DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING

PROJECT REPORT ON

WIRELESS SWITCHING CIRCUIT BY PHOTORESISTOR

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DECLARATION

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Here we are, **MD SAIFUL ISLAM RIMON** (213002039) and **MD ARAFAT** (213002028) in a team **"BOT-X"** confirm that this report and the work presented in it are our own achievement. We have read and understood the penalties associated with plagiarism.

MD SAIFUL ISLAM RIMON **MD ARAFAT**

Date: ……. Date: …….

CERTIFICATION

GREEN UNIVERSITY OF BANGLADESH

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

This is to certify that this project is fully adequate in scope and quality as an undergraduate project work.

……

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ABSTRACT

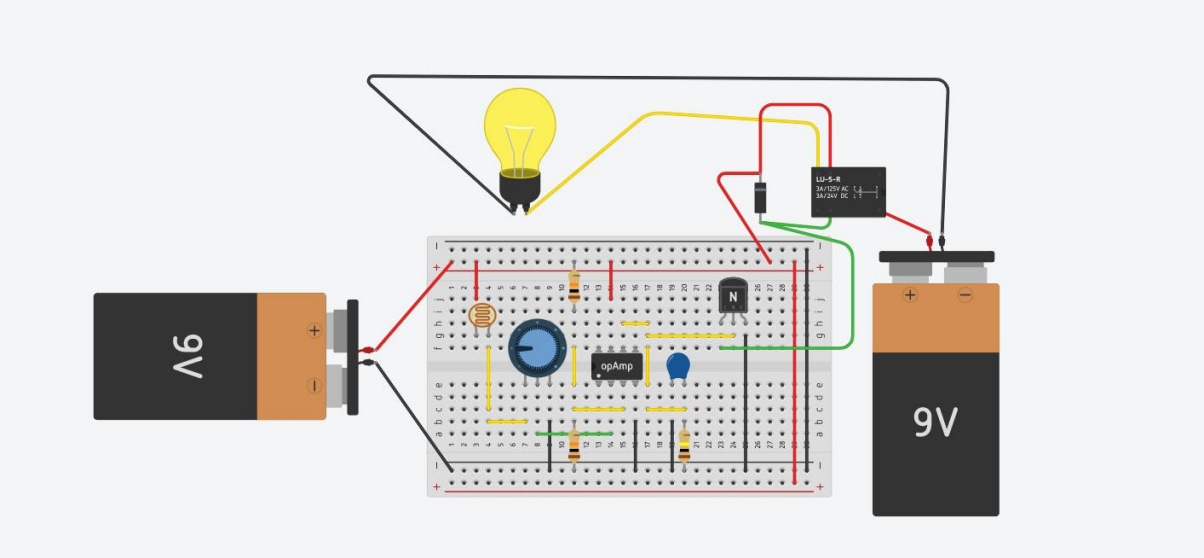
WIRELESS SWITCHING CIRCUIT BY PHOTORESISTOR

Normally, there is some situation where turning ‘on’ or ‘off’ the devices regularly is difficult and even need to give a particular attention or concern on this. So, here people need automated something for those kind of situations. By this project the devices or appliances can be turned ‘on’ or ‘off’ by some light sources (like: sun-light). When sun light goes, the devices will turn ‘on’ and when the circuit get sun light or other light, the devices will turn ‘off’. Basically, this kind of circuit or system is used for night time majorly.

OBJECTIVES

- To implement wireless switching circuit by using photoresistor.
- To make easier and hassle-free system for difficult and risky situation.

FIGURES, PICTURES AND SOME EXAMPLES:



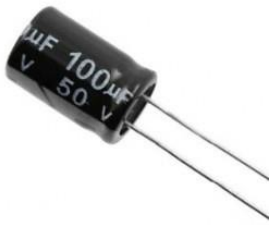
THEORY

The SPDT Relay is a high quality Single Pole Double Throw Relay (SPDT). The Relay consists of a coil, 1 common terminal, 1 normally closed terminal, and one normally open terminal. When the coil of the relay is at rest (not energized), the common terminal and the normally closed terminal have continuity.

Diode is an electrical semi-conductor component that allows the flow of current in only one direction.

NPN transistors are used in amplifying circuit applications like: in the Darlington pair circuits for amplifying weak signals.

The capacitor is a two-terminal electrical device that stores energy in the form of electric charges.



741 op amp ic, Its main purpose is to amplify (increase) a weak signal

Resistor, which is used to resist the flow of current

A potentiometer (also known as a pot or potmeter) is defined as a 3 terminal variable resistor in which the resistance is manually varied to control the flow of electric current. A potentiometer acts as an adjustable voltage divider.

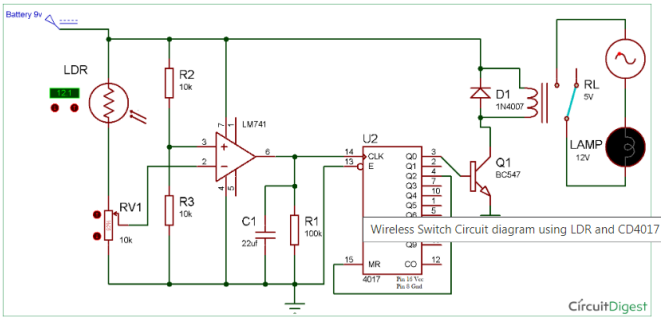
A photoresistor is a type of resistor whose resistance decreases when the intensity of light increases.

COMPONENTS:

Name	Quantity	Component
BAT1, BAT2	2	9V Battery
K1	1	Relay SPDT
L1	1	Light bulb
U1	1	741 Operational Amplifier
T1	1	NPN Transistor (BJT)
C1	1	22 uF Capacitor
Rpot1	1	250 kΩ Potentiometer
R1, R3	2	10 kΩ Resistor
R2	1	Photoresistor
D1	1	Diode
R4	1	100 kΩ Resistor

BUILDING PROCESS:

The main principle of this Wireless Switch Circuit is in the functioning of LDR, LM741 Op-Amp and a CD4027 JK Flip-Flop IC. In this circuit, all we need is to pass your hand above a simple Light Sensor, the infamous LDR. The LDR is configured in such a way that, light from an LED will continuously fall on the LDR and when you place your hand over (or pass your hand between the LED and LDR), the device connected to the circuit will turn ON.



This change is detected by an Op-Amp (LM741 is used here) and triggers a flip-flop (CD4027 is used). The device will stay turned ON until you pass your hand over the LDR again. The design of the circuit is very simple. First, connect a

Figure 1: Circuit Diagram

Voltage divider (using either two resistors or a potentiometer) to the Inverting terminal (Pin 2) of the Op-Amp LM741. Now, connect the combination of LDR and a resistor (which again form a voltage divider) to the Non-Inverting terminal (Pin 3) of the Op-Amp. Place an independent LED (with current limiting resistor) in from of the LDR so that the light from LED will always fall on the LDR.

Connect the output (Pin 6) of the Op-Amp to the clock (Pin 13) of the Flip-Flop IC CD4027. The output of the Flip-Flop (Pin 15) is connected to the Relay Input of the 5V Relay Module.

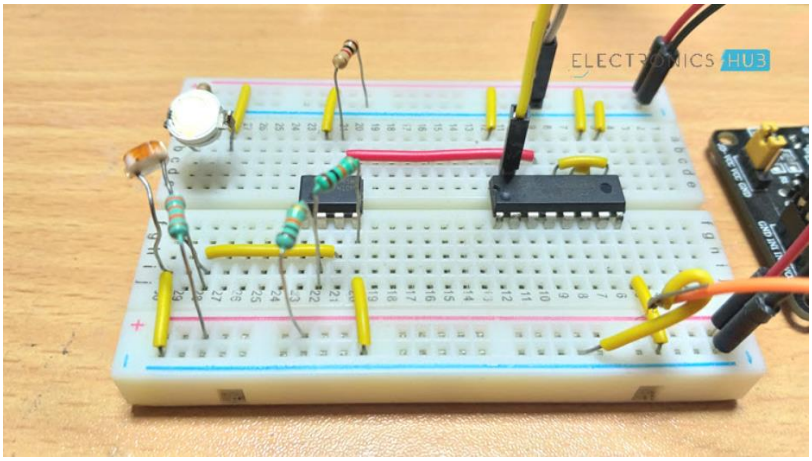


Figure 2: Wireless Switching Circuit Implemented

Finally, connect the J (Pin

10) and K (Pin 11) Pins of CD4027 to +5V and Set (Pin 9) and Reset (Pin 12) to GND. Rest of the connections with respect to power supply are self-explanatory.

NOTE: In place of two fixed resistors that are connected to the Inverting Input of the Op-Amp, you can connect a Potentiometer and vary the sensitivity of the circuit.

***WARNING**: If you are planning to use a real light bulb (that run on AC Mains Supply) with the relay module, you must be extremely careful when making the connections.*

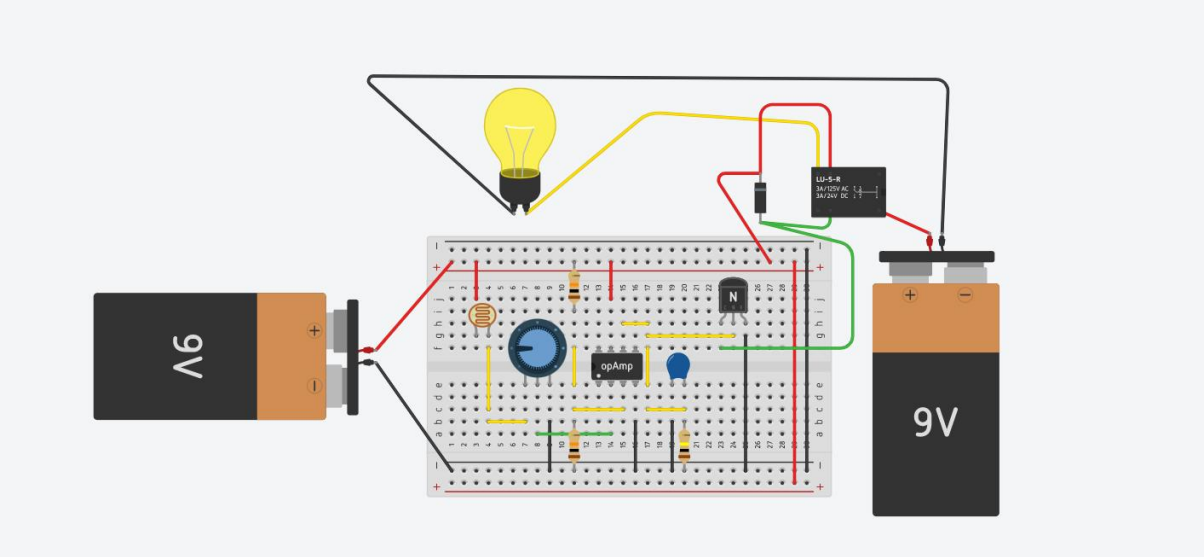


Figure 3: Simulation circuit on TinkerCad

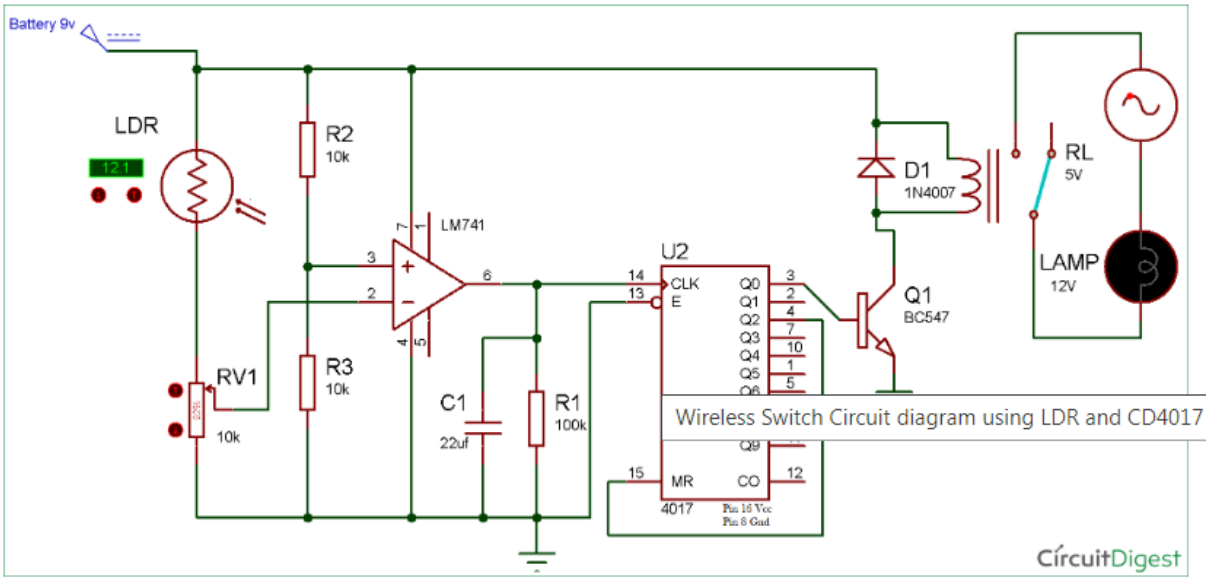


Figure 4: Circuit Diagram

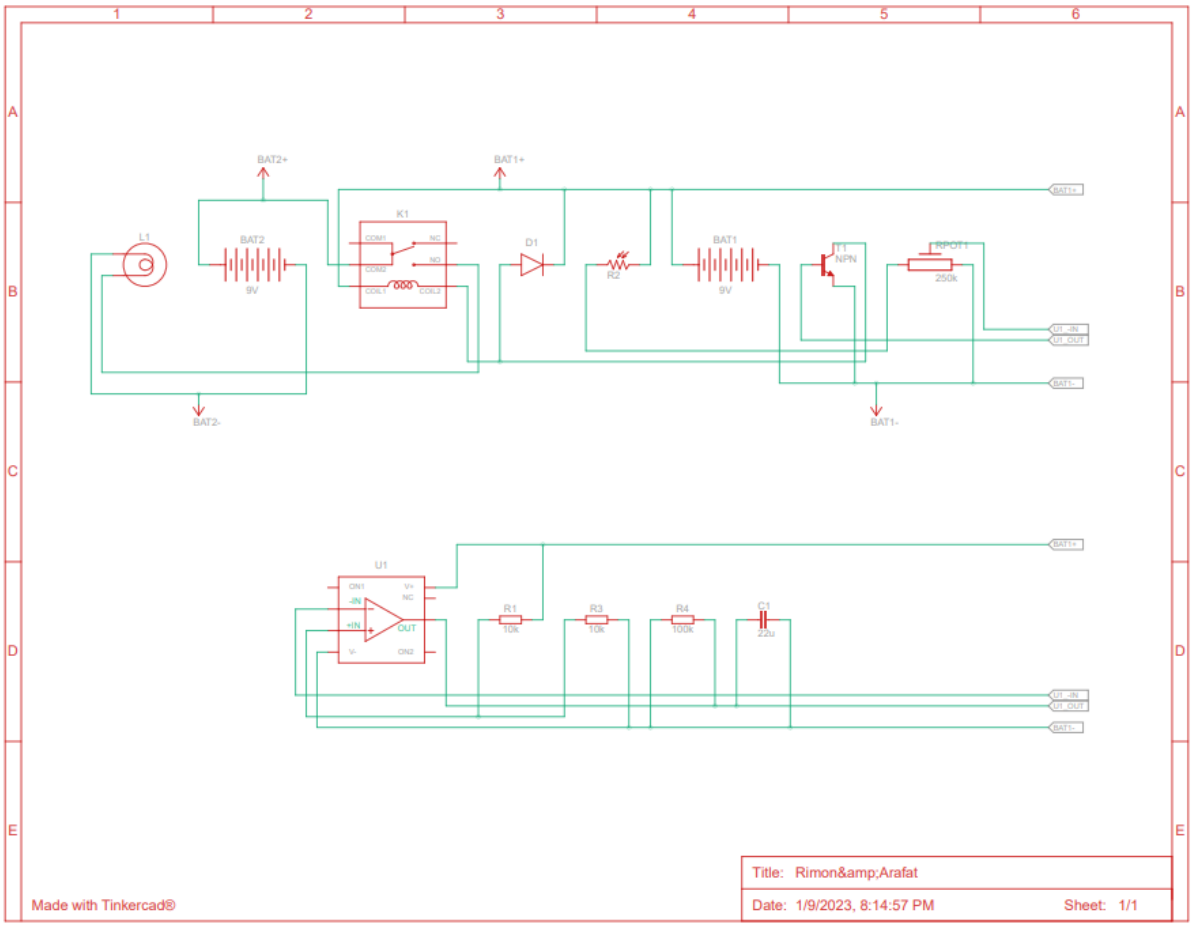


Figure 5: Schematic Diagram

WORKING PROCESS:

When we do not put our hand on LDR device remains off and as a result pin 2 of IC1 goes high. Consequently, output pin 6 of IC1 remains low. As soon as anyone puts his hand over LDR, pin 2 of IC1 goes low in comparison to pin 3 of IC1 . Pin 6 becomes high thus providing a clock pulse to pin 13 of IC2 which is a flip flop whose stage is controlled by the logic levels present at J and K input with some internal control. Change in state occurs at the positive going transition of the clock pulse. In this, set and reset pins are independent of the clock and they are initiated when a high signal is present on any of the input pins. The circuit shown is triggered on the leading edge of the switch pulse which means that output changes when you again put your hand over LDR. From the circuit you can see that both J and K are tied to high input so at every negative or positive transition, the clock pulse pin 13 toggles between high to low. This can be verified with the help of the truth table of the JK flip flop. Therefore, when it receives the clock pulse from IC1 due to hand over LDR, transistor connected to pin15 starts conducting and we will receive the output with the help of relay. You can adjust the sensitivity of LDR with the help of VR1. Photoresistor plays the major part to function the device. It decides if the appliance will turn ‘on’ or ‘off’. Battery supplies power to the circuit. When it gets ‘on’ signal, the circuit distributes power to all other components. A photoresistor is a type of resistor whose resistance decreases when the intensity of light increases. So, here the photoresistor catch the sunlight or other sorts of lights and make the circuit ‘off’ or paused and when the photoresistor can’t get any light, then the circuit will on automatically. So here, the photoresistor is playing the major role of this entire circuit. And other important thing is, ‘potentiometer’. A potentiometer (also known as a pot or potentiometer’) is defined as a 3 terminal variable resistor in which the resistance is manually varied to control the flow of electric current. A potentiometer acts as an adjustable voltage divider. Here, the potentiometer regulates the photoresistor as its working parameter.

ADVANTAGES:

- **Manage your circuit remotely**

  Of course, the most significant advantage of smart circuit is that it gives you the capability to manage your circuit remotely. For many of us, this means not having to get out of bed to turn the bedroom light off or being able to dim the lights using voice commands. However, this can also be an important feature for people with mobility challenges.

  This ability to manage your circuit remotely is also an essential safety feature. For example, when you're out of town, you can set up a schedule for your smart lights to go on and off during the times when you usually use them. This makes it harder for potential burglars to tell if you're home or not and may protect you from potential break-ins.

- **Circuit as an Automatic Solar Street Lights**

- ✓ First of all solar energy is absolutely free & is a renewable resource for generating electricity. Here are some other advantages of using the automatic solar street light system.
- ✓ Since automatic street light systems feature no moving parts, they require less maintenance than conventional street lights.
- ✓ The automatic solar street light system is a stand-alone arrangement & therefore requires no external wiring or having to connect with the grid.
- ✓ There are lower chances of the automatic street light system overheating & risk of accidents is also minimized.
- ✓ Cost of operating automatic solar street lights is far less when compared to the conventional street lights.
- ✓ The automatic street light system is eco-friendly & hence helps in reducing the carbon footprint.
- ✓ Smart solar street lights can be put up in remote areas even in places that are not accessible to the grid.

LIMITATIONS:

- **High cost as compared to a traditional circuit system**

  If we look at the conventional bulbs, they need the material required for lighting up the room. But for intelligent light, to provide advanced features, it is equipped with many sensors, additional electronic components, communicational circuits, etc., which elevates its cost.

- **Requires an additional hub**

  We mentioned that smart bulbs are somewhat expensive, but the bulbs themselves are not the only costs you'll pay when setting up your smart circuit system. As we mentioned, smart bulbs require you to have a hub that acts as a controller. This hub communicates with your phone and manages the schedules and commands for all the bulbs around your house.

  Smart circuit hubs vary in price depending on what brand you're using. Often, these hubs may be used for more than one smart device around your house, making it a somewhat more affordable investment. You can even get home security systems that function as hubs for smart lights and other smart devices around your home.

- **Circuit as Automatic Solar Street Lights**
  - There are some disadvantages which are associated with solar street lights as well.
  - The automatic street light system requires a higher initial investment in comparison to conventional street lights.
  - Generation of energy for solar street light entirely depends upon the climatic conditions.
  - Risk of theft of the automatic street light system is relatively higher since they are non-wired & are much expensive.
  - Rechargeable batteries of the automatic street light system are required to be replaced a few times.
  - Snow, dust or moisture can accumulate of PV panels which can hinder energy production.

USAGE:

- ✓ Automatic street light
- ✓ In industry for various purpose
- ✓ Lights in runway
- ✓ Lights in bridge
- ✓ Lights in airplane wings
- ✓ Lights in ship
- ✓ Security light
- ✓ Lights in tunnel
- ✓ Riverside
- ✓ Various stations, like: Railway
- ✓ Brightness control in displays
- ✓ Solar-system lights

FUTURE SCOPE:

- ✓ It can be extended as a smart automatic circuit.
- ✓ It can be made a routine-wise scheduling circuit.
- ✓ In industrial sector, it can be used highly.
- ✓ The circuit can be made remote-control from distant places.
- ✓ In educational institution, it can be used highly.
- ✓ In hospital it can be used.
- ✓ In various stations (Like: Railway station)
- ✓ In garden and etc.

EVALUATION, RESULT AND DISCUSSION:

To complete this project we have seen these equipment for the very first time. So, we had to study first about all of those components used. Then we have to get knowledge from many online sources (like: YouTube, Google, Wiki etc.) about how can we build this project. And finally, we did it. So, our circuit works fully okay. We haven't found any problem in it. It is filling the objectives of this project properly. We got what we wanted from this project. When, we force any light (like: sun-light, flash-light etc.), our loads are getting 'off' and when we clear the light sources and place it in a dark place, the circuit is turning 'on' automatically. That's all we wanted.

CONCLUSION

This wireless switching circuit using photoresistor project is useful for saving costs. Additionally, it can also save energy and save the earth. In this circuit the delay time between input and output is very less to produce an output for an applied input. The power wastage in the circuit is very less because of low current sinking property of the op-amp

Because of its high input impedance. The circuit doesn't require any manual touch to switch ON or OFF the electronics appliances. Because of the non-ideal behavior of op-amp and flip-flop the circuit output may deviate from the ideal value. It is efficient as no workers are needed to control the switch. Besides, Photoresistor is a useful device when we want to make a project in relation to light. Despite the darkness sensor project, there is a lot thing we can do by using Photoresistor such as morning alarm, light detector and many more. Overall there are a lot more things can be done with this photoresistor project.

REFERENCES

[1] https://ediylabs.com/contests/TCDC2021/upload/Project/4174386-Wireless%20Switching%20Circuit.png

[2] https://ediylabs.com/contests/TCDC2021/projectlist

[3] https://www.youtube.com/watch?v=b_s6vu43xek&feature=youtu.be

PROJECT LINK

Privacy: Design is viewable by anyone with the link.

https://www.tinkercad.com/things/0irTco6GgAY?sharecode=O-UeP36FLrss8CW7BqPcyWLXSSLV23OFQ_G_7AIUBwE

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