

EN1070 Electronic Product Design and Manufacture

Design Project – Progress Review Report:

Bluetooth Based Remote Light Controlling System

Team Name – Good Game

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Weerasinghe K.N.	190672T	Problem Description, Motivation and Justification for Selection, Project Budget with BOQ

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Problem Description, Motivation and Justification for Selection

Problem Description

Remote control light bulbs eliminate the need to get up and physically turn the lamp on and off. But this system can be enhanced into eliminating many complications, such as given below.

- Potential to save energy.

By including motion sensors into the system, the option to dim or shut off lights in a room can be provided to the consumer. Thus, power consumption and money consumption can be reduced without sacrificing the user's accustomed environment.

- Enhancing comfortability within the household

Handling this system is very simple. It's within the customer's grasp. For example, the customer won't need to walk around the room like a blind person if the need to go to the bathroom arises in the middle of the night. Or let's say the person is used to read a book before going to sleep. He/she won't have to get up and go to the switch to turn it off.

- Personalize Household

This system can be further enhanced by allowing the option to change the brightness of the bulbs. That way, the user can adjust the lightings according to the situation: i.e., Zoom meeting, Cloudy weather, Evening.

Motivation

This system helps the disabled immensely. This makes their lives easier and helps lift their mentality by removing their need to have a caretaker 24/7.

Justification

Our team created a survey to check the preference of the community for a product like this. Following are some pictures containing our survey.

Bluetooth Based Remote Light Controlling System

Greetings!

We are an enthusiastic group of students in the Electronics and Telecommunications department at the University of Moratuwa. We are trying to produce a Remote Light Controlling System these days. 😊

This system contains a bulb holder and a remote. If you buy one of these in the future, you just have to set up the holder to your home electrical system and voila! You can control the bulb attached to it with the remote. 😊

Still we are having some problems deciding what you would prefer. Hope you will give us your fullest support.

*** Required**

Before starting anything else tell us a bit about yourself. *

I am a...

- ☐ Student
- ☐ Undergraduate
- ☐ Senior Citizen
- ☐ Employee
- ☐ Other: _____

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Google Forms

Bluetooth Based Remote Light Controlling System

Please rate the following details according to your preference.

How badly do you need such a control system.

1 2 3 4 5

Not Interested ☐ ☐ ☐ ☐ ☐ Extremely Interested

Why do you think you need this product?

Your answer: _____

Who do you think will most benefit from this product?

Your answer: _____

What do you prefer to use as a controller?

- ☐ Remote Controller containing a number of buttons
- ☐ Mobile App
- ☐ Other: _____

Are you willing to spend 1000 to 1500 rupees to buy one of these.

A pack containing the remote and the holder will cost in that range.

- ☐ Yes
- ☐ No

Our target is to release packages containing multiple holders to the market. In that case how much are you willing to buy at a time. (Note that price of purchase will increase with the number of holders in your package.)

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

☐ 6

☐ 7

☐ 8

☐ Other: _____

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Bluetooth Based Remote Light Controlling System

Congratulations, You've made it!

Your feedback is highly appreciated.

Your answer: _____

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Most of the responses were from undergraduates.

The answers to these questions

Please rate the following details according to your preference.

How badly do you need such a control system.

1 2 3 4 5

Not Interested ☐ ☐ ☐ ☐ ☐ Extremely Interested

Are you willing to spend 1000 to 1500 rupees to buy one of these.

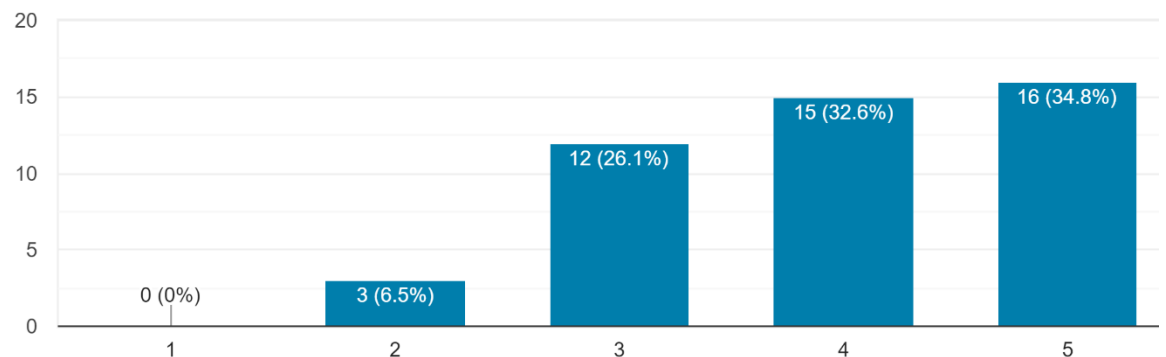
A pack containing the remote and the holder will cost in that range.

- ☐ Yes
- ☐ No

Were as follows...

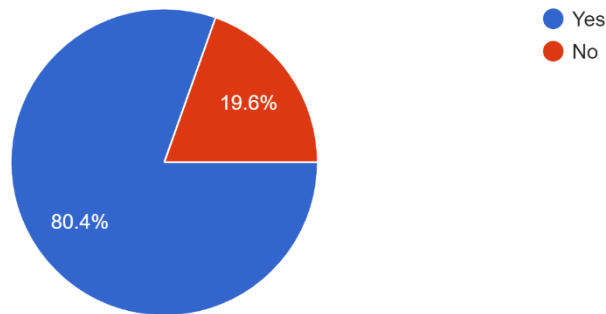
How badly do you need such a control system.

46 responses



Are you willing to spend 1000 to 1500 rupees to buy one of these.

46 responses



Thus, the need for our product and our initial predictions of the market value is justified.

Technical Feasibility

ITEM DESCRIPTION

A Bluetooth-based remote light controlling system is a system that allows lighting to be customized and controlled remotely using Bluetooth. This light system consists of 4-7 bulb holders and a single remote controller. These holders can be controlled through remote control or a mobile app.

TARGET

Turning ON/OFF a light system consists of 4-7 bulbs within 10-15m distance.

TECHNOLOGY

Remote Controller

Functions: ON/OFF

Connectivity: Bluetooth (up to 10-15m)

Pairing: Self-Pairing

A Bluetooth remote controller is equipped with,

1. A keypad

2. An HC-05 Bluetooth module
3. A microcontroller

The keypad in the remote controller(transmitter) consists of several push buttons. Each button of the keypad has a specific digital signal. The Bluetooth module transmits various signals to the receiver which is inside the bulb holder according to the pressed push button. The system can be extended to operate any number of bulbs by increasing the number of pushbuttons in the keypad.

Bulb Holder

The bulb holder or the receiver is equipped with,

1. An HC-05 Bluetooth module
2. A microcontroller
3. A relay module (Depending on the number of applications that are controlled, the number of channels in the relay module is decided)

The transmitted signal is received by the Bluetooth module inside the bulb holder. The channel of the relay module is ON or OFF, depending on the transmitted signal.

Android Operating System / Mobile App

An android app is meant for mobile phones with an android based operating system. As an alternative, the mobile app can be used as a remote controller to switch ON/OFF bulbs.

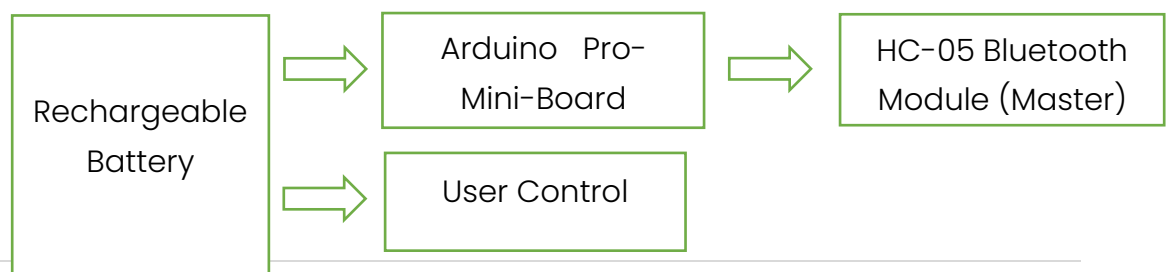
Product Architecture

By considering the functioning of our product, we can study architecture as follow.

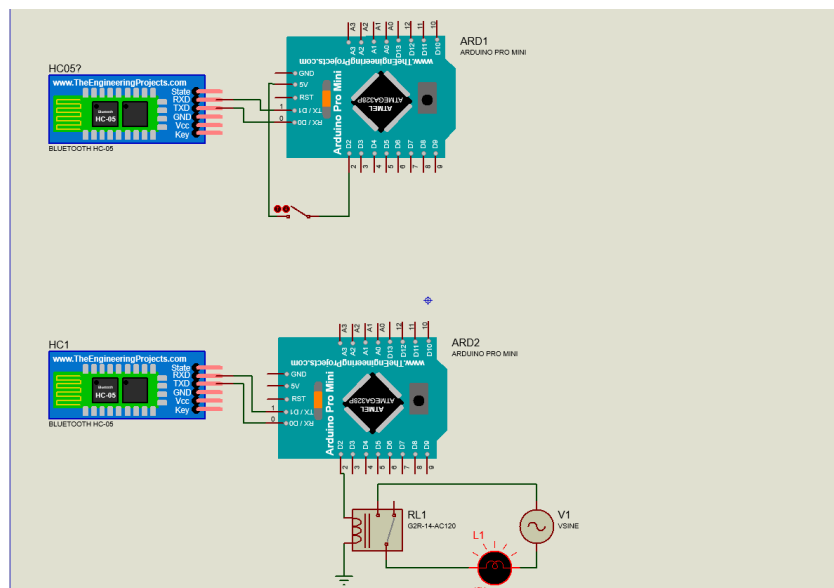
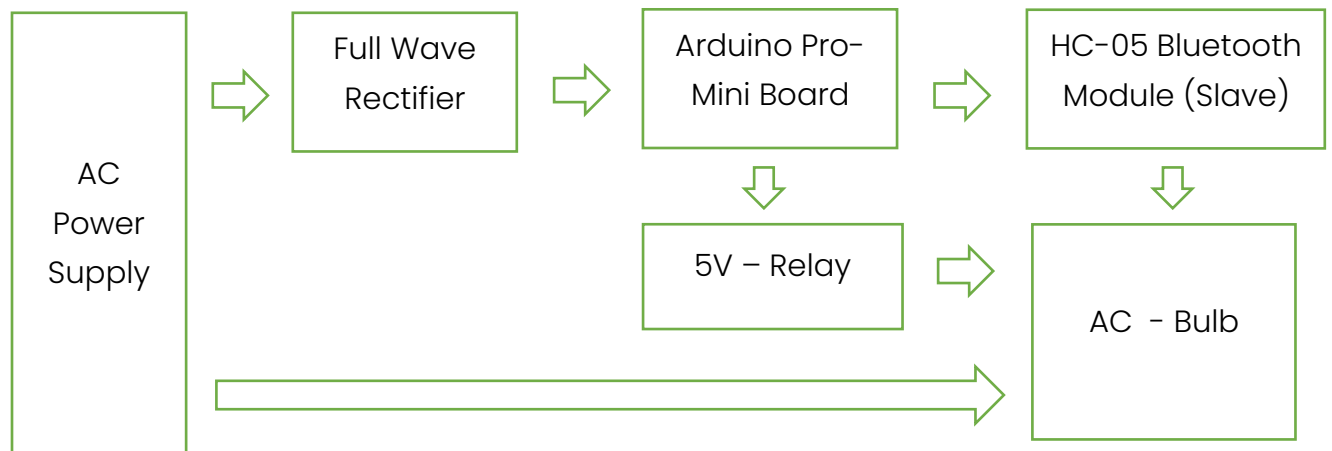
1. Electronic Architecture
2. Housing Architecture

Electronic Architecture

- Transmitter Schematic



- Receiver Schematic



Here also we can make a clear separation between the transmitter part and receiver part.

- In both parts, we must use a microcontroller to manage our operations. By regarding the size, we have decided to use Arduino pro mini board as our microcontroller.
- To create the wireless connection between the transmitter and receiver, we had some alternatives. But after considering factors like range, we have decided to use Bluetooth technology. We have selected the HC-05 Bluetooth module since we can use it as both master and slave.

- Another vital part is powering the circuits. Since transmitter and receiver show two different properties especially in terms of portability, we had to use two different approaches.
 - i. **Transmitter (Remote Controller)** – Since the remote controller is a portable device, batteries are the best solution. Users can easily replace batteries when they get obsolete.
 - ii. **Receiver** – Inside the receiver, we must power up the bulb also. Hence, we have to depend on AC voltage. But the issue is we must operate pro mini board by DC voltage. So, we have to use a Full Wave Rectifier to give DC voltage input to the pro-mini-board.
- Another barrier to complete our project is we can't control an AC bulb directly using pro-mini-board commands. We must implement an intermediate controller. So, we used a 5V relay to fulfill this requirement.

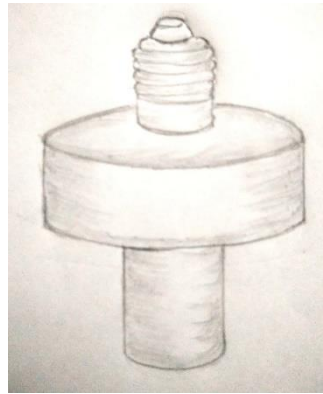
Housing Architecture

In this case, also we can address this issue using by considering receiver and transmitter parts separately.

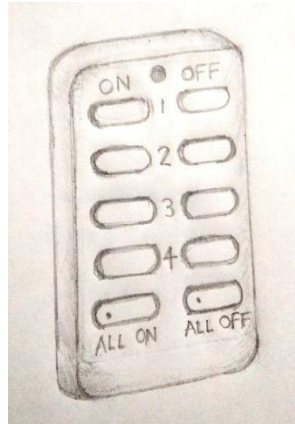
- **Transmitter** – This is the end that should have more user-friendliness. The shape of the remote is the most important. It should be easy to grab and press the buttons. We have included this section in our surveys and we have chosen one prototype.
- **Receiver** – When we consider the housing of the receiver it is simply a holder. But it should be able to release extra heat. Unless it will cause to melt up the connections. This can even cause to make firings also. We have to seal the connections also. Because let's say a user uses this product in a coastal area. Then if we failed to seal the connections, there will be corrosion issues that can cause severe damages.

Initial and Finalized Sketches of the Product Enclosures

Initial Sketches



Finalized Sketches



Initial -> Finalized Sketches Path

When we finalize the sketches of the product enclosures we considered the following factors.

1. Size of the product
2. Able to place the PCB inside the bulb holder
3. Flexibility of design
4. User-friendliness
5. More attraction to the customer

Project Budget with BOQ

Item	Quantity	Unit Price(Rs.)	Total Price(Rs.)
HC – 05 Bluetooth module	2	200.00	400.00
Pro mini microcontroller	2	330.00	660.00
Relay 5V	1	175.00	175.00
6.2V Zener Diode 500mW	1	7.00	7.00
1 AMP Full Wave Bridge Rectifier	1	6.50	6.50
TOTAL(Rs.)			1248.50