

TOUCH DIMMER SWITCH CIRCUIT

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Abstract - The past decade has seen significant advancement in the field of consumer electronics. A Touch Dimmer Switch Circuit is a simple project, where the dimmer action is achieved with the help of a Touch Sensor. While a regular switch is used to simply turn ON or OFF a light, a Dimmer (or Dimmer Switch) will allow us to control the brightness of the light. Without a Dimmer Switch, the light bulbs tend to glow at full brightness consuming maximum power. If full brightness is not required, then Dimmer Switches can be used and save some energy. With the help of a Dimmer Switch, we can vary the brightness from fully off to fully on.

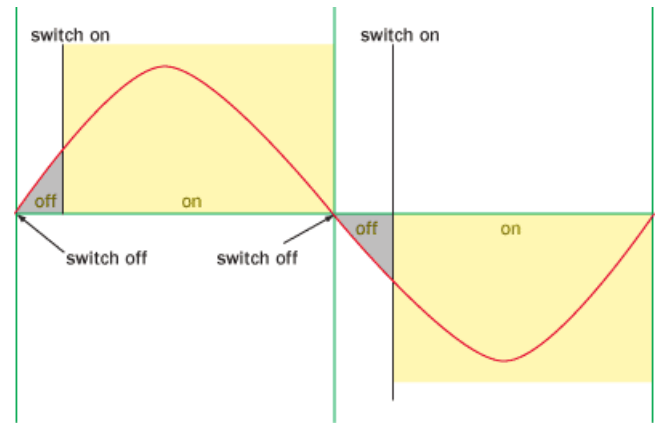
Key Words: Micro controller Touch sensor, LED light, Transistor, Printed Circuit Board.

1. INTRODUCTION

Early dimmers were directly controlled through the manual manipulation of large dimmer panels. This required all power to come through the lighting control location, which could be inconvenient, inefficient and potentially dangerous for large or high-powered systems, such as those used for stage lighting.

1.1 Modern Light Dimmers:

Solid-state light dimmers work by varying the "duty cycle" (on/off time) of the full AC voltage that is applied to the lights being controlled. For example, if the voltage is applied for only half of each AC cycle, the light bulb will appear to be much less bright than when it gets the full AC voltage, because it gets less power to heat the filament. Solid-state dimmers use the brightness knob setting to determine at what point in each voltage cycle to switch the light on and off. Typical light dimmers are built using thyristors and the exact time when the thyristor is triggered relative to the zero crossings of the AC power is used to determine the power level. When the thyristor is triggered it keeps conducting until the current passing through it goes to zero (exactly at the next zero crossing if the load is purely resistive, like a light bulb). By changing the phase at which you trigger the triac you change the duty cycle and therefore the brightness of the light.



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Fig -1: Waveform of dimmer

1.2 Touch Sensor

Different light bulbs need different dimmer switches and there are different types of Dimmer Switches available in the market. Some of the commonly found Dimmer Switches are Slider type and rotary type. In this project, we have designed a Touch Dimmer Switch using Arduino. The Touch Dimmer Switch Circuit is implemented using a Touch Sensor. This sensor is activated with the touch of human skin or a stylus holding an electrical charge.



Fig -2: Touch Sensor

1.3 Arduino

In default the Arduino is not equipped with a display to visualize measuring-data, for example from your temperature or your pressure Sensor. If you want to get the data shown you need a PC, printing the data to the console or mounting a display directly to the Arduino. So there is no simple way to WIRELESSLY visualize measuring-data. In this intractable Fig.2 will show how to transfer measured Sensor-data in real-time from your Arduino-Microcontroller to your Android-Smartphone via Bluetooth.

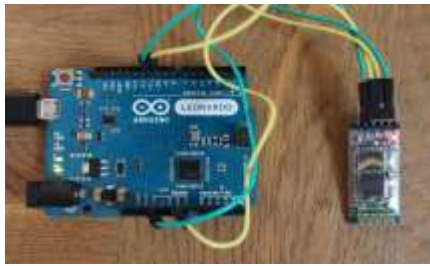


Fig -3: Bluetooth HC-05 and Arduino

2. PROBLEM FORMULATION

Over illumination is the presence of lighting intensity higher than that which is appropriate for a specific activity. Over illumination was commonly ignored between 1950 and 1995, especially in office and retail environments. Since then, however, the interior design community has begun to reconsider this practice. Over illumination encompasses two separate concerns. Unnecessary electric lighting is expensive and energy-intensive. Lighting accounts for approximately 9% of residential electricity use as of 200 and about 40% of commercial electricity use.

2.1 Existing Technology

In electrical engineering, a switch is an electrical component that can "make" or "break" an electrical circuit, interrupting the current or diverting it from one conductor to another. The mechanism of a switch removes or restores the conducting path in a circuit when it is operated. It may be operated manually, for example, a light switch or a keyboard button, may be operated by a moving object such as a door, or may be operated by some sensing element for pressure, temperature or flow. A switch will have one or more sets of contacts, which may operate simultaneously, sequentially, or alternately. Switches in high-powered circuits must operate rapidly to prevent destructive arcing, and may include special features to assist in rapidly interrupting a heavy current. Multiple forms of actuators are used for operation by hand or to sense position, level, temperature or flow. Special types are used, for example, for control of machinery, to reverse electric motors, or to sense liquid level.



Fig -4: Traditional Switch

2.2 Proposed Technology

A Touch Dimmer Switch Circuit is a simple project, where the dimmer action is achieved with the help of a Touch Sensor. While a regular switch is used to simply turn ON or OFF a light, a Dimmer (or Dimmer Switch) will allow us to control the brightness of the light. Without a Dimmer Switch, the light bulbs tend to glow at full brightness consuming maximum power. If full brightness is not required, then Dimmer Switches can be used and save some energy. With the help of a Dimmer Switch, we can vary the brightness from fully off to fully on. Intelligent lighting forms part of home automation where the circuit levels are pre-programmed according to use and according to other factors such as time of day. Light fittings can be controlled individually or grouped together in circuits. Each circuit or fitting can be set to be at a different level of brightness. These levels are then stored as a "scene" which can be best of as being a complete look of a room. Some systems have 10 or more programmable scenes. Once set up scenes can be easily recalled manually from touch screen, switch panels, infra-red or wireless remote controls. They can be recalled automatically by time clock, or according to occupancy. Once a new scene is selected the lighting will fade to the new set of levels.

3. Hardware Implementation

The design of the Touch Dimmer Switch Circuit is very simple and is explained here. The touch sensor is given the power supply by connecting 5V to VCC and ground to GND pins. The SIG pin of the touch sensor is connected to any of the digital input / output pin of the Arduino UNO board. Here, it is connected to digital I/O pin 8.

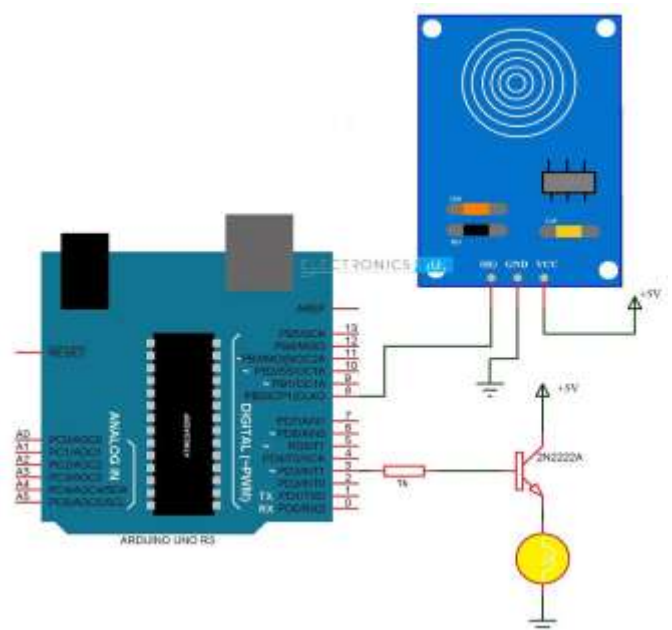


Fig -5: Block diagram

4.1 Working

We will connect a small incandescent bulb that glows on DC. The bulb is interface with the Arduino UNO board with the help of a transistor. So, first connect the base of a transistor like 2N2222 to any digital I/O pin of Arduino UNO with the help of a current limiting resistor. Then connect the collector terminal of the transistor to the 5V power supply. And finally, connect a bulb between the emitter and ground terminals. This completes the design of the circuit. As mentioned earlier, there are many types of dimmer switches for different types of bulbs. In this project, a simple touch dimmer switch circuit is designed. The working of the project is explained here.

When the sensor is not touched, the SIG pin of the sensor remains LOW. Whenever we touch the sensitive part of the touch sensor, the SIG pin of the sensor goes HIGH. Since it is connected to Arduino UNO, we will detect this change in state i.e. LOW to HIGH.

So, when the finger is placed on the touch sensor, Arduino UNO detects the change in the logic state of the sensor's output and drive the bulb using Pulse Width Modulation (PWM). Hence, the bulb is connected to a PWM pin of the Arduino UNO.

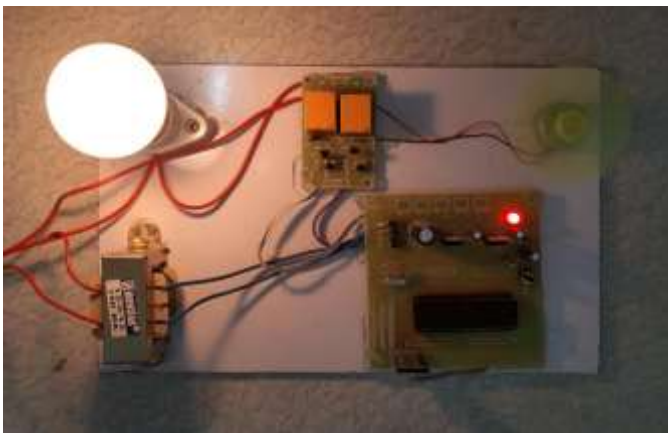


Fig -6: Output

4.2 Results

This is evident is that many of the products on the market today have benefited from the development of touch screen technology and particularly the use of microcontrollers to process the signals from the sensing elements. This has resulted in solutions that are far more capable and reliable than older, discreet touch sensing circuits, while still providing the basic functionality of on/off switches or simple sliders or wheels for dimming.

5. CONCLUSION

Mention 'touch sensors' or 'touch control' today and most people will tend to think of touchscreen displays, whether these are the cash machines (ATMs) used by banks, the self-scanning checkout terminals in grocery stores, or increasingly our smartphones, tablet computers and e-reader devices. These uses certainly reflect the advances that this technology has brought to our modern life, but not every application requires this level of sophistication and more basic touch sensors still have a role to play in providing convenient, easy-to-use controls. Lighting, for the home, office or factory, is a prime example where often all that is required is the ability to turn lights on and off or apply a simple dimming function. While touch control of lighting is not new, the broader developments in touch sensing have seen a proliferation in dedicated ICs that make it even easier and more cost-effective to design touch controls for lighting.

6. FUTURE SCOPE

These are the cash machines (ATMs) used by banks, the self-scanning checkout terminals in grocery stores, or increasingly our smart phones, tablet computers and e-reader devices. These uses certainly reflect the advances that this technology has brought to our modern life, but not every application requires this level of sophistication and more basic touch sensors still have a role to play in providing convenient, easy-to-use controls. Lighting, for the home, office or factory, is a prime example where often all that is required is the ability to turn lights on and off or apply a simple dimming function. While touch control of lighting is not new, the broader developments in touch sensing have seen a proliferation in dedicated ICs that make it even easier and more cost-effective to design touch controls for lighting.

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