GESTURE CONTROLLED ROBOTIC CAR

Department of Computer Science, Samrat Ashok Technological Institute

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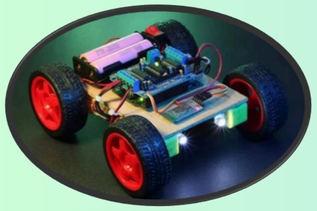
Team ID: CS2024TID27

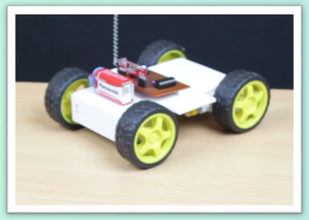
Project Guide: Prof. Usha Kiran Tigga Mam

Team Members: Ayush Dhabale (0108CS201022), Himanshu Kudesiya (0108CS201041), Nilima Barde (0108CS201071), Jaiansh Bora (0108CS201043)

ABSTRACT

This research paper presents a novel approach to gesture-controlled robotics through the integration of hand landmark detection for precise car movement. The project focuses on developing a Gesture Controlled Robotic car system that interprets hand gestures captured through a camera and translates them into navigational commands for the robotic car. The use of hand landmarks enhances the accuracy and reliability of gesture recognition, enabling intuitive and efficient control of the robotic car in real-time scenarios. The methodology involves the implementation of computer vision algorithms for hand landmark detection, coupled with a control system to execute corresponding car movements. Experimental results demonstrate the effectiveness of the proposed system in accurately interpreting a variety of hand gestures for controlling the robotic car's speed, direction, and maneuverability. This research contributes to the advancement of gesture-based interaction in robotics and opens avenues for practical applications in autonomous vehicles, assistive technologies, and human-machine interfaces.





INTRODUCTION

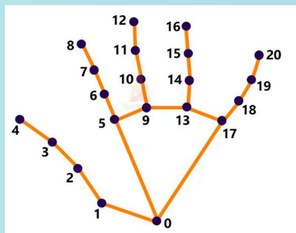
Gesture-controlled robotic cars represent a transformative fusion of human interaction and autonomous technology. Harnessing the power of hand gestures, these vehicles offer a natural and intuitive way for users to navigate and control their environment. By leveraging computer vision techniques such as hand landmark detection, we enable precise and responsive communication between humans and machines. This research delves into the development of a gesture-controlled robotic car, emphasizing real-time adaptation to user gestures for enhanced user experience. Beyond technical innovation, this technology holds promise for revolutionizing transportation accessibility and human-robot collaboration. Our project aims to bridge the gap between human intent and machine action, paving the way for a future where gestures drive mobility and interaction in autonomous systems.

METHODOLOGY

- Hardware design and prototyping: Developed components such as motors, sensors, and microcontrollers for data processing.
- Software infrastructure: Used Python, OpenCV, and TensorFlow for hand landmark detection and gesture recognition.
- Machine learning training: Trained models using labeled gesture data to accurately interpret and respond to user gestures.
- Integration: Integrated hardware and software components for real-time communication between gestures and car movements.
- Testing and validation: Conducted extensive tests to ensure reliability, responsiveness, and user-friendliness.
- Iterative refinement: Incorporated feedback from user trials and performance metrics for continuous optimization.
- Holistic approach: Combined hardware design, software development, machine learning, and user interface design for a robust system.

ANALYSIS

The gesture-controlled robotic car system captures hand landmarks using a camera, processes them using OpenCV for gesture recognition, and then sends the interpreted commands via Bluetooth using an HC-05 module to an Arduino. The Arduino, receiving these commands, translates them into motor control signals for the car's movement, with ongoing testing and refinement for accuracy and reliability.



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1.	THUMB_CMC	12.	MIDDLE_FINGER_TIP
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3.	THUMB_IP	14.	RING_FINGER_PIP
4.	THUMB_TIP	15.	RING_FINGER_DIP
5.	INDEX_FINGER_MCP	16.	RING_FINGER_TIP
6.	INDEX_FINGER_PIP	17.	PINKY_MCP
7.	INDEX_FINGER_DIP	18.	PINKY_PIP
8.	INDEX_FINGER_TIP	19.	PINKY_DIP
9.	MIDDLE_FINGER_MCP	20.	PINKY_TIP
10.	MIDDLE_FINGER_PIP		

TOOLS & TECHNOLOGY

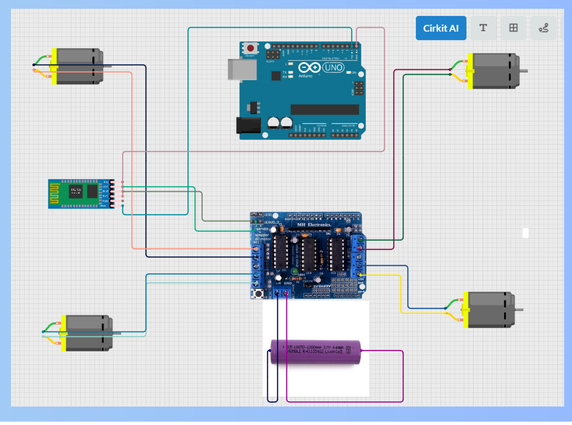
Hardware Components: –

- Microcontrollers and Processors
- Sensors
- Actuators
- Communication Modules

Software Components: –

- Gesture Recognition Algorithms
- Control Algorithms
- Operating System
- Gesture Mapping and Command Logic

Tool – Visual Studio Code



CONCLUSION

Gesture-controlled robotic cars redefine human-machine interaction, promising a future where gestures drive seamless mobility. Our project highlights the practicality and potential of this intuitive technology in enhancing accessibility and user experience. This innovation not only transforms transportation but also fosters a deeper connection between users and autonomous systems. Embracing gesture-based interfaces paves the way for a more inclusive and interactive technological landscape.

REFERENCES

- Martin Zobl, Michael Geigel, Bjom Schullec, Manfred Lang, Gerhard Rigoll. “A realtime system for hand gesture controlled operation of in-car devices.
- Wikipedia “Gesture Interface.” http://en.wikipedia.org/wiki/Gesture_interface 9 January 2017.