

ARDUINO BASED AUTOMATIC LIGHT AND FAN CONTROL USING WIRELESS MODULE

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ABSTRACT

The Project 'Automatic Fan and Light control using Arduino with Wireless module(nRF24L01)'. We use two parts in this project it includes IR sensors and load cell. IR sensor controls the switching on/off light when it detects any person entered into room. Load cell is used to control fan using nRF24L01 wireless module. Load cell that are embedded into seats to detect if the human is sitting on it. Load cell will give the signal to arduino which gives the signal to nRF24L01. We use two nRF24L01, one for transmitter and another for receiver. Transmitter nRF24L01 transmits signal to receiver. nRF24L01 integrates complete 2.4GHZ RF transceiver. We use arduino instead of pic microcontroller because of reduction in speed also pic microcontroller needs programmer to dump the program to microcontroller. Arduino platform was designed to provide cheaper way to create applications that play in the human interface world using sensors, actuators, motors and other products. We use relay to switch the voltage from 5v to 230v to give power supply for fan and light. People usually forgets to switch off light and fans after use of public places or room. This leads to power wastage. This method puts forward to provide automated services to room and at the same time avoiding any unnecessary power usage.

INTRODUCTION

India is a presently sixth greatest electricity generating country. India's need for power growing at an extra-ordinary rate, annual electricity generation and consumption in India have increased by about 64% in past decade and its project rate will increase 8-10% in 2020. Worldwide 2 billion people are currently without electricity. India is facing a power shortage of 70,000mW which is due to increased demanding power. Our main idea is to conserve electricity that means we should use it only whenever necessary and avoid wasting it. Power wastage can be reduced by doing simple

things, such as turning off lights and fans when we leave a room, as well as more involved processes, such as replacing standard light bulbs and appliances with those that use less electricity. Our project is mainly designed to conserve electricity by using arduino. To avoid power wastage we use automatic fan and light control for a room.

HARDWARE REQUIREMENTS

Arduino UNO R3
Arduino USB cable
nRF24L01
Load cell: 40kg
HX711 Load cell Amplifier

IR sensor
Relay:+5V dc to 230Vac
Bulb
Fan
Jumper wires
Breadboard

This basic block diagram of the automatic fan and light control using arduino is shown in figure below. It consists of separate blocks

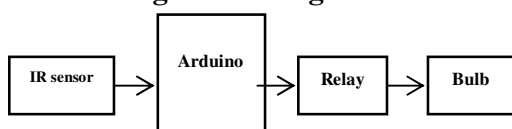
SOFTWARE REQUIREMENTS

Arduino IDE Software
Language:C

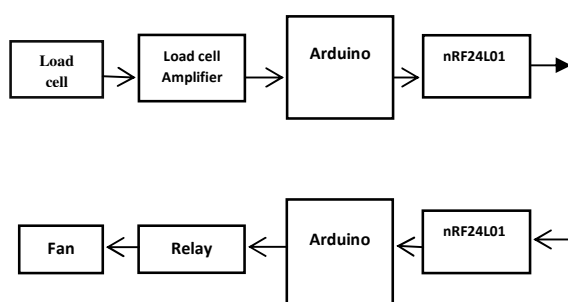
OVERVIEW OF DESIGN



Block diagram for Light:



Block Diagram for Fan:



IR SENSOR

IR sensor is an electronic device and it produces IR waves. IR sensor frequency range varies depending upon its cost. These IR radiation are invisible to our eyes. IR

sensor works as an Object detection sensor. It consists of IR transmitter(LED) and IR receiver(Photodiode). When IR transmitter emits radiation, it reaches the object and some of the radiation reflects back to the IR receiver. IR sensor is also capable of measuring the heat emitted by the object and detecting motion.

LOAD CELL

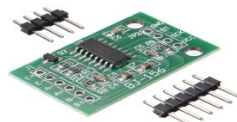
Load cell is a transducer or a sensor, that is used to create an electrical signal when a load or force given to it. There are many kinds of load cells are available they are resistive, capacitive etc.,. Resistive load cell works on the principle of piezo-resistivity. When a load is given to the load cell, it changes its resistance, which leads to change in output voltage when an input voltage is applied. This load cell consists of four strain

gauges that are bonded to the upper and lower surface of load cell. When a load is applied to the body of the load cell, it creates a compression to the two strain gauges and tension for the other two strain gauges. These strain gauges are configured in wheatstone bridge configuration. When a load is given to the load cell, it creates a change in resistance results in change in output voltage that can be measured and amplified to 5V or 10V.



LOAD CELL AMPLIFIER

The HX711 load cell amplifier accepts five wires from the load cell. These pins are labeled with colors; RED, BLACK, WHITE, GREEN and YELLOW. These colors correspond to the conventional color coding of load cells, where red, black, green and white wires come from strain gauge on the load cell and yellow is an optional ground wires that is not hooked up to the strain gauge but is there to ground any small outside EMI. Some times instead of yellow wires to shield the signal wires to lessen EMI.

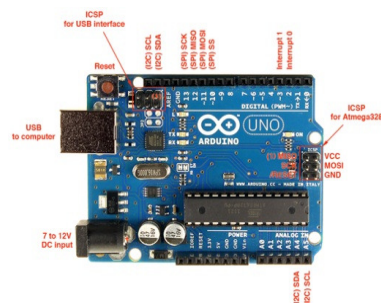


Load cell amplifier is capable of working with very low input signals right down to 0.06mv/v and amplifying them into a stable, high level industry standard process signal such as 0-10Vdc or 4-20mA.

ARDUINO UNO

Arduino is an open source physical computing platform based on a Simple I/O board, and a development environment for writing arduino software. Arduino uno can be used to develop interactive Objects, taking inputs from a variety of switches or sensors, and controlling a variety of lights, motors and other outputs. Arduino projects can be stand-alone, or they communicate with software running on your computer. It is flexible, offers variety of digital and analog inputs, SPI and serial interface and digital and PWM outputs. It is easy to use, connects to computer via USB and communicates using standard serial protocol, runs in standalone mode and as interface connected to PC. Very convenient power management and built-in voltage regulation. It can connect external power source of up to 12V and it will regulate it to both 5V and 3.3V. It can be powered directly off of a USB port without any external power. A 16Mhz clock. 32 KB of flash memory for storing a code. 13 digital

pins and 6 analog pins. These pins allow to connect external hardware to arduino uno.



NRF24L01 Wireless Transceiver Module

The nRF24L01 is a highly integrated, ultra low power(ULP)2Mbps RF transceiver IC for the 2.4GHz ISM (Industrial, Scientific and Medical) band. With peak RX/TX currents lower than 14mA, a sub μ A Power down mode, advanced power management, and a 1.9 to 3.6V supply range, the nRF24L01 provides a true ULP solution enabling months to years of battery lifetime when running on coin cells or AA/AAA batteries. It will have eight pins to interface with, and these are Vcc, GND, IRQ, CE, and the four SPI- related pins (CSN,SCK, MISO and MOSI).Operating range for Vcc is 1.9 to 3.6V. SPI interface uses four pins CSN, SCK, MISO and MOSI for data transmission and reception. The CSN(chip select not) pin is active-low, and is normally kept high. When the pin goes low ,the 24L01 begins listening on its SPI port for data and processes it accordingly. The remaining three pins should be tied to user's hardware SPI interface, to the same pins as their name suggests (SCK to SCK, MISO to

MISO, MOSI to MOSI). The remaining two pins are CE and IRQ. CE is used to control data transmission and reception when in TX and RX modes, respectively. IRQ is the interrupt pin, and is active-low.



RELAY

Relay is an electromagnetic switch, which is controlled by small current, and used to switch ON and OFF relatively much larger current means by applying small current. We can switch ON the relay which allow much larger current flow. Relay is the good example of controlling the AC (alternate current) devices, using much smaller DC current. Commonly used relay is SPDT(Single pole double throw),the application of relay started during of the invention of telephones. They were also used in long distance telegraphy. they were also used to switch the signal coming from source to another destination. relays are used to provide time delay functions. Relays are used to control high voltage circuits with help of low voltage signals. relays are used to realize the logic functions. It has three terminals COM, NO, NC are COM-Common Connection –it is the center terminal, it is hot as power to the load is connected at the terminal. NO-

NORMALLY OPEN acts like switch, since it is open- there will be no contact between COM and NO. NC- NORMALLY CLOSED is always contact with COM, even when relay is not powered.it behaves just opposite to NO.

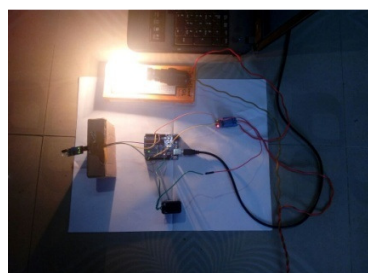


WORKING

In this setup IR sensor transmits IR signal to receiver.The Arduino continuously monitors the signal transmitted by the IR sensor.IR sensor is connected to the pin7 in Arduino. When any object passes through IR sensor it will detect the object and give signal to arduino.Arduino send the 5V output to relay circuit which will switch from 5VDC to 230VAC,then this power supply is given to bulb. Another input is Load cell which converts force into electrical signal.The electrical signal output is few millivots(2mV) and requires amplification by an HX711 load cell amplifier is used. This amplified signal is given to arduino which gives 3.3V to nRF24L01 transmitter. This transmitter transmits the signal of 2.4GHZ range to receiver. Receiver output signal is given to Arduino which gives the 5V output to relay.Then relay is used to

automatically turn on the fan. Through IDE arduino software we will dump the program to arduino.

RESULT



IR sensor successfully identify the object and which in turn on the light. After giving load to the load cell which gives the output signal to wireless module.the wireless transceiver automatically turn on the fan.

CONCLUSION

In this digital world technology is very advanced and we prefer things to be done automatically without any human efforts.This project also helps to reduce human efforts .In existing system the devices will be control by manual operation. This paper proposes automatic light and fan control using wireless module. A person should go near the appliance switch on/off the device.Also it is very useful to conserve resources.Further it can enhanced by various wireless technologies are XBEE and Bluetooth.

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