

Hand Waving Bot

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Abstract-Explorers and geographical scientists are always on the move of exploring new things due to which they need to go to places where the reach of humans is limited or not possible. Their problem can be solved by this hand waving robot. It can reach any places where humans find difficult to access. This bot uses high radio frequency signals for communication and the control of the bot is totally dependent upon the user.

This reduces the risk of discovering new places or mines where the human presence can be risky. It can be modified too with a camera and sensors through which we can get information about the places and spots beforehand. It can also act as a spy and can also be a useful tool for military purposes too, by increasing the signal strength of communication which can be done by using some advanced communication systems rather than nRF24L01 which we are using in our project.

It can be powered by an external dc source as well as a solar panel. We are using both to keep it energised always.

Keywords-Gyroscope/Accelerometer, Arduino NANO, Arduino UNO, nRF24L01 Module, Serial Communication, Motor Controller(L293d), DHT11, Ultrasonic Sensor(HC-04), I2C Protocol, SPI protocol

I. INTRODUCTION

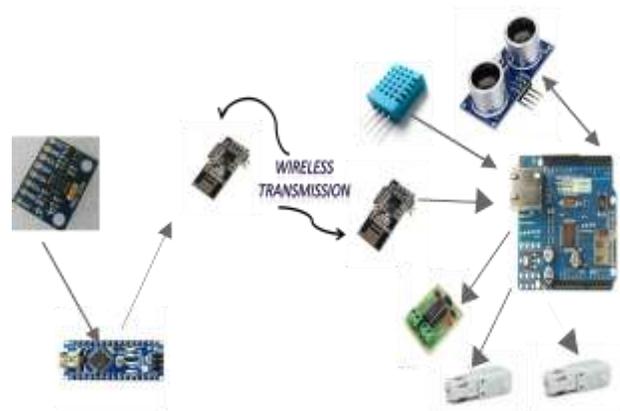
In the recent years, explorers and geoscientists have undergone many expeditions and discovered many new places and sites, which will also continue in the future too. The frequency of these expeditions might increase due to increase in the depletion of energy sources which may lead to in search of new places and sites where an alternative way of energy sources can be discovered or places where the present energy sources can be found in abundance.

But these expeditions become too risky for the explorers since they are not aware of the surroundings which may lead them to serious situations. This is where our “Hand Coordinated Bot” becomes a useful tool for the researchers and explorers. Through this they can acquire some sort of idea as how risky is the place and what precautions are needed to be taken by them on their journey. They will also get a brief idea of the land conditions and the atmospheric conditions too. The temperature and humidity can also be determined with the help of the sensors attached to the bot.

This becomes a lot easier for the researchers as they become familiar with the place to some extent. The researchers get to know more about the place by looking at the snaps taken by the camera module attached to the bot. The best thing about it is that it can be controlled from a very distant place, so they are a lot safer rather than actually visiting the site for inspection without knowing much about the conditions of the

place. We have designed this bot such as its control is fully dependent on the motion of the user’s hands. This gives a feeling of actually driving a car with just coordinating it by moving their hand in the desired direction. There are controllers for this purpose but to make it interesting we have used this concept of hand coordination in our project. The hand sensing is done by Gyroscope (Part Number: MPU6050).It uses I2C protocol to send data to any controller. It uses mainly acceleration as the variable to sense the current coordinate axis. These values are sent to the controller. These values are changed to digital format by the controller, and sent to the controller attached to the bot, via radio frequency signals. We have employed nRF24L01 for this purpose. The nRF24L01 is a single chip 2.4GHz transceiver with an embedded baseband protocol engine (Enhanced ShockBurst™), designed for ultralow power wireless applications. The nRF24L01 is designed for operation in the worldwide ISM frequency band at 2.400 - 2.4835GHz. The nRF24L01 of the second controller receives the data from the first module and sends it to the second controller. It uses SPI protocol for communicating with controllers. The controller then gives these signals to the motor controller driver, to which the wheels are attached.

Circuit/Flow Diagram



Working-The Hand Coordinated moving vehicle is employed for getting snaps, the temperature conditions of the spots or places, where human reach can be risky or is dangerous. Due to this reason, the vehicle is controlled by the user from a distant place, where he/she is safe. The control of the vehicle is fully controlled by the motion of the user’s hand who is present at a very distant place from the site. The user’s hand coordination decides whether the vehicle has to accelerate forward or has to reverse. The vehicle can also move left or right according to its hand motion only. The vehicle remains

in neutral mode if no hand motion is recorded by the sensor. The sensor which is employed to sense the motion of the hands is Gyroscope / Accelerometer (MPU6050). The Gyroscope is connected to the microcontroller 1 (Arduino Nano) via I2C protocol . The data fed to the controller by the Gyroscope is converted to the corresponding digital units by the ADC (Analog to Digital Converter) of the controller .According to the range set by the programmer this microcontroller decides what signal to transmit to the microcontroller 2 (Arduino UNO) via serial communication. This serial communication between microcontroller 1 and microcontroller 2 is done by employing nrf24L01 RF transceiver module as the medium. The transceiver in the microcontroller 1 sends data to microcontroller 2 via the second transceiver. The data received by the second transceiver is sensed by the microcontroller 2 , and according to the signal received it gives analog signals to the motor controller. The wheels of the vehicle are connected to the motor controller and their rotation is controlled by the signal received by the motor controller from the microcontroller 2. A DHT 11 is used to sense the temperature and humidity of the surrounding and an ultrasonic sensor is used to detect obstacles around the vehicle. If more than one ultrasonic sensor is employed in the vehicle then we can map the surroundings of the site by calculating the three axis coordinates of the surroundings.

III. EXISTING METHODOLOGY

The motto of this project was to drive a bot wirelessly whose principle was known earlier, usage of wireless communication such as nRF24L01 radio frequency communication or Bluetooth Serial Communication was invented earlier but the cons of this wireless communication is that the range is limited, and after a certain distance the signal becomes weak and the bot becomes out of control from the user. More research is required as to how the communicating range can be increased so that the signal strength can be strong for larger distances and the bot is always in control of the user. To make it interesting and more useful additional features are loaded to the bot such as, DHT11, camera module, and ultrasonic sensor. This increases its effectiveness and makes for interesting to use since the control is fully dependent on the motion of the user's hands.

III. HARDWARE DESCRIPTION

Components-Arduino UNO, Arduino NANO, Gyroscope, Chassis, Motor controller (L293d), nRF24L01, Distance Sensor, DHT 11, LCD module.

1. ARDUINO UNO- We have used Arduino development board to sense the data from nRF module and send appropriate signals to the motor controller .Arduino UNO becomes our microcontroller 2 or the slave controller Codes are uploaded into this board through its own IDE and thus acts according to the signals written in the code.



2. Arduino NANO- The Arduino Nano is a small, complete, and breadboard-friendly board which has ATmega 328PU as its controller. It has the same properties and specs of the UNO board but in a smaller form and size .The Arduino Nano is programmed using the [Arduino Software \(IDE\)](#).

This Arduino NANO becomes the microcontroller 1 or the master controller on which the gyroscope is connected.



3. nRF24L01-module-The nRF24L01 is a single chip 2.4GHz transceiver with an embedded baseband protocol engine(Enhanced ShockBurst™), designed for ultra low power wireless applications. The frequency band of nRF24L01 is 2.400 - 2.4835GHz.

The nRF24L01 is configured and operated through a Serial Peripheral Interface (SPI).Therefore these modules become the source of wireless communication between our two microcontrollers.



4. Ultrasonic sensor-These sensors are used to detect the presence of any obstacle near it. It uses the property of reflection of sound and also detects how far the obstacle is from the sensor. We have used also used this sensor to detect obstacles and far is it from the vehicle.



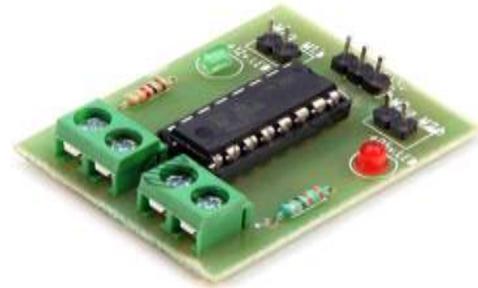
5. Gyroscope-It is used to sense the movements of our hands. The gyroscope values are sensed by the microcontroller 1(master). These values are sent to microcontroller 2(slave) by nRF24L01 module and according to these values the motor driver works.



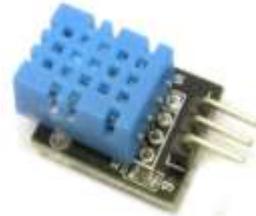
6. Chassis-A chassis consists of an internal vehicle frame that supports an artificial object in its construction and use, can also provide protection for some internal parts.



7. Motorcontroller(L293d)-It senses the corresponding signals from UNO(slave) and drives the motor of the wheels according to the signals.9 V external power source is to be supplied to run this motor driver.



8. Temperature and humidity sensor (DHT11)-The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and transmits corresponding digital signal on the data pin.



9. LCD module-The LCD Module is used to display the current temperature and % humidity present in the surroundings which are sensed by the DHT11 sensor.



IV. SOFTWARE DESCRIPTION

Arduino IDE- The Arduino IDE is a cross-platform Java application that serves as a code editor and compiler and is also capable of transferring firmware serially to the board.

We have used Arduino IDE to program the microcontrollers both “master” and “slave”.

This IDE is simple to use and programming becomes too easy with this. This IDE can also be used to burn the code to the

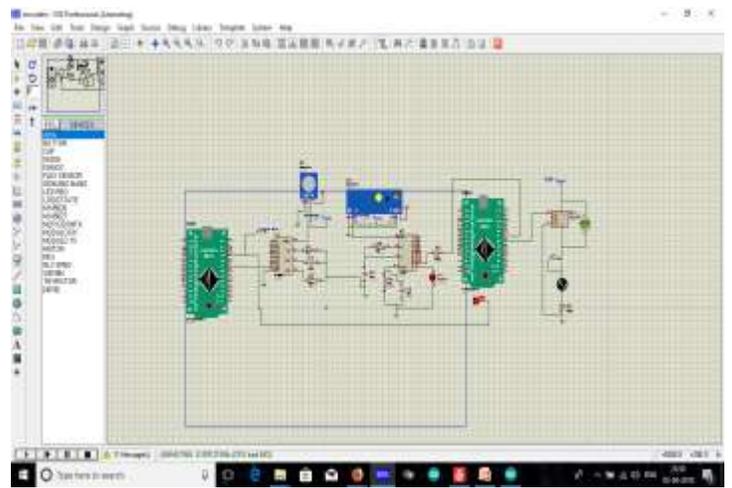
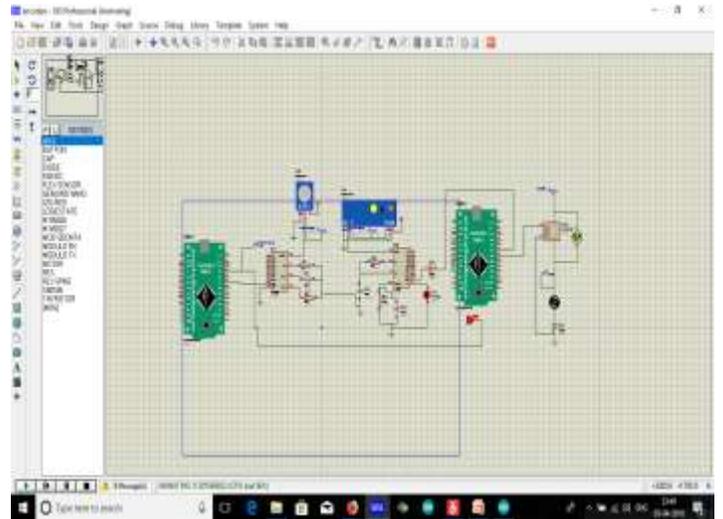
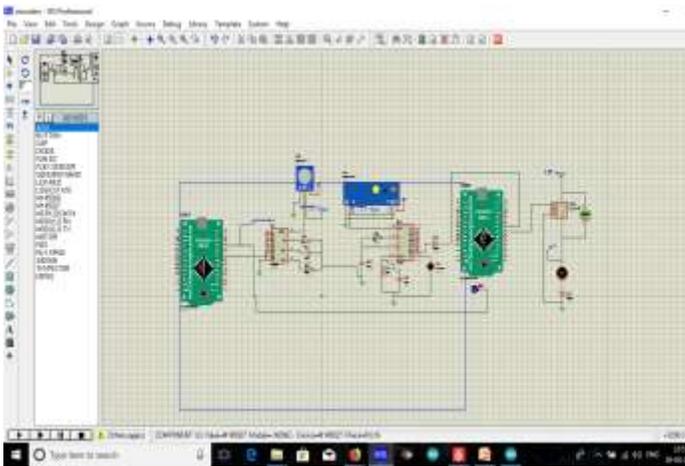
controller. The results can also be observed in the serial monitor or the plotter of the controller.

Proteus-The Proteus Design Suite is a proprietary software tool suite used primarily for electronic design automation. The software is used mainly by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit boards.

It was designed in Yorkshire, England by Lab- enter Electronics Ltd and is also available, Spanish and Chinese languages.

This software became a tool to simulate our project in a software environment which was done successfully.

Software results



V. HARDWARE RESULTS

i. Slave Control





ii. Master Control



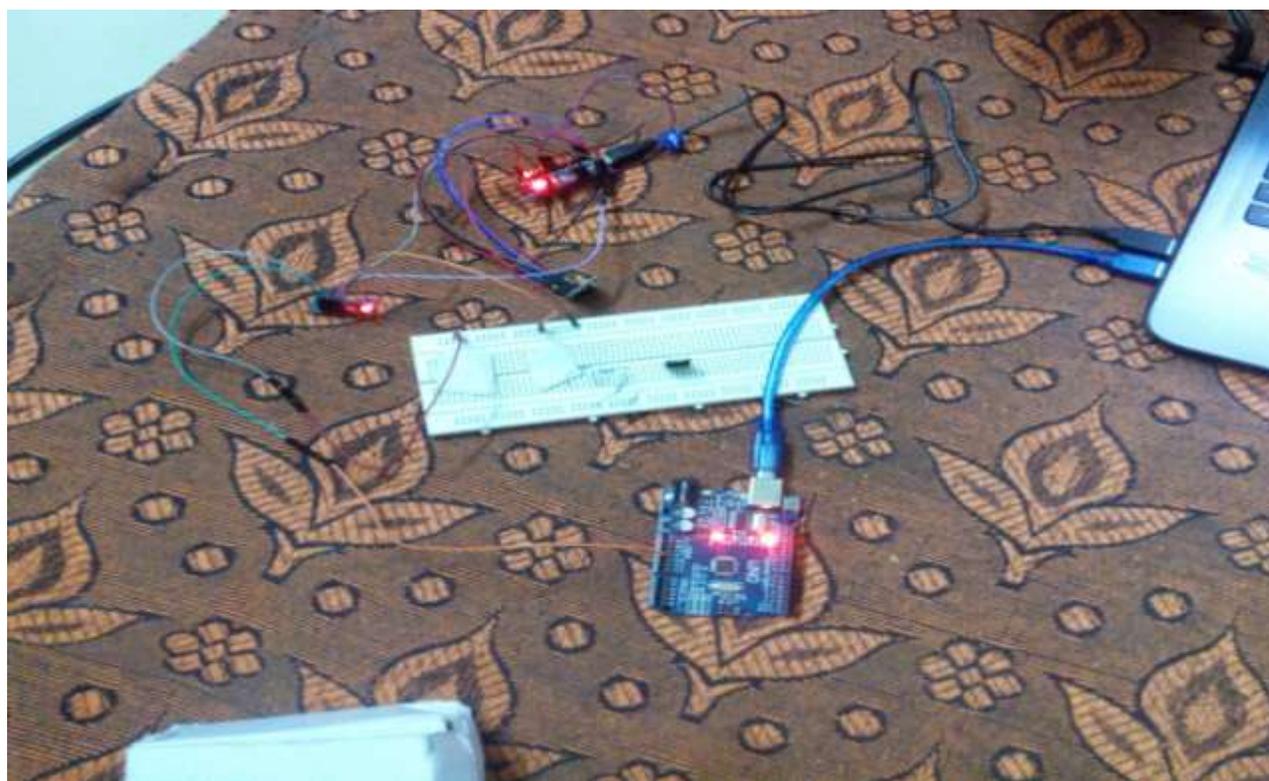
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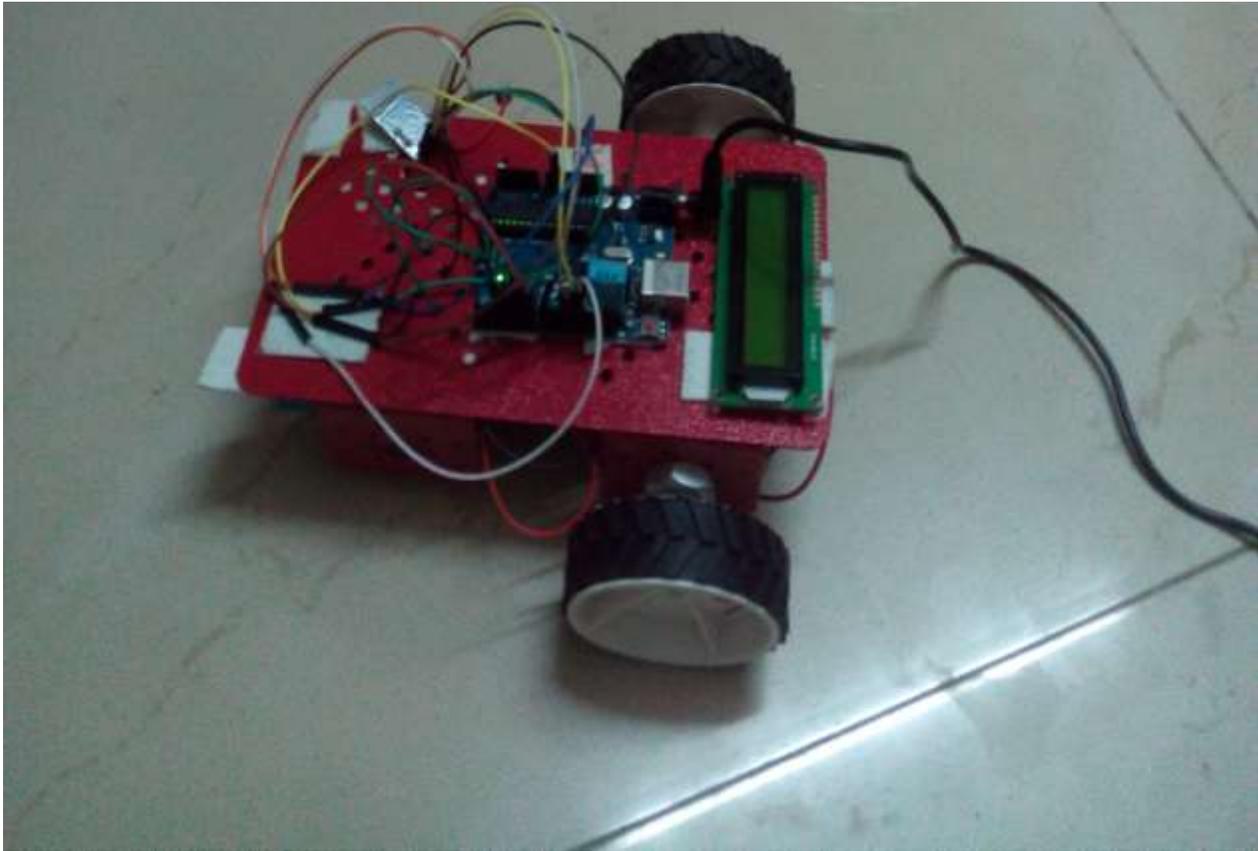


FORWARD

iii. *Full Master Setup*



iv. Full Slave Setup



VI. CONCLUSION

This paper on “HAND COORDINATE BOT” is based on robotics and sensors which might become a very useful tool for researchers and geoscientists. Many such robots have been designed and now drones are being designed too, but communication becomes a very big problem in all cases in which more research is required because communication becomes the key to our project. We hope on further researching on this issue so that the end product will become more fine, more efficient and cost friendly too.

VII. PROJECT VIDEO LINK

https://drive.google.com/open?id=1FkSiT26BwesZefGU91SIdg1sXA-8_o0m

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