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SEMI-AUTONOMOUS CAR FOR SURVEILLANCE & MONITORING

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ABSTRACT

This project presents the creation of half-car vehicles for monitoring and surveillance purposes. To improve situational awareness, the car includes a live video feed (first-person view or FPV) that gives operators real-time visual input. The WLAN module provides wireless control and enables remote operation over the network. The vehicle uses sonar-based obstacle avoidance technology that dynamically recognizes and avoids objects in autonomous navigation. It also includes a flame sensor to identify potential fire threats in the area and to alert users immediately with active summer alarms. Thanks to the integration of various technologies, the system can operate efficiently in manual and semi-autonomous modes suitable for activities such as safety, inspection, disaster response, and more in both indoor and external environments.

I. INTRODUCTION

Semi-autonomous vehicles with wireless connectivity and intelligent sensors have been developed to meet the growing need for highly developed surveillance and surveillance systems. The purpose of this project is to build a semi-car that could work in situations where immediate detection of danger and real-time observations is essential. The car has an FPV camera (live first person view) that streams movie material in real time, providing better view and control for the operator. Smooth remote control operation is enabled by WLAN-based wireless control, while dynamic obstacle avoidance, enabled by sonar sensors, ensures simple navigation over unpredictable terrain. Active Summer Alarms provide immediate acoustic notifications and include a flame sensor to detect fire events. This multipurpose platform is perfect for industrial surveillance, disaster relief, and outdoor safety patrols.

II. OBJECTIVE

The purpose of this project is to create and use semi motor vehicles that can perform monitoring and monitoring tasks in real time. Sonar sensors for dy namic obstacle avoidance, live FPV video feeds for visual surveillance, and WLAN based wireless control for remote operation are one of the most important characteristics. The devi ce also has an active summer of immediate fire alarms and flame sensors to identify fire threats. The purpose of this project is to improve the automation, efficiency and safety of the security and insp ection process.

III. PROPOSED MODEL

The proposed model with features such as FPV cameras, sonar-based obstacle avoidance, flame sensors for fire detection, and active summer alarms, is a WLI-controlled semi-autonomous vehicle that promotes effective surveillance, hazard identification and remote surveillance.

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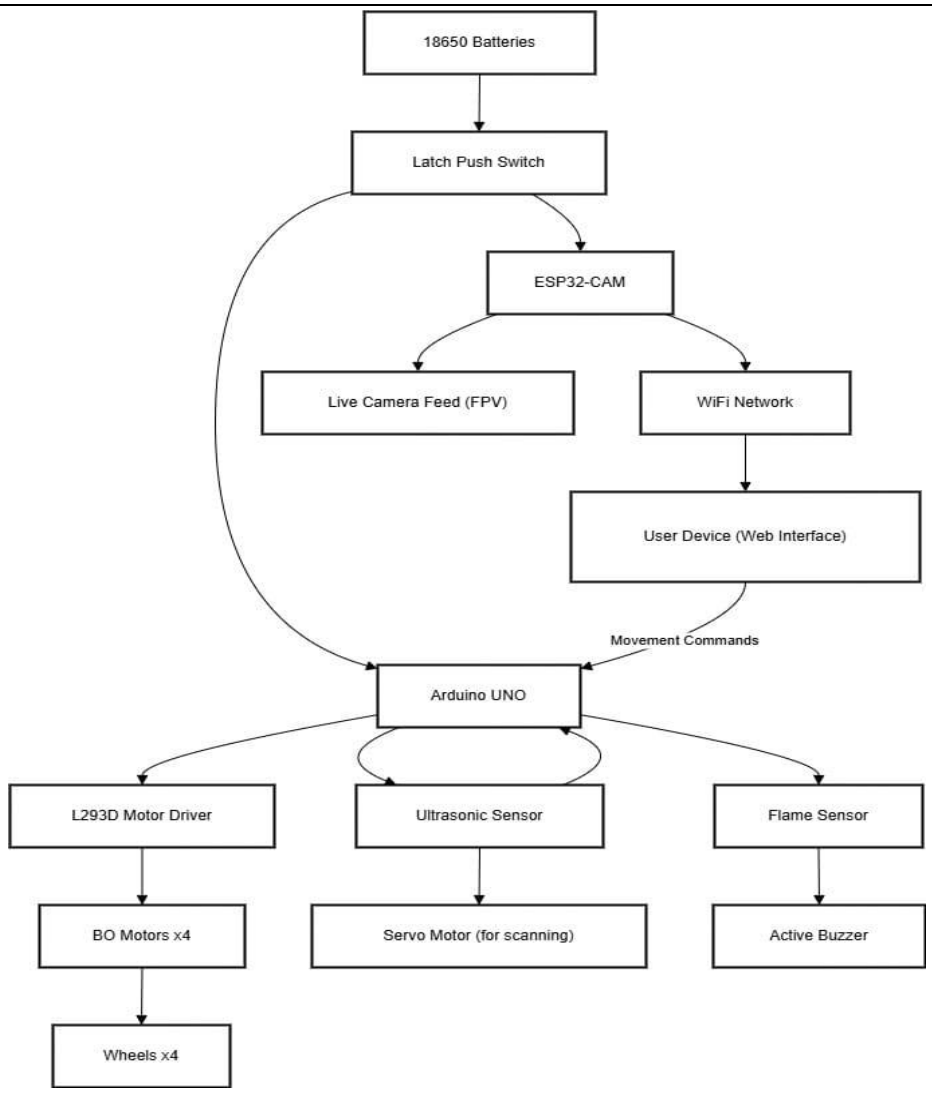

Fig 1: Block diagram

Materials Required

BO Motors x4 & Wheels x4

Arduino UNO x1

L293D Motor Driver x1

ESP32 CAM x1

Servo Motor x1

Ultrasonic Sensor x1

Flame Sensor x1

18650 Battery x2 & Battery Holder x1

Latch Push Switch & Jumper Wires

Fig : 2 our proposed prototype

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BO Motors - The compact DC engine, known as the BO engine, is used in robotic applications that require low speeds and powerful torque.

Fig 3: BO

MotorsArduino UNO - Create embedded and digital systems using a microcontroller called Arduino UNO. Arduino UNO is an open source microcontroller board based on the ATMEGA328P. It has 14 digital E/A pencils, 6 analog inputs, USB connections, and a simple programming environment perfect for building electronic and automation projects for beginners and enthusiasts.

Fig 4: Arduino UNO

L293D Motor Driver - The L293D engine driver is a dual H-bridge IC, with two DC engines being controlled independently of each other. This allows for bidirectional engine control with external power supply support, making it suitable for robotics and automation projects involving Arduino or other microcontrollers.

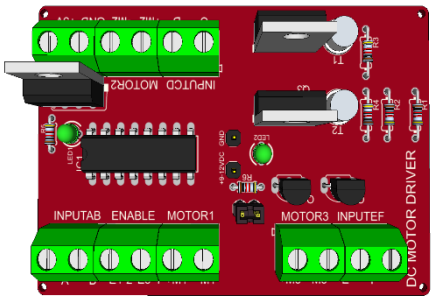

Fig 5: L293D Motor Driver

ESP32 CAM -The ESP32 CAM is an inexpensive microcontroller module with integrated camera, WLAN and Bluetooth. It supports image and video streaming, remote surveillance and AI applications, making it ideal for surveillance, IoT and wireless camera projects.

Fig 6: ESP32 CAM

Servo Motor - A servo motor is a rotary drive that uses a feedback system to provide accurate position control

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Fig 7 : Servo Motor

Ultrasonic Sensor - Ultrasonic sensors measure distance by emitting sound waves and calculating echo times on nearby objects.

Fig 8 : Ultrasonic Sensor

Flame sensor - The flame sensor recognizes the presence of fire or flame by capturing infrared light from a burning source.

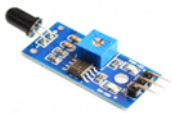

Fig 9 : flame sensor

18650 Battery & holder -The 18650 battery is a rechargeable lithium-ion cell. The owner will secure it and connect it to the power device.

Fig 10 : 18650 Battery and holder

Latch push switch & Jumper wires - Latch Push Switch maintains its state (on/off) that helps to switch electricity after pressing. A bridging wire is an isolated connector in which components are linked to a pan board or microcontroller that allows for flexible temporary circuit connections during prototype and testing.

Fig 11 & 12 : Latch push switch & Jumper wires

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Wheels - Wheels are circular components that facilitate movement by reducing friction, often used for mobility in vehicles and robotics.

Fig 13 : wheels

IV. CIRCUIT OF OUR PROPOSED SYSTEM

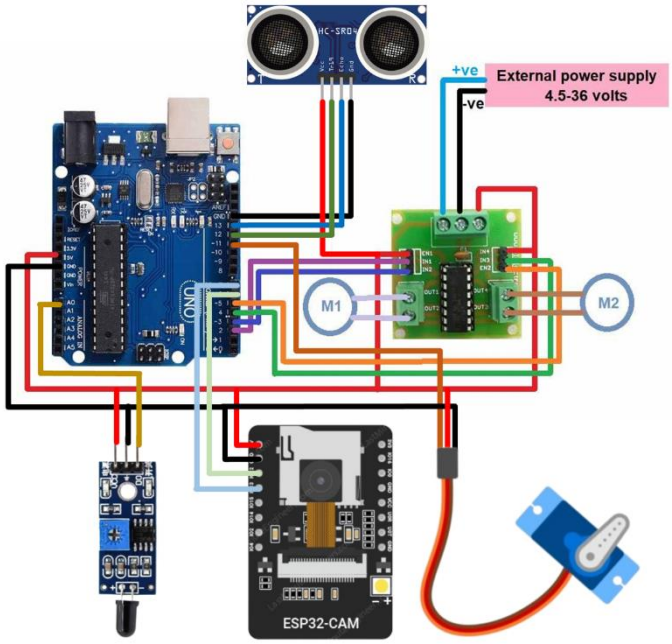

Fig 12 : Circuit of our proposed system

The photo shows the circuit diagram of the robot car . The Arduino Uno-Mikrocontroller is connected to several components. An ultrasound sensor for obstacle recognition, a Bluetooth module for wireless control, a motor driver for control of two engines (M1 and M2) for movement, and perhaps an ESP32-CAM module for Streaming video and power engines. The external power supply (4.5-36 volts) supplies the engine driver and possibly other components. This diagram shows the cable connections between these modules. These modules are extremely important for the robot's autonomous navigation and remote control functions.

V. APPLICATIONS

1 : Safety Monitoring - Actual surveillance for security. It's like fire danger.

2 : Seven Remote Inspections - Inspection in areas that are difficult to achieve.

3 : Infrastructure Maintenance - Monitor your infrastructure for security issues. Invasion.

4 : Surveillance in Hazardous Areas - Safe Surveillance in Hazardous Areas.

5 : Wireless Monitoring - Wireless Communication and Control. Alarm System - Trigger alarm for a fire emergency.

VI. CONCLUSION

Semi-autonomous vehicles for surveillance and surveillance represent innovative solutions to improve security, security and situational awareness in a variety of environments. The integration of advanced technologies such as FPV cameras, WLAN-based wireless control, sonar-based obstacle avoidance, and flame sensors provides a versatile platform for manual and semi-autonomous operating processes. This vehicle can efficiently monitor

the area, recognize fire and other hazards, and avoid obstacles in dynamic environments. This means it is suitable for a variety of applications such as security surveillance, disaster response, testing, public safety and more. Successfully integrate these technologies will allow vehicles to effectively block both indoors and outdoors, providing improved company fakes and security.

VII. REFERENCES

[1] REFERENCES Bhimellu, S., Das, S., Bhimellu, S., Raut, S., Kandala, P., & Patil, Y. (2024). Arduino Based Obstacle Avoiding Robot-with Crash Detection & GPS System. Multidisciplinary Emerging Trends i n Engineering and Technology, 164.

[2] DEVI KAUSTHUBH, Y. V., CHAITHANYA, K., YAMUNA, M., POOJITHA, B., & NEERAJ, P. (2024). SMART ROVER-VOICE CONTROL BLUETOOTH CONTROL ROBOT TO AVOID OBSTACLES. i-manager's Journal on Electronics Engineering, 14(2).

[3] Sissodia, R., Rauthan, M. S., & Barthwal, V. (2023, February). Arduino based bluetooth voice-controlled robot car and obstacle detector. In 2023 IEEE International Students' Conference on Electrical, Electronics and Computer Science (SCEECS) (pp. 1-5). IEEE.

[4] J. Wade, T. Bhattacharjee, R. D. Williams, and C. C. Kemp, "A force and thermal sensing skin for robots in human environments," Rob. Auton. Syst., 2017.

[5] J. Lim, G. Tewolde, J. Kwon, and S. Choi, "Design and Implementation of a Network Robotic Framework Using aSmartphone-Based Platform," IEEE Access, vol. 7, pp. 1–1, 2019.

[6] M. Lillack, C. Kastner, and E. Bodden, "Tracking load-time configuration options," IEEE Trans. Softw. Eng., vol. 44, no. 12, pp.1269–1291, 2018.

[7] K. Liu et al., "Security Analysis of Mobile Device-to-Device Network Applications," IEEE Internet Things J., vol. PP, no. c, p. 1, 2018.

[8] S. Hauser, M. Robertson, A. Ijspeert, and J. Paik, "JammJoint: A Variable Stiffness Device Based on Granular Jamming for Wearable Joint Support," IEEE Robot. Autom. Lett., vol. 2, no. 2, pp. 849–855, 2017.

[9] W. Qiao and R. Sipahi, "Consensus Control under Communication Delay in a Three-Robot System: Design and Experiments," IEEE Trans. Control Syst. Technol., vol. 24, no. 2, pp. 687–694, 2016. F. Stradolini et al., "Wireless Monitoring of Endogenous and Exogenous Biomolecules on an Android Interface," IEEE Sens. J., vol. 16, no. 9, pp. 3163–3170, 2016.

[10] K. Ramirez-Benavides and L. A. Guerrero, "MODEBOTS: Environment for Programming Robots for Children between the Ages of 4 and 6," Rev. Iberoam. Tecnol. del Aprendiz., vol. 10, no. 3, pp. 152–159, 2015.