

Project Report: Hybrid-Powered Surveillance System

Project Title: Hybrid-Powered Surveillance System

Role: Team Lead

Project Duration: September,2019 – May,2020

Project Overview

The Hybrid-Powered Surveillance System was developed as an innovative solution to enhance examination hall surveillance and curb malpractice. The system integrates multiple technologies, including a solar-powered energy source, cellphone RF detection, autonomous navigation, and real-time video streaming via an IP camera. This project underscores the seamless blend of electronics, programming, and leadership to deliver a sustainable and impactful technological solution.

Technical Contributions and Expertise

Leadership Skills

- Led a team of six engineering students, coordinating tasks, and ensuring timely project delivery.
- Conducted regular team meetings, delegated responsibilities, and provided mentorship to enhance project outcomes.
- Prepared detailed project documentation and presented findings at competitions, earning recognition for innovation.

Electronics Skills

- Designed and integrated the hardware components, including a PWM solar charge controller, RF detection units, and servo motors.
- Fabricated and tested PCBs to ensure reliable performance under real-world conditions.
- Utilized advanced sensors like HC-SR04 ultrasonic sensors for distance measurement and autonomous navigation.

Programming Skills

- Developed Arduino-based control algorithms for autonomous navigation, obstacle avoidance, and RF detection.
- Wrote efficient and modular code to interface with sensors, actuators, and communication modules.

- Implemented Bluetooth functionality for remote manual control, allowing versatile operation modes.

Real-World Importance

- Addresses the critical need for examination integrity by preventing the use of unauthorized electronic devices.
 - Enhances sustainability by employing solar power, making the solution viable for off-grid deployment.
 - Reduces reliance on human invigilation, ensuring unbiased and consistent surveillance.
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Skills and Technologies Used

Core Skills

- Electronics design and integration
- PCB fabrication and testing
- Embedded systems programming
- Leadership and team management
- Problem-solving and innovation

Technologies and Tools

- **Hardware:** Arduino Uno, HC-SR04 ultrasonic sensors, RF detection modules, PWM solar charge controller, L298N motor driver, IP camera
 - **Software:** Arduino IDE, AutoCAD (for design schematics), Bluetooth communication protocols
 - **Programming Languages:** C++ (Arduino)
 - **Power Solutions:** Solar panels for renewable energy sourcing
 - **Prototyping Tools:** Breadboards, multimeters, and soldering equipment
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Project Highlights

- Successfully developed and demonstrated a working prototype, showcasing technical functionality and real-world applicability.
 - Improved the efficiency and reliability of examination hall monitoring, ensuring a fair testing environment.
 - Delivered a comprehensive technical feasibility report to stakeholders, earning accolades for innovation.
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Outcomes and Achievements

- Recognized for innovation in blending renewable energy with cutting-edge surveillance technology.
 - Demonstrated the project's potential for scalability and deployment in various environments beyond educational institutions, such as industrial security.
 - Enhanced teamwork and collaboration skills through interdisciplinary integration of electronics, programming, and hardware design.
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