# Automation system for industries using secure NRF24L Communication system

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**ABSTRACT:**Automation has become a ubiquitous process in this present time.Nowadays seeing an outcome without any human interference is a common view. This project reviews the usage of automation in industry environment which is wireless and can be implemented. Moreover, it also shows safety measures to be taken for normal misfortunes in industry. System includes Arduino nano microcontroller at the transmitter and receiverwhich are interfaced with the NRF24L modules. AT transmitter end we have keypad for controlling appliances. And at the receiving end we have another nrf24l reciever module which includes like fan, motor, led, controlling system to make them turn off and turn on and provide security with a altering system.

**KEYWORDS:**ARDUINO            NANO,NRF24L Module.

## 1.  INTRODUCTION

It often happens that we forgot to switch off some electric devices while leaving home for a journey. This will cause wastage of energy, power and even the devices may get damage due to overheating and load. Even if we remember often left from home there is a rare  options to rectify it. But it causes wastage of time and at the same time wastage of energy too.Also if we are away from home we may have to turn on lights at night. These are normally not possible in present conditions. so, this paper offer a solution for aproblem by using mobile phone whichwe can handle easily for normal people and also vary useful for disabled(handicap)people.ex:ac,fans,lights,waterpumps,doorsetc.The componentsthat we use inthis paperare Power supply Atmega328microcontroller, Relays, Nrf24l module, and home appliances that we needed to control For Ex: fan, light, water pump and door etc.

## II.WORKING PRINCIPLE:

Connect the NRF24L01 module with Arduino according to the circuit diagram. copy thecode of transmitter and receiver and paste it in Arduino IDE. Upload the code. Now, open the serialmonitorandobserve themessagethatiscomingfromthe    transmittertothe receiver.

This system includes arduino nano micro controllers at the transmitter and receiver which are interfaced with the NRF24L modules. At the transmitter end we have a keypad for controlling the appliances. And at the receiving end we have a another NRF24L receiver module which includes lights, Dc motors , locks and a security system to make them turn on and turn off and alert. It also includes the PIR sensor For Human detection
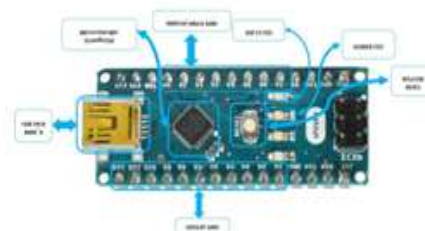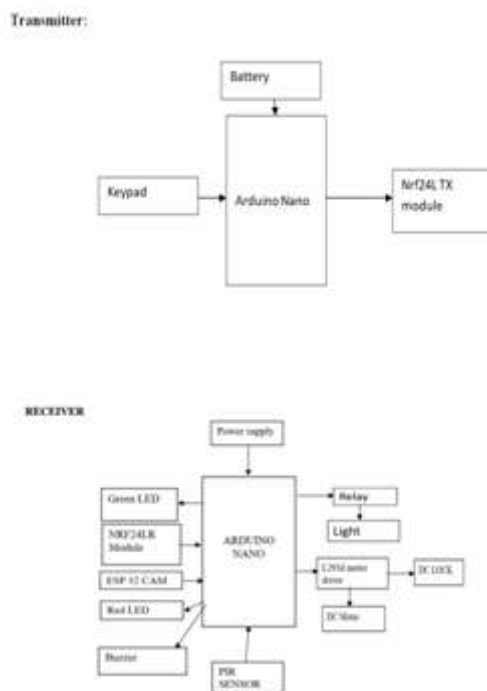
**TRANSMITTER**

In the transmitter block we have a battery with Arduino Nano which is interfaced to the 3 pin push button keypad and a Nrf24l module. Whenever we press the push button for controlling of light, fan or lock then a digital data to a specific address will be sent to the receiver using a particular frequency band above 2Ghz.

**RECEIVER**

In the receiver block, arduino Nano is interface  with the power supply , green led, red, led, buzzer, Pir Sensor, relay and L293D motor Driver modules, light ,fan and lock with Nrf24l receiver module. The Nrf24l receiver will capture the signal from the Transmitter and decode the data with specific frequency and address. This decoded data will executed to the respective appliances like light , fan or lock. And a pir sensor is used for providing the Security.

## III.BLOCK DIAGRAM:



## IV.HARDWARE DESCRIPTION

### ARDUINO NANO

Arduino Nano The Arduino Nano is a small, compatible open-source electronic development boardbased on an 8-bit AVR microcontroller. Two versions of this board are available, one is based on ATmega328p, and the other on Atmega168. Arduino nano can perform some functions similar to other boards available in the market, however, it is smaller in size and is a right match for projects requiring less memory space and fewer GPIO pins to connect with. his unit features 14 digital pins which you can use to connect with external components, while 6 analog pins of 10-bit resolution each, 2 reset pins, and 6 power pins are integrated on the board. Like other Arduino boards, the operating voltage of this device is 5V, while input voltage ranges between 6V to 20V while the recommended input voltage ranges from 7V to 12V. The clock frequency of this unit is 16MHz which is used to generate a clock of a certain frequency using constant voltage. The board supports a USB interface and it uses a mini USB port, unlike most



Arduino boards that use the standard USB port. And there is no DC power jack included in this unit i.e. you cannot power the board from an external power supply. Plus, this device is bread-board friendly in nature means you can connect this unit with breadboards and make a range of electronic projects. The flash memory is used to store the program and the flash memory of Atmega168 is 16KB (of which 2KB is used for the Boot loader) and the flash memory of Atmega328 is 32Kb.

### NRF24L MODULE:

Having two or more Arduino boards be able to communicate with each other wirelessly over a distance opens lots of possibilities like remotely monitoring sensor data, controlling robots, home automation and the list goes on. And when it comes down to having inexpensive yet reliable 2-way RF solutions, no one does a better job than nRF24L01+ transceiver module from Nordic Semiconductor. NRF24L01+ (plus) transceiver module can often be obtained online for less than two dollars, making it one of the most inexpensive data communication options that you can get. And best of all, these modules are super tiny, allowing you to incorporate a wireless interface into almost any project.The nRF24L01+ transceiver module is designed to operate in 2.4 GHz worldwide ISM frequency band and uses GFSK modulation for data transmission. The data transfer rate can be one of 250kbps, 1Mbps and 2Mbps.

The operating voltage of the module is from **1.9 to 3.6V**, but the good news is that the **logic pins are 5-volt tolerant**, so we can easily connect it to an Arduino or any 5V logic microcontroller without using any logic level converter.

The module supports programmable output power viz. 0 dBm, -6 dBm, -12 dBm or -18 dBm and consumes unbelievably around **12 mA during transmission** at 0 dBm, which is even lower than a single LED. And best of all, it consumes 26 µA in standby mode and 900 nA at power down mode. That's why they're the go-to wireless device for low-power applications.**SPI Interface**

The nRF24L01+ transceiver module communicates over a 4-pin Serial Peripheral

Interface (**SPI**) with a maximum data rate of **10Mbps**. All the parameters such as frequency channel (125 selectable channels), output power (0 dBm, -6 dBm, -12 dBm or -18 dBm), and data rate (250kbps, 1Mbps, or 2Mbps) can be configured through SPI interface.

The SPI bus uses a concept of a Master and Slave, in most common applications our Arduino is the Master and the nRF24L01+ transceiver module is the Slave. Unlike the I2C bus the number of slaves on the SPI bus is limited, on the Arduino Uno you can use a **maximum of two SPI slaves** i.e. two nRF24L01+ transceiver modules.
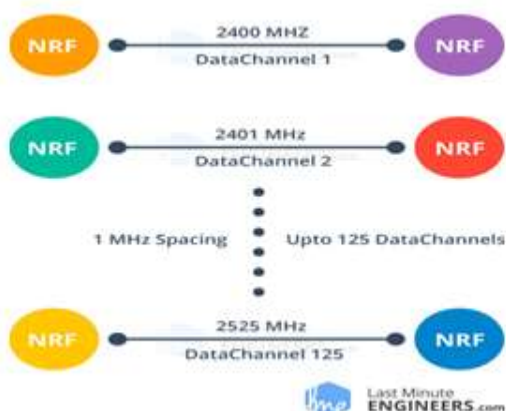


**PIR SENSOR:**

PIR sensor is made of ceramic material that generates surface charge when exposed to infrared radiations. As the amount of radiation increases, the surface charge generated increases. A FET is used to buffer this signal. As the sensor is sensitive to a wide range of radiations, a filter is used which limits the infrared rays falling on the sensor to 8um-14um range. Thus the output of an IR sensor is a function of infrared radiation. But since the output is affected by vibration, radio interference, sunlight, etc. as well, dual sensing elements are used. Both sensors are connected out of phase such that any excitation common to both gets cancelled out. The field of view of these sensors is the area or zone which it sees or where changes in the infra-red radiation can be sensed or detected. Typically, to enhance the range and field of view, the field of view is divided into number of zones (both vertically as well as horizontally) with the help of Fresnel Lens.; a Fresnel lens is a plano convex lens that is collapsed on itself to form a flat lens which retains its optical properties, but is thinner and has lesser absorption losses.

**POWER SUPPLY CIRCUIT**

As in below figure this circuit is an approach to obtain both 12V and 5V DC power supply. The circuit uses two ICs 7812(IC1) and 7805 (IC2) for obtaining the required voltages. The AC mains voltage will be stepped down by the transformer T1, rectified by filtered by capacitor C1 to obtain a steady DC level .The IC1 regulates this voltage to bridge B1 and obtain a steady 12V DC. The output of the IC1 will be regulated by the IC2 to obtain a steady 5V DC at its output. In this way both 12V and 5V DC are obtained. Such a circuit is very useful in cases when we need two DC voltages for the operation of a circuit.

**BLOCK DIAGRAM OF POWER SUPPLY**
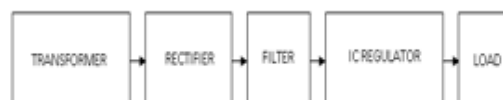


# V.RESULT
**TRANSMITTER DEVICE**
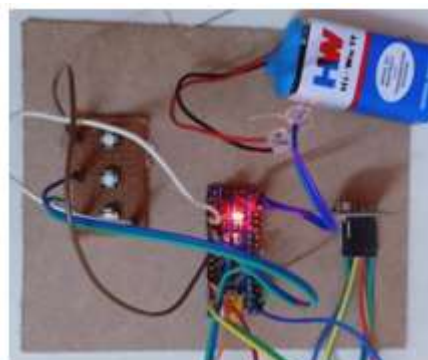


**RECEIVER DEVICE**



# VI. CONCLUSION

This project aim is to We have been discussing about the project uses a microcontroller at mega 328 whichis interfaced through a Nrfl24L device which receives signals from transmitter device for automatic home control .which helps to control over all this at home in the off/on manner.

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