

Practical Robotics Projects with Arduino

End-Term Project Synopsis

The project synopsis may be of **2 – 3 pages** and shall be simple, straightforward depicting your project study and tools and techniques applied.

Group No.	Group Members (Regd. No.)	Project Title
12	2241019269	David Putra - Gesture Controlled Robot Car Using Arduino
	2241014005	
	2241019128	
	2241019415	
	2241013070	
	2241019022	

Fill up the following Topics and submit the colour printed Hardcopy to the corresponding Faculties.

1. Introduction: (Details about the Topic, industry, products, need of study and some history about the same etc.)

This project entails the construction of an **AI-enabled 4WD robotic car** which merges **AI, embedded systems, and the cutting-edge world of wireless communication** to attain the level of intelligent mobile-robotics. As technology advances, the world seems to have an increased demand for **autonomous systems, fully integrated with AI**. There seems to be a demand for these systems for incorporated systems for autonomous vehicles, logistics, military, and research. This project integrates the AI and mobile robotic systems at the control level of the robotic vehicle, illustrating the vehicle's respond behavior and interactivity.

The robotic car uses an **Arduino Uno microcontroller** as its central control unit. The microcontroller performs the control functions for the car's hardware, which includes motors control using a TB6612FNG motor driver, and an HC-SR04 ultrasonic sensor for autonomous obstacle detection. The robotic car also features a NeoPixel LED strip which gives the car additional visual feedback, and an NRF24L01 wireless module for wireless communication.

This project's most innovative feature is the **Android application** which utilizes **AI model**. This model interprets the users voice or texts commands such as "move forward," "turn left," or "stop." The intelligent application commands the microcontroller to perform these actions.

The research initiated to fulfill the demand for intelligent, autonomous, and human-interactive systems in robotics.

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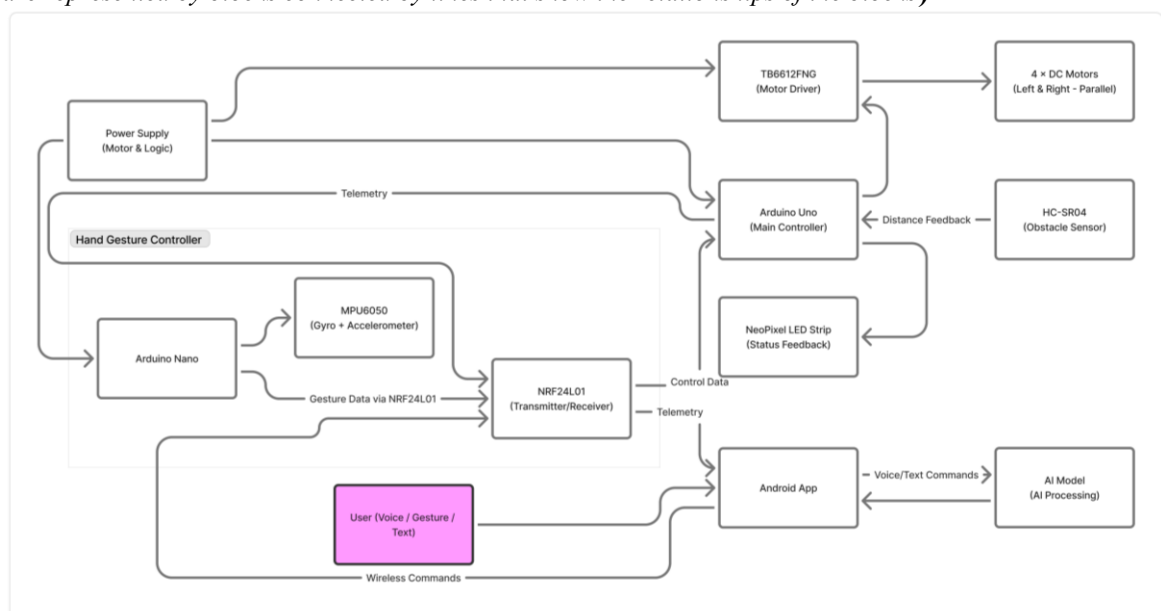
2. Problem identification and Problem Formulation: *(Core area of problems or other related problems and their brief solutions)*

Conventional robotic vehicles can either be driven manually or have their actions determined through preset logic, which results in limited flexibility and limited interaction by humans. Because they do not have the capability to interpret commands and make independent choices in ever-changing settings, they do not have real-time intelligence. The principal challenge is the convergence of **AI-enabled natural language comprehension** and **embedded control systems** to achieve real-time control. This initiative addresses the challenge using Arduino-based systems and an AI-enabled Android application, which offers the user commands to the robotic vehicle, allowing it to move, bypass obstacles, and demonstrate intelligent responsiveness, fulfilling the balance of **human dialogue and independent robotic action**.

3. Objective of the Project: *(Objectives should be mentioned pointwise. Students can also divide the broader and narrow areas of the objectives. These objectives must be near to the situation of the problems)*

- To design and build a 4WD robotic car using Arduino and essential hardware components.
- To implement autonomous obstacle detection using the HC-SR04 sensor.
- To add AI control through an Android app that understands voice/text commands.
- To enable wireless communication using the NRF24L01 module.
- To control the car's movement using the TB6612FNG motor driver.
- To provide visual feedback using a NeoPixel LED strip.
- To integrate AI and embedded systems for intelligent robotic control.
- To develop a user-interactive robotic system that responds to natural commands.

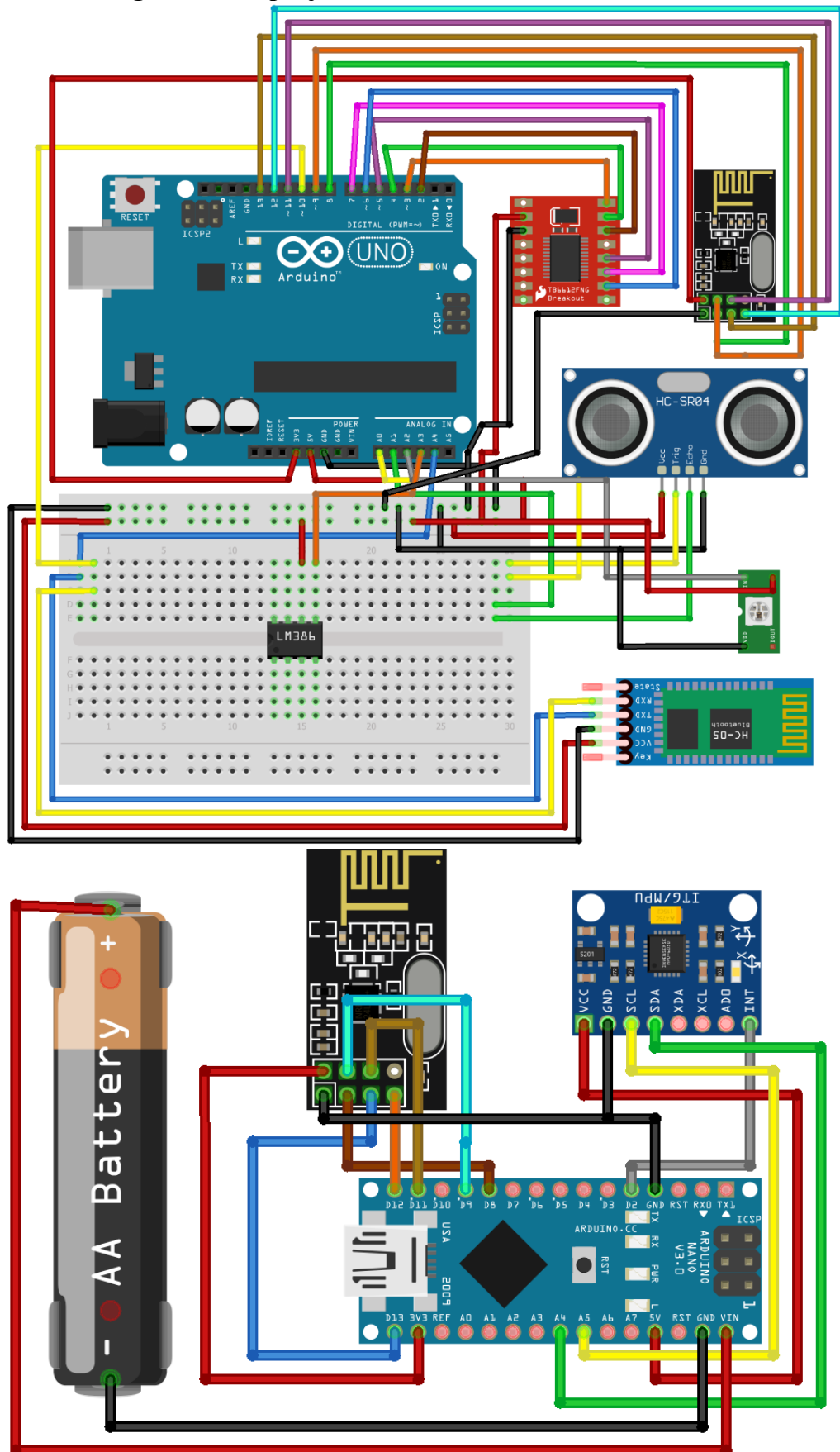
4. Block Diagram of the Project: *(Diagram of a system in which the principal parts or functions are represented by blocks connected by lines that show the relationships of the blocks)*



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5. Circuit Diagram of the project:



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6. Components/Items Required:

Sl. No.	Name of the Components	Specification	Quantity
1	Arduino UNO	ATmega328P, 16 MHz	1
2	TB6612FNG Motor Driver	Motor Driver Carrier	1
3	DC BO Gear Motor	500 RPM Straight	4
4	Wheels	65mm	4
5	Battery	Lipo – 2200mAh-18650	3
6	Battery Holder with Switch	On/Off switch	2
7	MPU6050	Accelerometer + Gyro	1
8	Bluetooth Module	HC-05 Module	1
9	Arduino Nano	ATmega328P, 16 MHz	1
10	Ultrasonic Sensors	HC-SR04	4
11	WiFi Transceiver	NRF24L01	2
12	Speaker and Speaker Amplifier	LM386 and 0.5W	1
13	NeoPixel Lights	WS2812	16
14	Jumper Wires and Accessories	Connecting	-

The project synopsis should be verified by the corresponding faculties within 7 days.

Full Signature of Group members:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Signature of Corresponding Faculty