Remote Control of Electrical Appliances using IR Communication based on Temperature and Light Intensity

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***Abstract*: In the context of smart innovation at home, the kitchen is usually the control center of devices. Such automatic robots are an evolution of traditional household activities (previously done by hand), and as a result, people can take on other domestic tasks that they would not have had the time to accomplish. In this work, a new architecture configuration for the regulation of room-space electrical appliances is proposed, implying a step toward home automation is accessible. The monitoring comprises an IR receiver, a temperature sensor, and an LDR module. The IR sensor on the TV/DVD remote control activates the system, allowing you to turn on or off lights using the Arduino microcontroller to process the received IR signal. This retreat, combined with the rapid-fire relay driver branch, amplifies the signal at the end of the circuit with a diode. This causes the device to be connected to the AC mains. Touching the relay energizes its contacts, which, if it has a normally open (NO) body, serve as a trigger for the device. The system's design is flexible in responding to external circumstances by operating the fan through a temperature sensor and adjusting the light based on how bright the room is through the LDR module. The system is remotely enabled and offers an intuitive and easily operable interface, making utility management in homes more convenient than ever.**

***Keywords*: Remote control, Light sensor, Temperature sensor, Arduino, IR Communication.**

I. INTRODUCTION

In present days, people generally operate their electrical and electronic appliances such as fans, lighting bulbs, coolers, etc. manually through switches of regular switchboards. This manual method is an inconvenient method for old people or physically handicapped elders as well as for the young youth when the frequent switching operation is need. This type of operation can be replaced by introducing home appliances that can be controlled by remote control. This method can be easily handled and it requires less manpower and cost [1]. In this method is more convenient, safe to use, and is more secure. With the increasing advancement in technology the concept of IoT (Internet of Things) came into existence and with the use of this concept, we can control appliances in our home and anywhere in the world through Internet. Arduino is used for controlling the home appliances [2]. IR remote is used for giving the signal to the IR receiver, and then the signal is fed into the Arduino Uno board. Arduino Uno sends the related signal to relays that are responsible for switching ON or OFF of the home appliances (e.g., fans, TV, bulbs, etc.) through a relay driver base on temperature and room light intensity. The circuit is connected to any of the home appliances (lamp, fan, radio, etc) to make the appliance turn on/off from a TV, VCD, VCR, Air Conditioner or DVD remote [3]. The circuit can be activated from up to 10 meters.

II. BLOCK REPRESENTATION

The block representation of proposed Remote Control of Electrical Appliances Using IR Communication Based on Temperature and Room Light Intensity is shown in fig.1. IR receiver output is given to Arduino controller. If the code is matched for any one of the appliances, then the corresponding relay driver module is activated and the load is turn on. Temperature sensor output is given to Arduino controller. If the room temperature is less than the threshold value and the corresponding key is pressed on remote, then

the load is not turn on. Suppose the temperature is above the threshold value, then the load (fan) is turn on. Room light sensor output is given to microcontroller. If the light intensity is less than the threshold value and the corresponding key is pressed on remote, then the light is turn on otherwise light will be switch off.

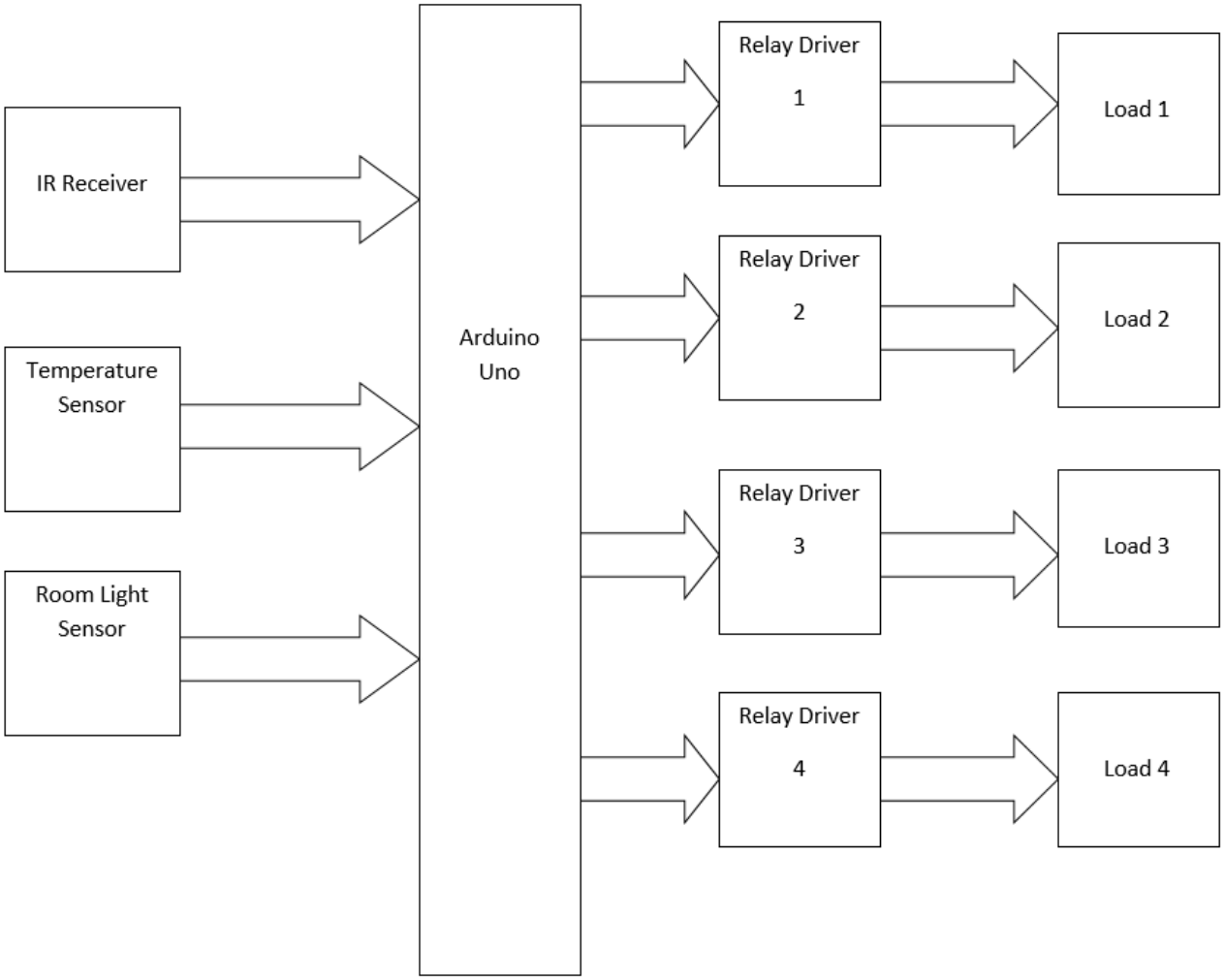

Fig.1. Block representation of proposed system

III. HARDWARE IMPLEMENTATION

The hardware realization of proposed Remote Control of Electrical Appliances Using IR Communication Based on Temperature and Room Light Intensity is detailed below

a) Arduino Uno Microcontroller

An Arduino Uno board is one type of Microcontroller platform which includes the controller name is Atmega328P which is shown in Fig.2. Atmega328P is a 8 bit RISC processor from Atmel family. It consists of 14 I/O pins, 6 analog I/O pins, Power Jack, One Serial Port and Reset button. Arduino Uno power supply can be done through USB cable or an external power supply. The suggested voltage input range is 7 to 12V from external source [4]. Programming software for this Arduino board is Arduino IDE 2.2.1 or higher version. Programming is done through USB serial cable with help of Arduino driver

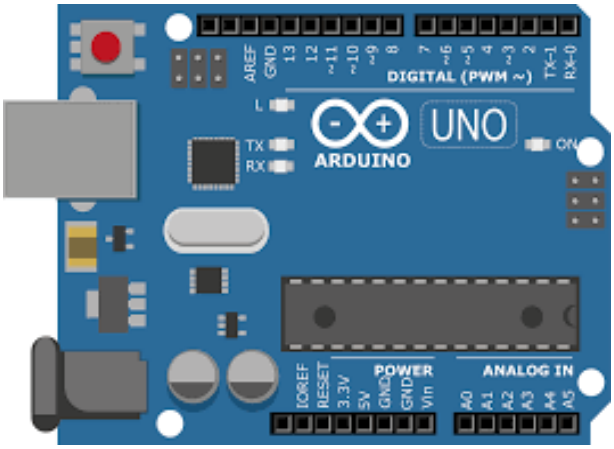

Fig.2. Arduino Uno

b) IR Receiver

In this article, we are using TV/DVD remote as a transmitter. It transmits the HEX code to the IR receiver when the key is pressed in remote. TSOP1738 consist of AGC (Automatic Gain Control), Band pass filter, Demodulator and Control circuit which is shown in Fig.3. [5] IR receiver receives the code from remote and send it to microcontroller. Then microcontroller takes the necessary action as per the program.

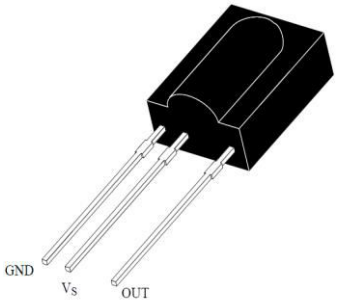

Fig.3.TSOP1738

c) Temperature Sensor

DHT11 is a digital Temperature and Humidity sensor which provides values serially with one wire protocol. DHT11 is a 4 pin sensor these pins are VCC, GND, DATA and one pin is not used which is shown in Fig.4. It provides relative humidity value is percentage (20 to 90%) and temperature values in degree Celsius (0 to 50 degree C). If the temperature value is less than the threshold value, then the fan is off condition even the corresponding key is pressed on remote.

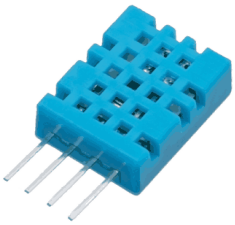
Fig.4.Temperature Sensor

d) Room Light Sensor

Room light sensor is nothing but LDR (Light dependent Resistor) sensor module which is shown in Fig.5. It consists of LDR, Variable pot, analog and digital output pins. Operating voltage for this module is 5V. This module is used to measure and detects the light intensity. If the intensity value is less than the threshold value, then the light is off condition even the corresponding key is pressed on remote.

Fig.5. Room Light Sensor

e) Relay Driver

A single channel 5V relay is an electronic switch that can be controlled by low voltage signal from microcontroller which is shown in Fig.6. By using Arduino Uno and single channel relay module, we can control high voltage devices such as fan, light and motors [6] & [7]. Single channel relay module consists of VCC, GND, Input, normally open, normally closed and Common terminals. Operating voltage for this module is 5V.

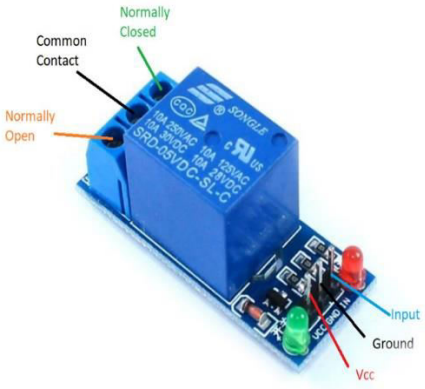

Fig.6. Relay Driver Module

IV. HARDWARE MODEL

The final hardware model is shown in Fig.7. It consists of IR receiver, LDR sensor, Temperature sensor, Arduino Uno and Relay driver module. When the key 1 is pressed on remote, microcontroller now checks temperature threshold value and key 1 value. Both are meet the true condition, then fan will be turn on. Again press the key 1, now fan will be turn off. When the key 2 is pressed on remote, then microcontroller checks the light sensor value and key 2 value. Both are meet the true condition, light will be turn on. Again press key 2, now light will be turn off. When the key 3 is pressed on remote, microcontroller will turn on motor. Again press key 3 on remote, motor will be turn off. When the key 4 is pressed on remote, microcontroller will turn on light. Again press key 4 on remote, light will be turn off.

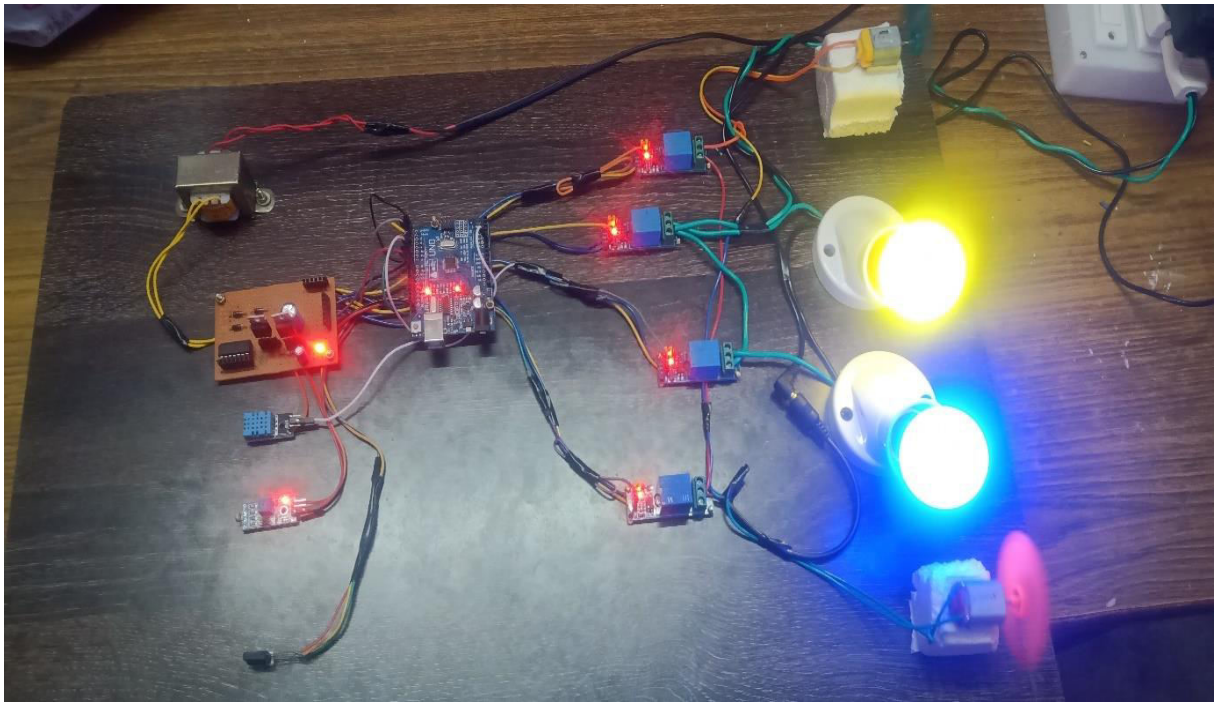

Fig.7. Hardware Model

The following table shows the remote key number and load name.

S.No	Key Number	Load Name
1.	1 When Temperature is Greater than 25°C then fan will be switch on	Fan
2.	2 When room light intensity is less than threshold value then light will be switch on. Otherwise light cannot switch on	Light
3.	3	Light
4.	4	Motor

V. CONCLUSIONS

This article proposes a low cost and user-friendly remote control of electrical appliances using IR communication based on Temperature and Room light intensity. Main advantages of this concept is

remote controlling of electrical appliances based on temperature and room light. So we can avoid the unwanted usage of light and fan.

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