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# Power to the Wheeled Person

**Heena Sharma, Punit Soni, Paridhi Garg, Km.Varsha Pal, Rashi Gupta**

[1,2,3,4]*Inderprastha Engineering College, Ghaziabad, Uttar Pradesh, India*
[5]*Assistant Professor, Dept. of Electronics and Communication Engineering, Inderprastha Engineering College, Ghaziabad, Uttar Pradesh, India*

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**Abstract -** *Since severely disabled people due to spinal cords injuries were a burden on society and families, they couldn't perform their daily life regularly. Assistive technologies have been developed to play a vital role in helping paralyzed persons. It will improve the ability to control their environment, assist them to be employed, reduce the workload of family members and reduce their health care cost. This project is on automatic wheelchair for physically disabled people. A dependent user RF in this wheelchair. In this way we have obtained an automatic wheelchair which can be driven using DPDT switches and with the possibility of avoiding obstacles by using infrared sensors and down stairs or hole detection by using IR sensors. In this 4 additional switches are added for emergency, food, automation and washroom which will provide help for severely disabled people in controlling their life easily.*

***Key Words***: **Arduino UNO, RF module, GSM module, IR sensor, DPDT switches.**

## 1. INTRODUCTION

Many disabled people usually depend on others in their daily life especially in getting from one place to another. For the wheelchair users, they need continuously someone to help them in going the wheelchair moving. By having a wheelchair control system will help handicapped persons become independent. The system is a wheelchair control system which employs a system for triggering and controlling all its movements. The wheelchair responds to command from its user to perform any movement functions. It integrates a microcontroller, motor control interface board to move the wheelchair. The basic movement functions include forward and reverse direction, left and right turns and stop. It utilizes an Arduino Uno to control the system operations. The corresponding output command to drive the left and right motors. To accomplish this task, an assembly language program is written and stored in the controller's memory.

But in this project, we are using some additional feature for making the life a little easier for the disabled person. We are using the features like Home automation, emergency, getting food and for washroom. The wheelchair has also been developed to work on movement of switch which will help for the person whose limbs are not working. We will use the IR sensor which detects the obstacle and stops the wheel chair.

## 2. OBJECTIVE

Providing independent, productive and enjoyable living for physically challenged people by the use of helpful buttons and switches to operate wheelchair. The goal of this smart wheelchair project is to enhance an ordinary powered wheelchair using sensors to perceive the wheelchair's surroundings .Intelligent wheelchair will play an important role in the future welfare society. The use of intelligent wheelchair encourages the view of the machine as a partner rather than as a tool. Implementation of infrared sensor which is used to sense the obstacles coming in path of wheelchair. Introducing home automation in the system would be an added feature of the wheelchair where a disabled person can turn on/off home appliances without getting up from his position.

**Fig -1:** Smart wheelchair

## 3. BLOCK DIAGRAM OF TX SECTION

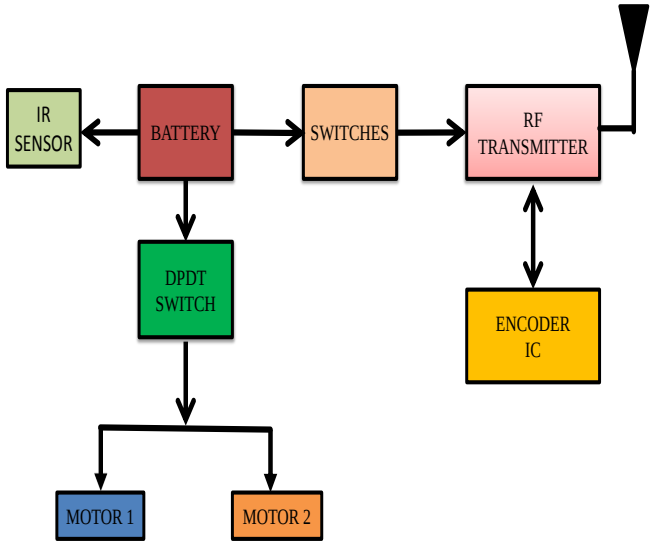


**Fig -2:** Block Diagram of Transmitter Section

The transmission section consist of a 12 Volts battery, switches, two DPDT switches, two dc motors, IR sensor and RF transmitter module. This section is consisting of a rechargeable battery. This section deals with the power requirements of the wheel chair for DC motors, RF transmitter and IR sensor. When power supply is provided through the battery, dc motors get start. With the help of DPDT switches one can change the directions of the wheelchair as per the requirements (forward, backward, left or right).

IR sensor is connected so that if there will be any obstacle in the way then it will help in detecting the obstacle so that the person can change the direction of the wheelchair and enhance safety by preventing collisions with walls, fixed objects, furniture and other people. There are four switches present at the wheel chair. These switches having the different functions like emergency, home automation, washroom and food requirement.

For communication process RF technology is used. It consists of RF transmitter at the transmitter side and RF receiver at the receiver side. The frequency range of RF is 433 MHz. The signals generated by RF transmitter are first encoded by the encoder and then transmitted to the RF receiver at the receiver side with the help of HT12E IC.

## 4. BLOCK DIAGRAM OF RX SECTION

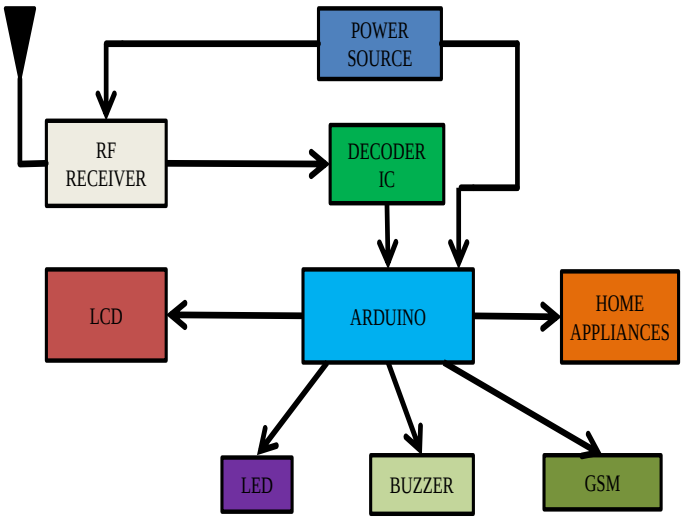


**Fig -3:** Block Diagram of Receiver Section

The receiver section consists of RF receiver module, battery, Arduino UNO, LCD, LED, a buzzer, a bulb and In case of emergency the GSM technology is used. The transmitted signal is received by RF receiver then the received signal is decoded by decoder IC HT12D. The Arduino is the main component at the receiver section. All the devices are connected through Arduino. The commands from the user will display on LCD like emergency, food requirement, washroom and home appliance. We are using led for indication of the food requirement and the buzzer is used for washroom, also in case of emergency the GSM module has been used and bulb is used for indicating home appliances.

## 5. COMPONENTS DESCRIPTION

### 5.1RF Module (Transmitter & Receiver)

The RF module, as the name suggests, operates at Radio Frequency. The corresponding frequency range varies between 30 kHz & 300 GHz. In this RF system, the digital data is represented as variations in the amplitude of carrier wave. This kind of modulation is known as Amplitude Shift Keying (ASK).

Transmission through RF is better than IR (infrared) because of many reasons. Firstly, signals through RF can travel through larger distances making it suitable for long range applications. Also, while IR mostly operates in line-of-sight mode, RF signals can travel even when there is an obstruction between transmitter & receiver. Next, RF transmission is more strong and reliable than IR transmission. RF communication uses a specific frequency unlike IR signals which are affected by other IR emitting sources.

This RF module comprises of an RF Transmitter and an RF Receiver. The Transmitter /receiver (TX/RX) pair operates at a frequency of 434 MHZ. RF transmitter receives serial data and transmits it wirelessly through RF through its antenna connected at pin4. The transmission occurs at the rate of 1Kbps – 10Kbps.The transmitted data is received by an RF receiver operating at the same frequency as that of the transmitter. The RF module is often used along with a pair of encoder/decoder. The encoder is used for encoding parallel data for transmission feed while reception is decoded by a decoder. HT12E–HT12D, HT640-HT648, etc. are some commonly used encoder/decoder pair ICs.

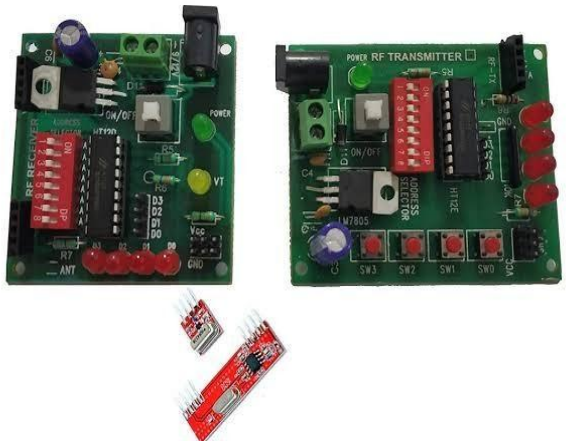


**Fig -4:** RF TX and RX Module

**Features:**

- Receiver frequency 433MHz
- Receiver typical frequency 105Dbm
- Receiver supply current 3.5mA
- Low power consumption
- Receiver operating voltage 5v
- Transmitter frequency range 433.92MHz
- Transmitter supply voltage 3v~6v
- Transmitter output power 4

## 5.2GSM Module

This is a GSM/GPRS-compatible Quad-band cell phone, which works on a frequency of 850/900/1800/1900MHz and which can be used not only to access the Internet, but also for oral communication (provided that it is connected to a microphone and a small loud speaker) and for SMSs. Externally, it looks like a big package (0.94 inches x 0.94 inches x 0.12 inches) with L- shaped contacts on four sides so that they can be soldered both on the side and at the bottom. Internally, the module is managed by an AMR926EJ-S processor, which controls phone communication, data communication (through an integrated TCP/IP stack), and (through an UART and a TTL serial interface) the communication with the circuit interfaced with the cell phone itself. The processor is also in charge of a SIM card (3 or 1.8 V) which needs to be attached to the outer wall of the module. In addition, the GSM900 device integrates an analog interface, an A/D converter, an RTC, an SPI bus, an I2C, and a PWM module. The radio section is GSM phase 2/2+ compatible and is either class 4 (2 W) at 850/ 900 MHz or class 1 (1 W) at 1800/1900 MHz The TTL serial interface is in charge not only of communicating all the data relative to the SMS already received and those that come in during TCP/IP sessions in GPRS (the data-rate is determined by GPRS class 10: max. 85.6 kbps), but also of receiving the circuit commands (in our case, coming from the PIC governing the remote control) that can be either AT standard or AT-enhanced SIM Com type. The module is supplied with continuous energy (between 3.4 and 4.5 V) and absorbs a maximum of 0.8 A during transmission.


**Fig -5:** GSM Module

**Features:**

- Quad-Band 850/ 900/ 1800/ 1900 MHz
- Dual-Band 900/ 1900 MHz
- GPRS multi-slot class 10/8GPRS mobile station class B
- Compliant to GSM phase 2/2+Class 4 (2 W @850/ 900 MHz)
- Class 1 (1 W @ 1800/1900MHz)
- Control via AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands)
- Low power consumption: 1.5mA (sleep mode)
- Operation temperature: -40°C to +85 °C

## 6. FLOW CHART

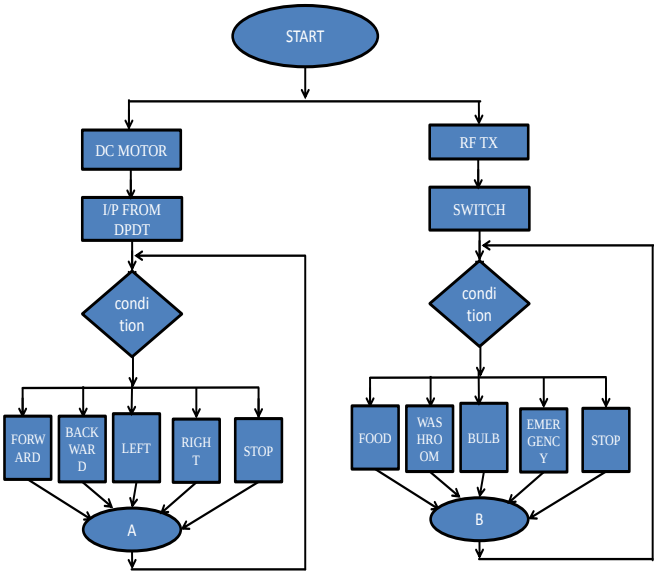


**Fig -6:** Flow Chart

First wheelchair will start with the help of dc motor. Movements of the wheelchair are controlled by using DPDT switches. There are five conditions (i.e. forward, backward, left, right and stop). The handicapped person will select one of the conditions and the wheelchair will move accordingly in that direction. This process will continue till the stop condition is not selected.

Now, for other features to get activated (i.e. food requirement, washroom, home appliances, emergency) RF transmitter section has to get started. Among the switches the person will select any one condition and if the person selects the condition of stop then the system will stop working.

## 7. APPLICATIONS

- Hospitals
- Home
- The wheel chair can also be operated by blind people
- Can be operated by the handicapped person itself
- Ability to provide sufficient risk management
- Obstacles in the way of wheelchair are detected and avoided using IR sensors.

## 8. CONCLUSION

The designed smart wheelchair enables the movement of wheelchair in any desired direction (forward, backward, right, and left) with the help of DPDT switches. The switches are mounted on the arm rest. This makes portable fort better usage. This greatly decreases the dependency on the family members and the care-takers. The wheelchair also provides efficient risk management by obstacle detection and obstacle avoidance. The wheelchair can be GSM based, where the patient sitting on the wheelchair can have access to additional features. If the patient on the wheelchair feels uncomfortable or will have some issue regarding health, he/she can send message to his/her relatives or friends indicating the need for help. Thereby creating a much more stable and reliable platform for the patient.

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