# Smart Chair

**Kartik Sanjay Vishwa, Omkar Santosh Atole, Nishant Tukaram Nevase, Prof Sujata Girawale**
Electronics and Telecommunication Engineering Department, Genba Sopanroa Moze College of Engineering Balewadi, Pune, Maharastra 411045

## ABSTRACT
The *Gesture Control Wheelchair* is an innovative mobility aid designed to assist physically challenged individuals by enabling wheelchair movement through simple hand gestures. The system utilizes an accelerometer sensor mounted on a wearable device, such as a glove, to detect the user's hand motions. These gesture signals are processed by a microcontroller (ESP32 or Arduino), which interprets the direction commands and controls the wheelchair motors accordingly. Wireless communication, such as Bluetooth or RF modules, allows for smooth and cable-free operation. This technology provides users with an easy, efficient, and independent way to navigate their surroundings without relying on physical effort or joystick control. The project emphasizes low-cost implementation, user-friendliness, and improved accessibility, making it a valuable contribution toward smart assistive technologies

## INTRODUCTION
A wheelchair is an essential mobility aid for individuals who have difficulty walking due to physical disabilities, injury, or illness. Traditional wheelchairs are either manually operated or controlled using a joystick, which may not be convenient for people with severe limb disabilities. To address this problem, a gesture control wheelchair provides an innovative and user-friendly solution by allowing users to control movement using simple hand gestures.

In this system, an accelerometer sensor is used to detect the direction of the user's hand movement. These gesture signals are processed by a microcontroller (such as an Arduino or ESP32), which interprets them and sends commands to the motor driver to move the wheelchair in the desired direction—forward, backward, left, or right. Wireless communication modules like Bluetooth or RF can be used to transmit signals between the gesture device and the wheelchair, ensuring smooth and flexible operation.

## LITERATURE SURVEY
A. Kumar et al. (2021):
This paper presents a gesture-controlled wheelchair using an accelerometer sensor and Arduino microcontroller, enabling movement control through hand gestures for physically challenged individuals.

S. Patel and R. Mehta (2020):
A study on a smart wheelchair system integrating MEMS sensors and wireless communication, allowing easy maneuvering without the need for physical effort.

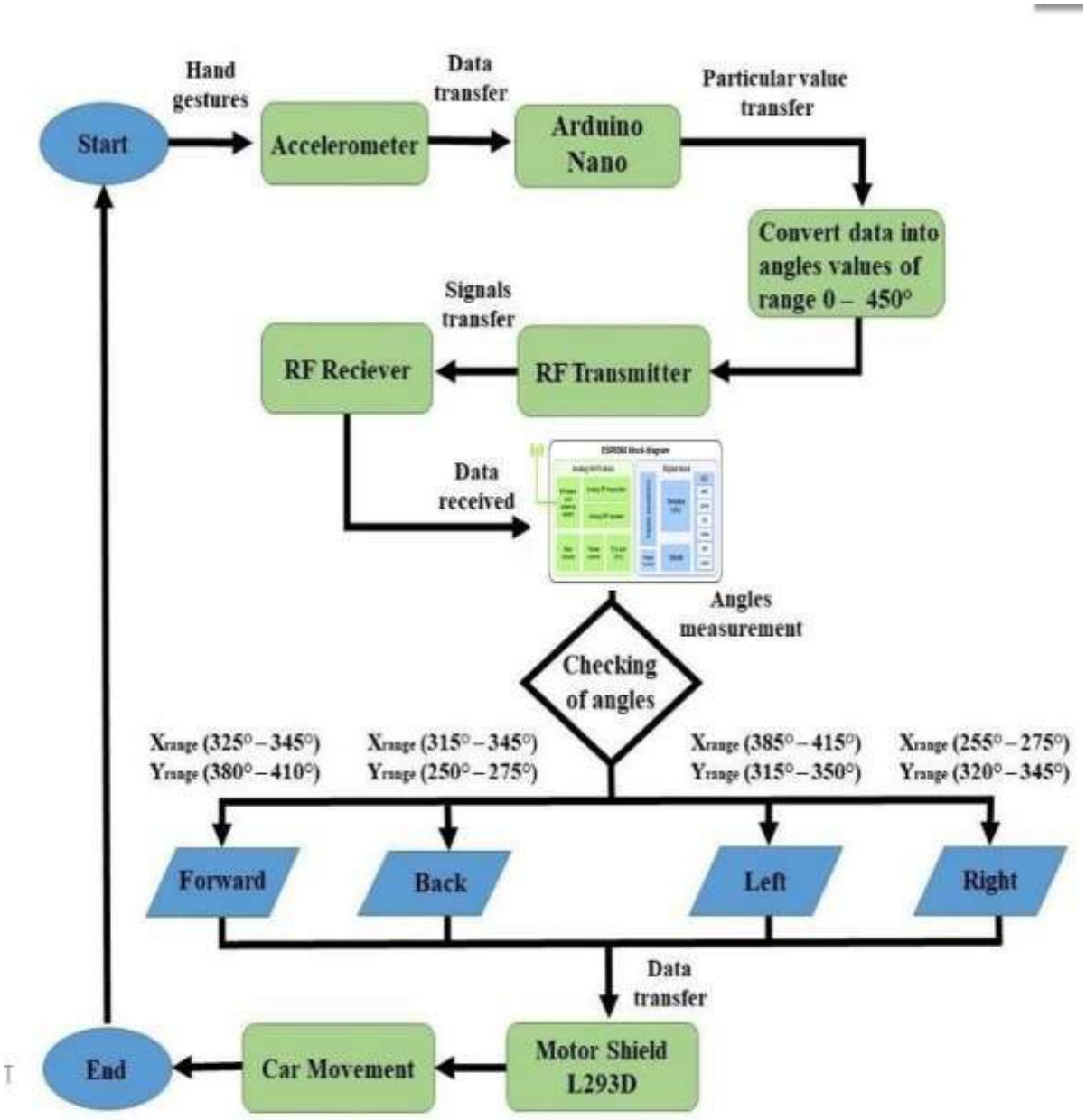
P. Sharma et al. (2022):
The proposed model utilizes a gyroscope-based gesture recognition system for wheelchair motion, providing high accuracy and fast response for disabled users.

IJRTE (2021):
Published in the International Journal of Recent Technology and Engineering, this paper focuses on developing a cost-effective gesture-controlled wheelchair for people with upper limb disabilities.

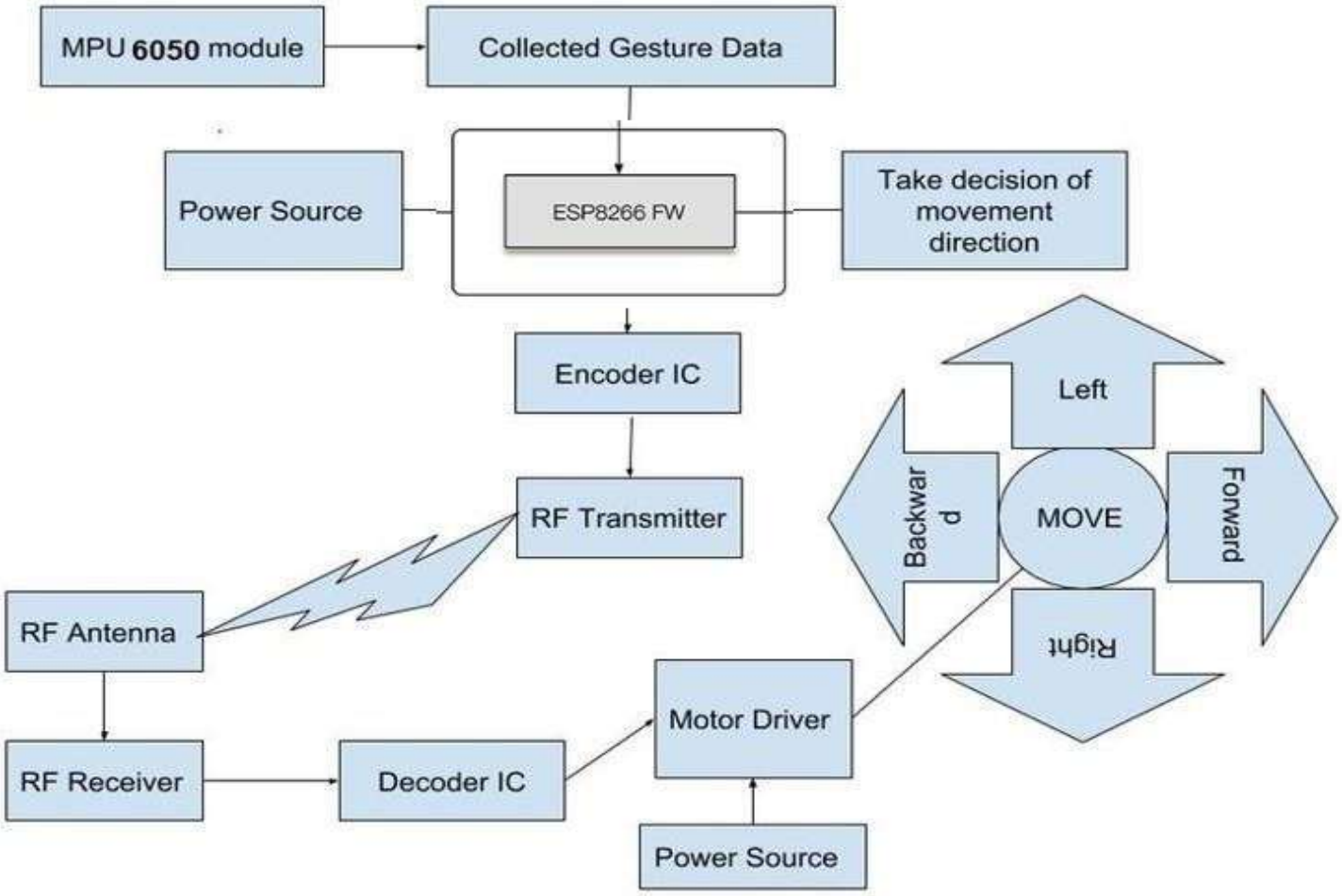
N. Singh and M. Verma (2023):
This research introduces an IoT-enabled wheelchair with gesture control and obstacle detection features, ensuring user safety and comfort.

IEEE Xplore (2022):
A review on assistive mobility devices based on gesture recognition and embedded systems, highlighting advancements in sensor accuracy, wireless modules, and control algorithms..

**BLOCK DIAGRAM**



**Flow Chart**




WORKING

The gesture control wheelchair works on the principle of detecting hand movements and converting them into motion commands for the wheelchair. The user wears a small device, such as a glove or wristband, fitted with an accelerometer sensor that senses the tilt and orientation of the hand. When the user moves their hand in a particular direction—forward, backward, left, or right— the accelerometer measures the change in angle along the X and Y axes. These readings are then sent to the Arduino Nano, which processes the sensor data and converts it into specific angle values representing the direction of motion. The processed data is transmitted wirelessly through an RF transmitter, while the RF receiver mounted on the wheelchair collects the signals. Once the data is received, the system compares the angle values with predefined ranges to determine the user's intended direction. The L293D motor driver then activates the motors of the wheelchair to move it forward, backward, left, or right according to the detected gesture. When the hand returns to its normal or neutral position, the wheelchair stops. In this way, the system enables easy and contactless control of the wheelchair through simple hand gestures, improving mobility and independence for physically challenged users.

**ADVANTAGES**

- Provides easy and intuitive control through simple hand gestures.
- Helps physically challenged users who cannot operate manual or joystick wheelchairs.
- Offers wireless operation (using RF or Bluetooth), reducing the need for cables.

- Ensures smooth and quick response to user commands.
- Reduces physical effort required to move or control the wheelchair.

**DISADVANTAGES**

- Limited hand movement requirement – users must be able to move their hand or wrist to control gestures.
- Sensor sensitivity issues – accelerometers may give inaccurate readings if not properly calibrated.
- Wireless signal interference can affect communication between the transmitter and receiver.

**ACTUAL SETUP**

**CONCLUSION**

The gesture control wheelchair is a smart and innovative mobility solution designed to help physically challenged individuals move independently and comfortably. By using hand gestures detected through an accelerometer sensor, the system allows users to control the direction of the wheelchair easily without physical strain or joystick operation. The integration of microcontrollers and wireless communication ensures smooth and efficient movement. This technology not only enhances user convenience but also promotes confidence and self-reliance among differently-abled individuals. With further improvements—such as obstacle detection, voice control, and safety features—the gesture-controlled wheelchair can become a highly effective assistive device for real-world applications

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