

Department of **ELECTRONICS AND COMMUNICATION ENGINEERING**

HAND GESTURE CONTROLLED WHEELCHAIR USING ARDUINO

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ABSTRACT



- Majority of the **physically disabled** and **elderly people** find it very **tiring** to control the **traditional wheelchair** and many a time need the **assistance** of another person.
- Other version including the **joystick** based wheelchair have limitations for the **hand impaired** people.
- Thus, to **reduce the strain** involved in maneuvering it, the **primary objective** of this project is to build the prototype of a **user- friendly hand gesture based wheelchair**.
- This method employs **specific hand gestures** to control the **direction of motion** of the wheelchair. Any objects or sudden **hurdles** are also detected and the wheelchair is brought to a **halt** in such a situation.
- This mechanism helps the user to control his wheelchair **wirelessly** and helps him perform his daily tasks **independently and comfortably**.

INTRODUCTION



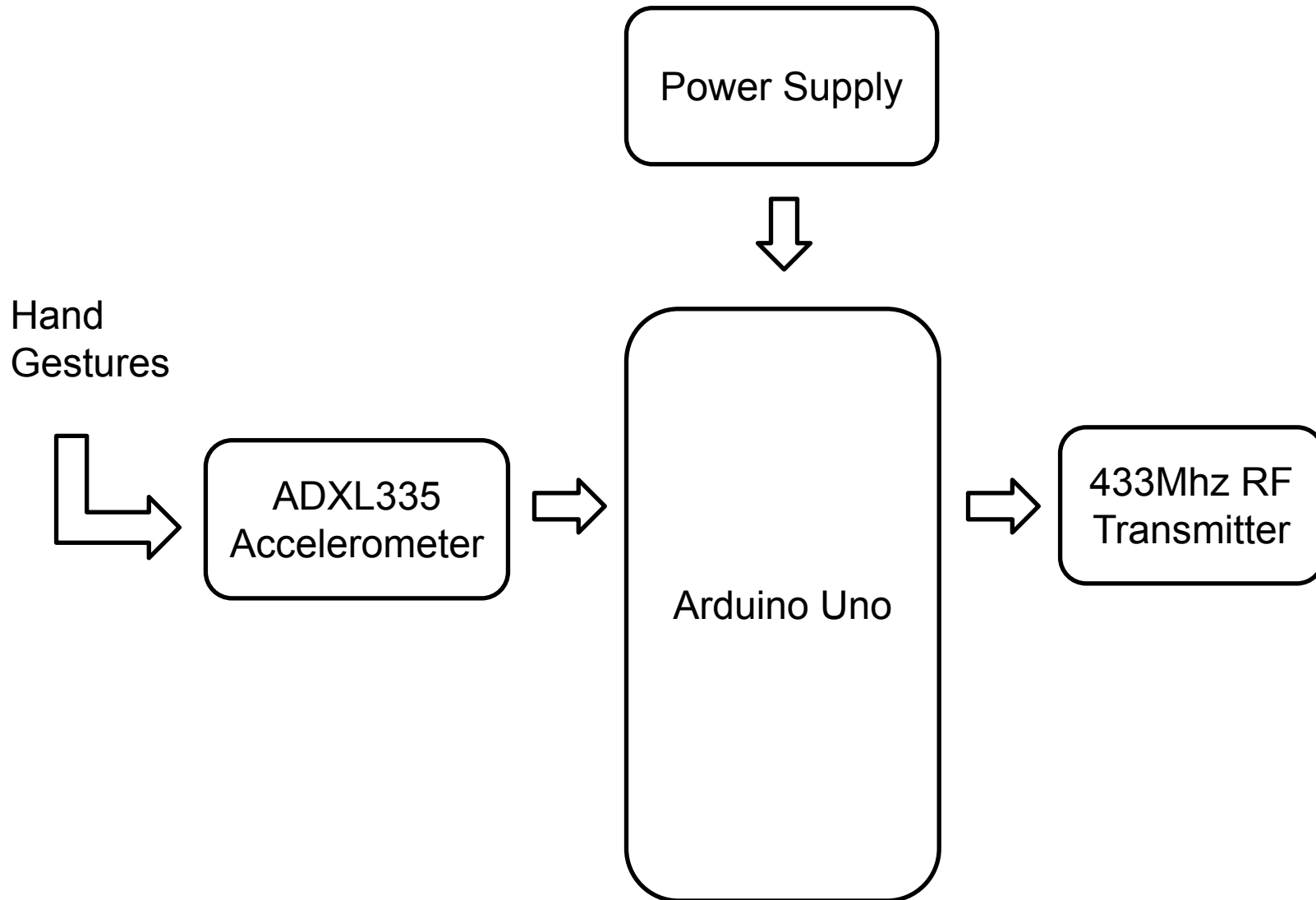
- Wheelchairs are among the most **popular assistive devices** in the medical field.
- With the advancement of technology, there's a **rise in the demand** for automated user convenient wheelchairs in the market.
- Our project **aims** to provide not only a **comfortable** but also a **safe** user experience for the **wheelchair-bound** using simple hand gestures .
- A **Gesture** is a **non-verbal form of communication** in which visible bodily actions are used to communicate particular messages.
- In this era of automation, **Micro Electro Mechanical Sensor (MEMS)** based devices have gained **great importance** for its user-friendly nature.
- Here, we use **MEMS accelerometer** that is highly sensitive to any kind of **tilt** in the 3-dimensional space as a transducer to recognize hand gestures and an **ultrasonic sensor** for **collision avoidance**.

LITERATURE SURVEY

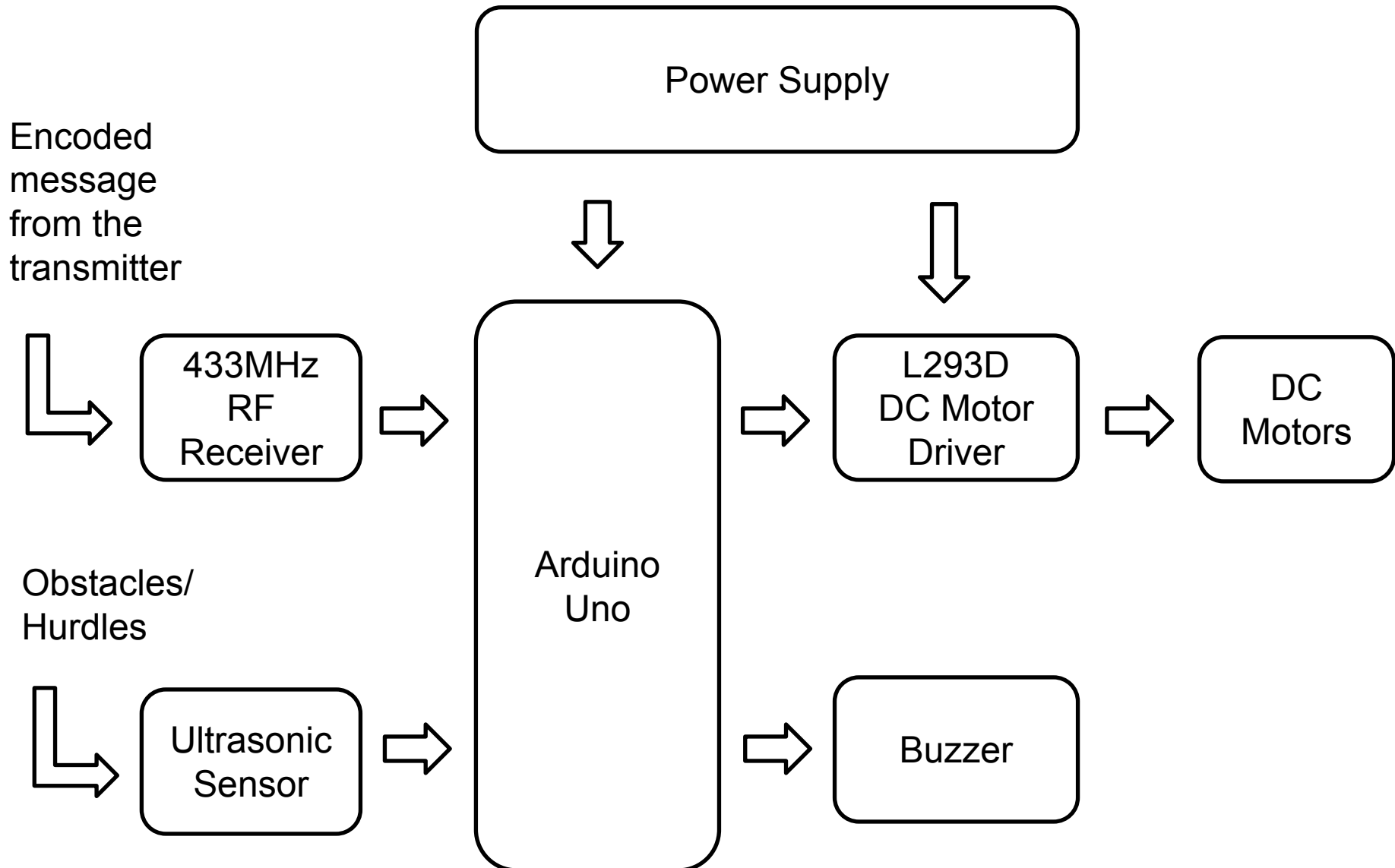


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- Javajji Veeraiah., P.V.N Aravind Syam,. N. Naga Durga., K. Ravi Kanth., G. Vasudha, “Accelerometer Based Gesture Recognition for Wheel Chair Direction Control Using ZIGBEE Protocol”, International Journal of Technological Exploration and Learning (IJTEL), Vol. 2, No. 2,pp.104-108, April 2013.

BLOCK DIAGRAM TRANSMISSION SECTION



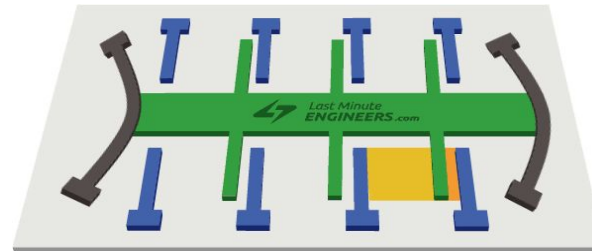
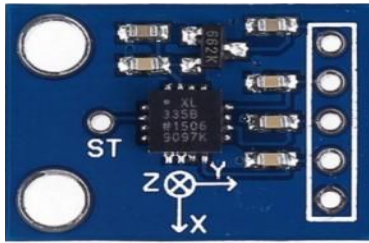
BLOCK DIAGRAM RECEIVER SECTION



METHODOLOGY



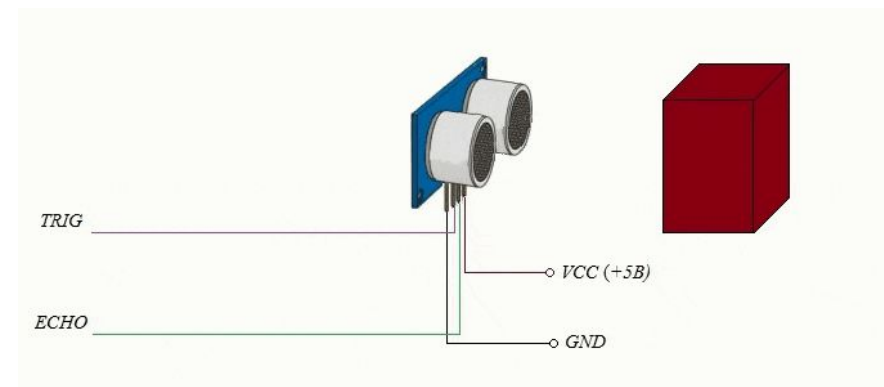
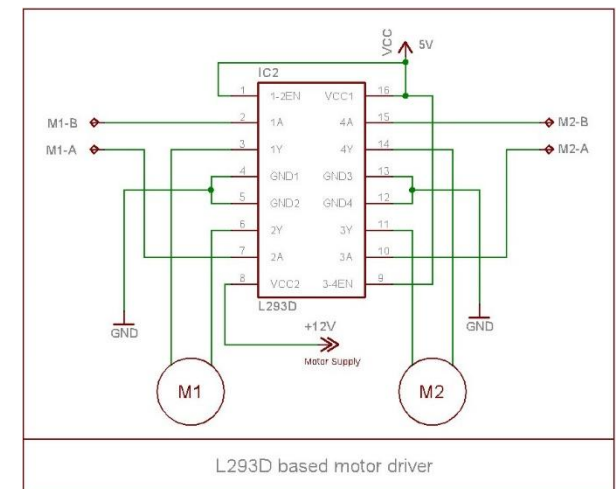
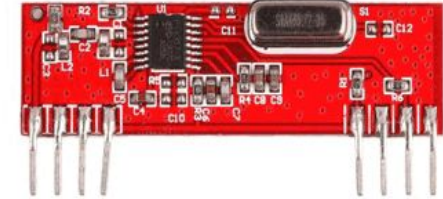
- In this project a **MEMS** based accelerometer **ADXL335** is used to measure the variations in acceleration in **X, Y& Z** axis. It is a small, light weight chip integrated with mechanical elements, sensors and actuators.



- When the person tilts the hand, change in acceleration is converted into corresponding analog voltage values and is sent to the **Arduino to encode** them.
- The Arduino then feeds these signals onto the **433MHz transmitter** which transmits them in the **RF range** to the receiver placed on the wheelchair.



- The **433MHz receiver** module receives and sends the data to the **Arduino for processing/decoding**.
- The decoded message is then used to drive the motors using the **motor driver L293D IC**.
- If in case there is an **obstacle** in front of the wheelchair, the **ultrasonic sensor** is used to halt its operation even if there is a gesture made by the user to move forward.
- It sends a **trigger** sound pulse and calculates the distance by taking into account the time gap between transmission and **reception**.



RESULT



- The proper fabrication of all the components according to the circuit diagram gives us a working prototype model for the Intelligent Wheelchair based on Hand Gesture Control.
- The accelerometer used here recognizes all the hand tilt gestures perfectly. The table below tabulates the reading of the accelerometer:

Gesture	X-range	Y-range
Forward	$325 < x < 340$	$265 < x < 290$
Backward	$325 < x < 340$	$365 < x < 395$
Right	$380 < x < 425$	$310 < x < 330$
Left	$205 < x < 350$	$310 < x < 330$
Stop	$320 < x < 350$	$320 < y < 350$

- The ultrasonic sensor is programmed to detect objects within 20cm range. The sensor successfully triggers the buzzer and brings the wheelchair to a complete halt state.
- The user is then given a chance to change the gesture.

FUTURE SCOPE



The hand gesture based wheelchair can further be modified and can be developed by:

- Adding the feature of an emergency button to give a call to their family in case of emergency using the GSM module.
- Using the same, location tracking can be enabled so that family members are notified when the emergency button is pressed by the wheelchair bound.
- Additional IR sensors can be placed along the sides of the wheelchair to improve the function of obstacle detection.
- Additional gestures can be created using the 3rd axis (z) to perform beneficial movements like lifting up the seat or positioning lumbar support and the leg rest.

CONCLUSION



- The project implemented is just a prototype of the gesture based wheelchair.
- If this is brought to the market as a commercial project then, it will surely be useful to all the disabled people who are unable to drive the normal ones on their own.
- This wheelchair can replace other versions like the remote or joystick controlled ones by its user friendliness.
- They can move it in the right, left, forward, and backward directions with the 3-axis accelerometer (MEMS SENSOR) which is highly sensitive and is capable of detecting the tilt.

THANK YOU