arduinos’ work together as one whole system, the ambient student room will be realized.

The systems in total will communicate with an administrator system through a serial port. The administrator application will be coded with the coding language c#, using the visual studio IDE. the purpose of the administrator application is to manage the system and the occupants. The application can add or remove students from the room. The application can also show information of specified students. The information can contain data such as, which light is being used or what food has been taken out of the fridge. The application will also have the function to show when a smoke alarm has been triggered.

# **Kitchen System**

### **Schematics**



### **Description**

The kitchen system will consist of 1 Arduino with 2 sensors. The sensors that are going to be used are the MQ-2 gas sensor and the TC230 color sensor. The gas sensor is used for smoke detection and the color sensor is used to detect which color is in front of it. When the gas sensor detects smoke, a buzzer will go off and alert the administrator system (C# application). The color sensor will be acting as a food detection sensor, which detects certain colors. These colors are food items and can be monitored with the administrator system.

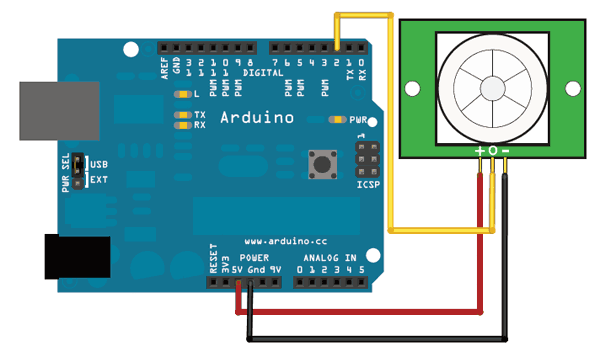
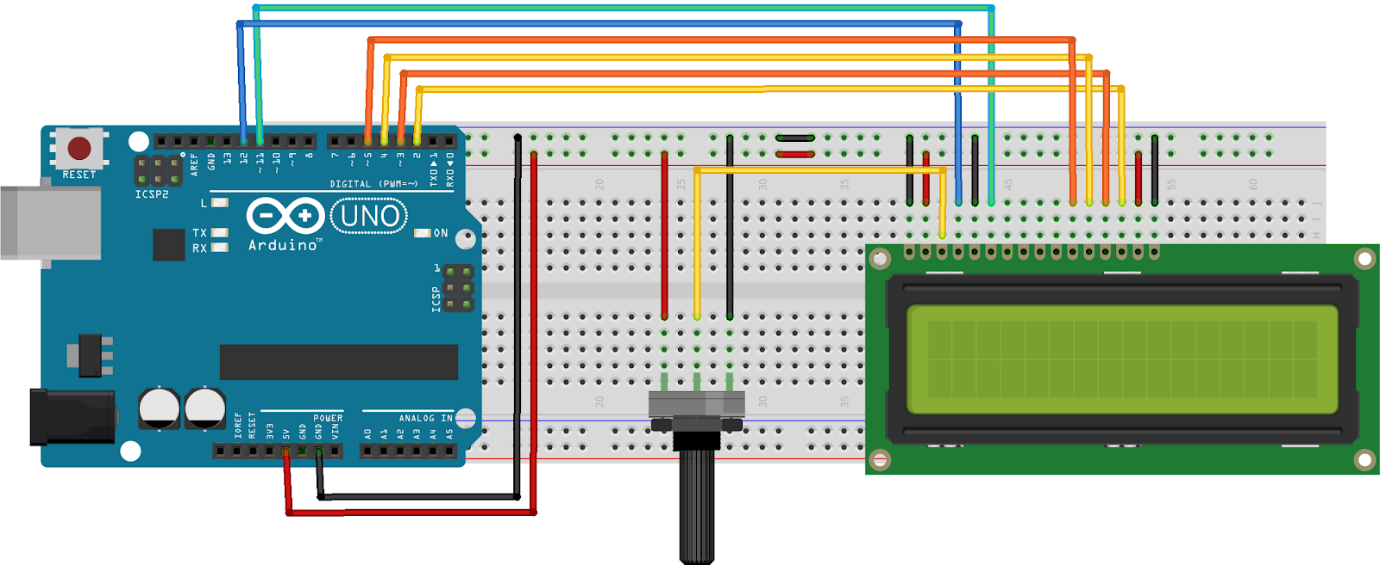
#### **State diagram**

#### **Flow chart**

# **Living Room System**

### **Description**

### **Schematics**

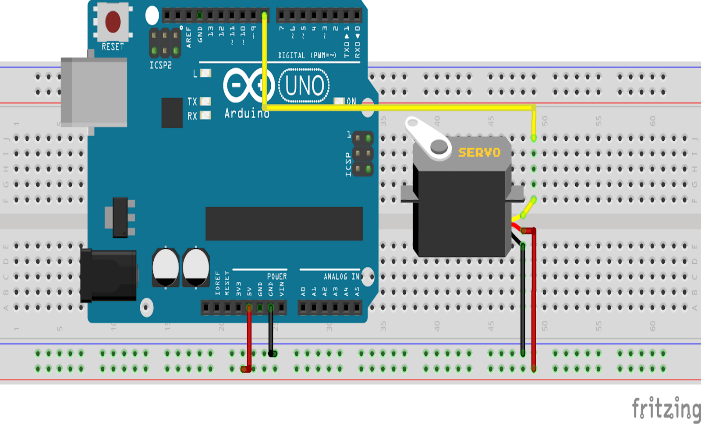
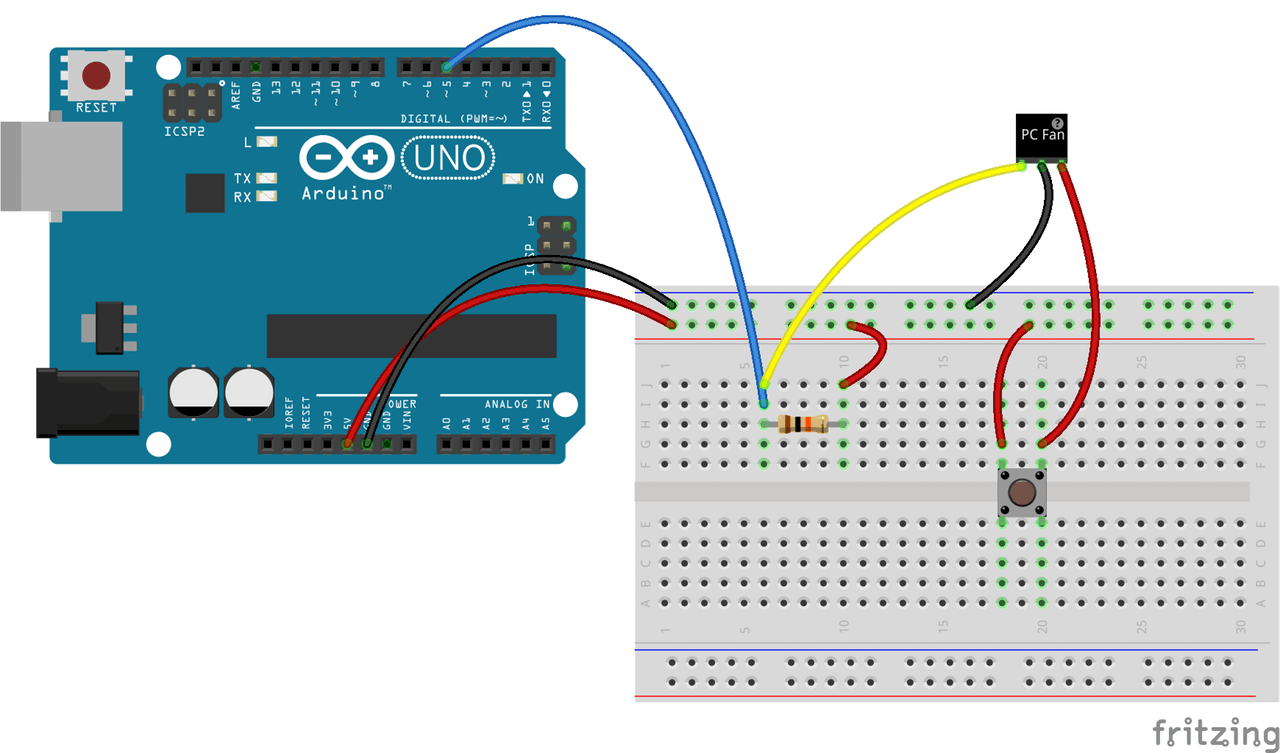
The Living Room System is going to be based on 1 Arduino with 1 16x2 LCD, a joystick, LEDs and a PIR sensor.  The LCD will act as an interface for the user to control the whole system (fan, lights, curtains). A simple menu will be displayed to help the user browse throughout the functions using the joystick. Changing the lights by selecting another preset, changing the fan power, or the curtains position. The mood lighting will consist of a few LEDs which will be controlled by using the menu. The PIR sensor whenever he will detect movement will turn on the LEDs and will turn them off after 5 minutes of not detecting any movement.

#### **State diagram**

Flow chart

# **Bedroom System**

### **Schematics**



### **Description**

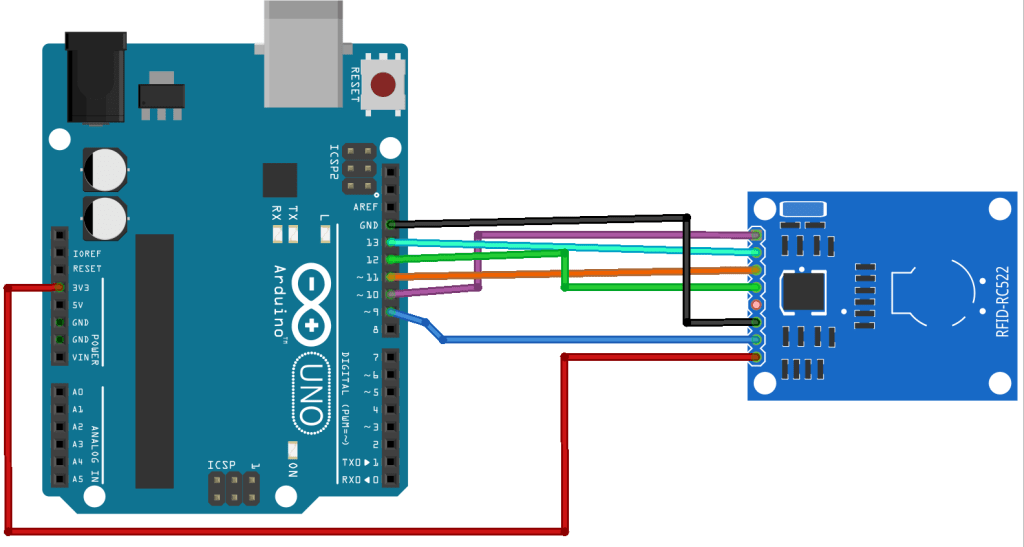
The bedroom system consists of 2 actuators and a few LEDs. The first actuator is a servo, which will make the curtains automatically open and close during a certain time of the day, or via a certain setting in the menu screen. The second actuator is a fan, that can be controlled automatically or will automatically turn on once the temperature surpasses a given threshold. The fan can also be turned on and off via the menu screen.

#### **State diagram**

#### **Flow chart**

# **Door system**

### **Schematics**



### **Description**

The digital lock system is based on an RFID-RC522 reader connected to an Arduino Uno board. The reader takes the UID tag from the card/keychain, compares it to the predefined tag in the code to grant/deny access. Once the door is open, the lock system sends a signal to the other boards to start up the entire system in the house. Furthermore, the lock can be opened by the user through the phone app by sending a signal through the ESP8266 Wi-Fi module connected to the board.

#### **State diagram**

#### **Flow chart**

# **Administrator system**

### **GUI**

### **Description**

The administrator system is an application that is going to be used in order to manage the room keys and manage the students. Communication between the application and the systems will happen through serial communication. There will be a few buttons with different functions, such as adding students, removing students, showing details of a specific student, etc. The application will communicate with the subsystems and vice versa.

-Side note: This application is just the first design, changes can and will be made in order to improve the application.

# List of reference

* <https://randomnerdtutorials.com/security-access-using-mfrc522-rfid-reader-with-arduino/>
* <https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor/using-a-pir-w-arduino>
* <https://howtomechatronics.com/tutorials/arduino/lcd-tutorial/>
* <https://howtomechatronics.com/tutorials/arduino/arduino-color-sensing-tutorial-tcs230-tcs3200-color-sensor/>
* <https://create.arduino.cc/projecthub/Junezriyaz/how-to-connect-mq2-gas-sensor-to-arduino-f6a456>
* <https://www.electronics-lab.com/project/using-sg90-servo-motor-arduino/>
* <https://create.arduino.cc/projecthub/porrey/use-a-pc-fan-as-a-sensor-265798>