



WIRELESS LIGHTING CONTROL SYSTEM

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ABSTRACT

- The goal of this project was to create a portable system from which a user could toggle various lights, and even move a spot light.
- This project came about as a request from our instructor Victor Bershinsky.
- Our project was mostly completed and packaged in the required time, however there were several setbacks in the final process.

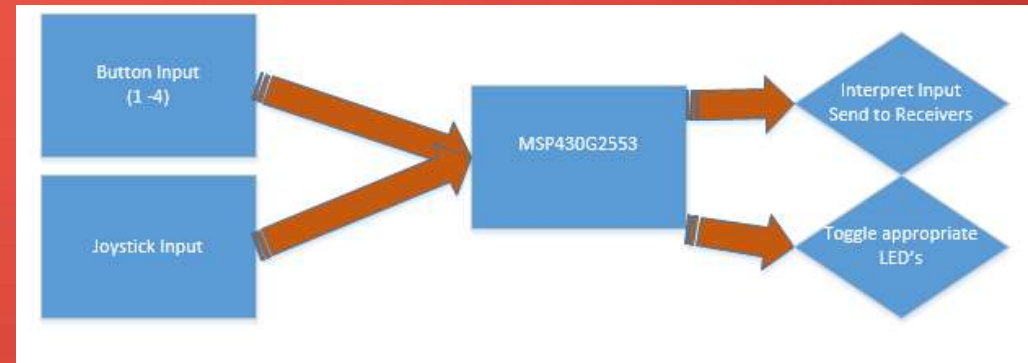
BACKGROUND

- The system will allow the user to control a given set of lights using a portable wireless controller.
- We were tasked to have this interface with an existing electrical system.
- There are similar products on the market, however, a system like ours is able to be used with any wireless (Wi-Fi) connection.
- Overall, the function of the system is as follows:
 - Press a button on the control and a designated light will illuminate until the button is press again.
 - Secondly, the directional controls for a spot light can be used via a joystick on the controller.

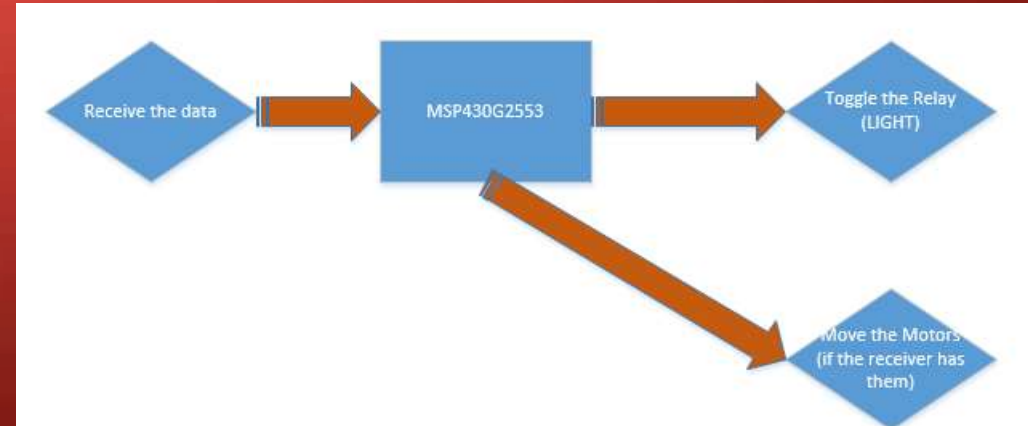
FUNCTIONAL DESCRIPTION

- Technical specifications
 - TI MSP430G2553 Microcontrollers
 - ESP8266 Wi-Fi Modules
 - 802.11 bgn
 - LED Tactile Buttons
 - ROHS Joystick
 - 5A 240VAC Relay Module
 - Single Pole Throw
 - Jameco Stepper Motor
 - 12 V @ 0.4A
 - 1.8 Degree steps
 - ROHS 120VAC – 12VDC Power Supply
 - Lithium Ion Battery
 - 400mAh
 - Communicate at a decent range

Controller Block Diagram

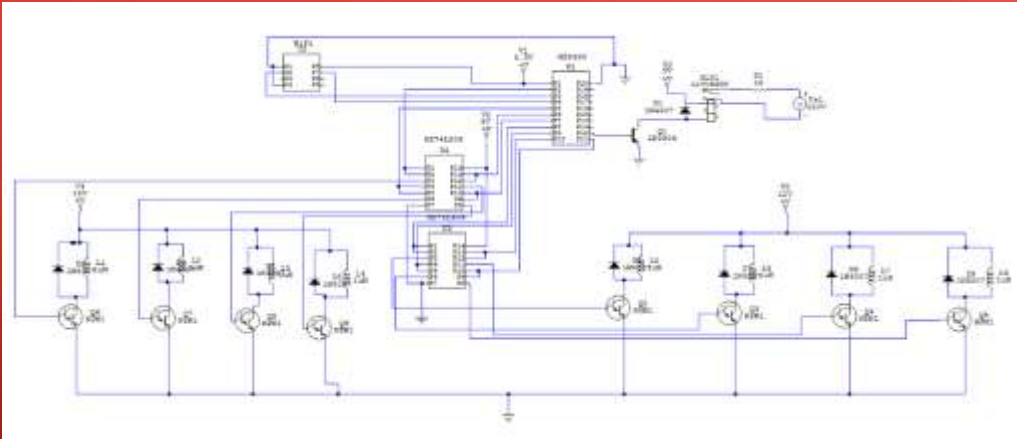


Receiver Block Diagram

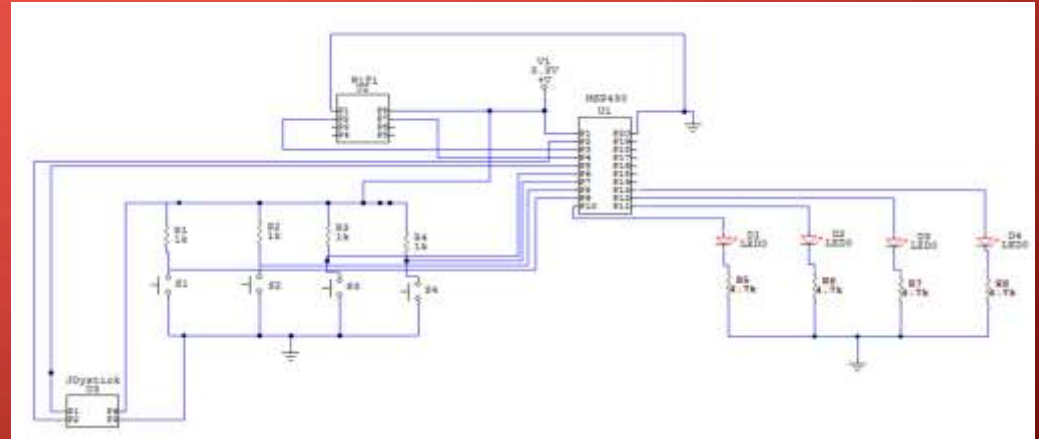


SCHEMATICS

Receiver



Controller



SUBSYSTEM DESCRIPTIONS

CONTROLLER

- Send the users input to the receiver via a Wi-Fi connection and Server.
- 4 button inputs to toggle each different light.
- Joystick for directional control

RECEIVER(S)

- Receives a signal from the controller and determines what action to take.
 - Toggle the light
 - Move the motor
 - Ignore if not for the correct receiver
- Interfaces with existing light switches.

RECEIVER

Each of the gang boxes will have this as well as a power supply.

The Wi-Fi module has been removed due to inoperability.



MOUNTING SYSTEM

The back plate has 3 stand alone receivers and one with motor control

Each receiver is packaged inside of the gang box with a normal light switch.



RESULTS

- **Successes**
 - Completed and tested the units via Serial Communication (UART) via computer and then controller to receiver again over UART.
 - Motors moved when given the proper signals
 - Only on one of the four receivers
 - Packaged the PCB and peripherals into single gang electrical boxes
 - **Communications**
 - Connected modules to Router
 - Setup controller TCP Server.
 - Connect receiver to the aforementioned server
 - Verify the connection via the ability to toggle lights

RESULTS CONTINUED

- Failures
 - Directional control receiver board shorted due to an unknown error
 - Two of the ESP8266 Wi-Fi modules were defective
 - Unable to utilize two of the receivers.
- Small fixes
 - The original Wi-Fi TraxMaker macro for the PCB was incorrect
 - Made adapters to mitigate this issue
 - TIP120 slots had pins 1 (base) and 2 (collector) swapped
 - Rectified by use of 8 adapters (one per TIP120)
 - MSP could not run the code when on the PCB
 - Fixed by removing the floating voltage on the RESET pin
 - Used 47k Ω pull-up resistor and 0.01 μ F Capacitor to ground

CONSIDERATIONS

- Cost
 - The receivers each cost \$24.18
 - Cost without motor interface
 - Receiver with motors cost \$77.62
 - Controller cost \$34.31
- The device should be installed by a licensed electrician for the safety of the user.
- These devices could be mass produced for a lower cost than seen above
- The user must own a router in order for the devices to communicate.
- Also, the user must also have a TI MSP430 Development Board in order to hard code the Wireless Network ID and Passcode.

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