1. Components Required

Power Supply

- 12V Rechargeable Battery
- Power Button
- Emergency Stop Button
- Voltage Regulators (Buck converters for 5V output)

Microcontroller & Modules

- Arduino Nano
- L293D Motor Driver Module
- HC-06 Bluetooth Module
- HC-SR04 Ultrasonic Sensor
- Servo Motor (for obstacle detection direction)
- Breadboard + Jumper Wires

Motors & Mechanical

- 4 DC Motors (attached to each wheel of the chair)
- Motor Mounts & Wheels
- Wheelchair Frame (manual or motorized chair structure)

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2. Power & Electrical Setup

Battery Wiring

- **+12V** → Power Button → Breadboard Positive Rail
- **GND** → Emergency Button → Breadboard Ground Rail

Voltage Regulation

- Two voltage regulators:
    - One 5V output → Servo Motor
    - One 5V output → HC-SR04 Sensor
- HC-06 Bluetooth → Powered by Arduino Nano's 5V pin

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3. Motor Driver (L293D) Setup

Motor Connections

- **Right-side motors**
    - Positive → OUT1
    - Negative → OUT2
- **Left-side motors**
    - Positive → OUT3
    - Negative → OUT4

Control Pins

- IN1 → Arduino Pin 4
- IN2 → Arduino Pin 2
- ENA → Arduino A0 (for speed control via PWM)
- IN3 → Arduino Pin 7
- IN4 → Arduino Pin 8
- ENB → Arduino A1 (for speed control via PWM)

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4. Ultrasonic Sensor (HC-SR04)

- TRIG → Arduino Pin 12
- ECHO → Arduino Pin 13
- VCC → 5V (regulated)
- GND → Ground

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5. Servo Motor

- Signal → Arduino Pin 9
- VCC → 5V (regulated)
- GND → Ground

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6. Bluetooth Module (HC-06)

- TX → Arduino RX (Pin 0)
- RX → Arduino TX (Pin 1)
- VCC → 5V (from Nano)
- GND → Ground

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7. Things to Check Before Assembly

Power Safety

- Use a fuse with the 12V line to prevent short circuits.
- Test voltage regulators before connecting sensitive components.

Breadboard Connections

- Ensure proper rail continuity (some breadboards split power rails in the middle).
- Use color-coded wires for easier troubleshooting.

Bluetooth Pairing

- Test HC-06 with mobile app before final mounting.
- Set up AT commands if needed (e.g., changing name or baud rate).

Motor Driver Load

- Ensure motor current draw is within L293D limits (~600mA per channel continuous).
- Heat sinks may be required for L293D if motors run long.

Arduino Code Considerations

- Use Servo.h for controlling the servo motor.
- Use NewPing.h or custom timing logic for HC-SR04.
- Use SoftwareSerial if Pin 0 and 1 are reserved for USB communication.

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8. Testing Order

1. **Power System**
    - Check 12V and 5V outputs
2. **Bluetooth**
    - Pair and send commands

3. **Motors**
    - Test individual motor direction and PWM speed
4. **Ultrasonic Sensor**
    - Check distance readings
5. **Servo**
    - Test sweep and specific angle movement
6. **Arduino Code**
    - Combine voice commands → motor actions
    - Add safety checks like emergency stop