

Gesture Controlled Home Security and Automation Systems (GCHSAS)

Expression of Interest:

We are writing this to express our firm interest in participating in the IEEE MYOSA contest. We are very passionate about electronics, technology and sensors. We are all very excited to make our first ever sensor system with MYOSA devices. We have well-researched these sensors, and we are very happy that we got this opportunity to work and learn through this contest.

As we are pursuing our degree in ICT and the core of ICT is solving real life problems and making the lives of people easier with innovation and tech, so we are very excited to apply our innovation and creativity to help solve a real world-based problem with this opportunity provided to us.

We are students of a research directed institute, we were naturally inclined to participate in this contest and give our best. We are also excited to represent our institute internationally through MYOSA contest.

Thanking you,

Team- Electrolytes.

Team Details:

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IDEATION DETAILS

MYOSA board Overview:

The MYOSA board forms the backbone of a gesture-controlled home automation and security system, aiming to simplify appliance management and enhance home security. Using gestures, users can control various home appliances, while an automated motorized security setup locks and unlocks entry points based on input from the MYOSA system. This solution eliminates the need for manual checks, providing users with hands-free control and enhanced convenience. An IoT system is created in which a gesture-controlled switch automates the home appliances connected to it and an automated home security system is created in which the doors and windows will automatically get locked/unlocked.

System Components to be used:

1. **Motherboard:** Serves as the central processing unit, receiving signals from sensors and sending commands to the actuators.
2. **Actuator:** Executes commands from the motherboard to control appliances based on assigned gestures.
3. **Gesture + Proximity + RGB Sensor:** Recognizes directional gestures and proximity, while the RGB function provides feedback on the device's status.
4. **Accelerometer + Gyroscope:** Monitors security by detecting vibrations or motion around entry points.
5. **OLED Display:** Provides a visual display of the system's status, enabling users to monitor appliance states and security alerts in real-time.

Additional Circuit and Software:

A custom motorized circuit is developed specifically for door and window locking. The circuit is controlled by the MYOSA board and allows for automatic securing of entry points. The software application, connected to the MYOSA board via the ESP32 module, provides an intuitive interface for users to control the system remotely or by touch.

The app includes functionalities such as:

One-Touch Control: Allows locking and unlocking of doors or windows with a single click.

Alarm Notifications: Alerts the user if the accelerometer/gyroscope sensor detects suspicious activity.

Real-Time Status Display: The app provides an instant update on appliance states and security status, ensuring users have complete control over their home environment.

Significance of the Application:

This application offers a streamlined, gesture-controlled solution for managing home appliances, doors, and windows in large properties, enhancing both security and convenience. By automating the locking and unlocking process, it eliminates the need for manual checks, saving time and reducing security risks when leaving or returning home or before sleep. Gesture-based commands provide a hands-free, accessible interface, benefiting users with mobility challenges. Additionally, the system can integrate with IoT features to optimize energy use, adjusting appliances based on occupancy. This scalable application is versatile for different home layouts, making it a valuable addition to the evolving smart home market.

System Design:

The MYOSA board integrates multiple components through an I2C port to establish connections between gesture recognition, appliance control, and security features. The components and connections are designed as follows:

- **Gesture-Based Appliance Control:** The MYOSA board's gesture sensor and actuator are connected via I2C to allow users to control appliances with assigned gestures. For instance, a gesture to the right can turn a light on, and a repeated gesture can turn it off. The motherboard processes the sensor's input and relays commands to the actuator, which then signals the corresponding appliance.
- **Automated Security System:** Doors and windows are secured with a motorized locking mechanism linked to the MYOSA board and mobile app. Through the ESP32 module, the system connects to the mobile app via WiFi and Bluetooth, enabling one-click locking and unlocking. The accelerometer and gyroscope continuously monitor for unusual movements, such as forced entry, which triggers an alert on the app's alarm system.

Implementation of the MYOSA Platform:

The MYOSA platform connects various components through its motherboard and ESP32 module, enabling gesture-based control for both appliance management and security features.

- **Gesture and Actuator Connectivity:** The gesture sensor and actuator link to the motherboard through an I2C port, with each gesture controlling a specific device. The motherboard receives signals from the gesture sensor, directing the actuator to execute commands such as turning devices on or off.

- **Mobile App Connectivity:** The mobile app is connected to the motherboard using WiFi and Bluetooth, facilitated by the ESP32 module. Through the app, users can secure all doors and windows with one click. Additionally, the accelerometer and gyroscope sensors monitor vibrations or movements around windows or locks, alerting the user on the app's alarm system if suspicious activity is detected.
- **Security Alerts and OLED Display:** An OLED display connected to the motherboard displays alerts and system status, allowing users to monitor the security of their home and the status of appliances in real-time. This feature adds an extra layer of control and security for homeowners.

Demonstration of System Functionality

★ *Gesture-Controlled Appliance Demo*

To demonstrate the system, a simple gesture to the right can be used to turn on a light, with a repeated gesture turning it off. This feature showcases the MYOSA board's responsiveness to user gestures and its capability to control various appliances.

★ *Security System Demo*

The motorized circuit connected to doors and windows allows users to lock or unlock entry points through the mobile app. This demonstration will showcase the convenience and effectiveness of the automated locking mechanism. For the security feature, a simulation of an attempted break-in can be performed. When the accelerometer/gyroscope sensor detects strong vibrations, the app's alarm will trigger, alerting the user to potential danger.

The demo highlights the MYOSA system's seamless integration, from gesture-based control of appliances to automated home security, ensuring an intuitive and secure smart home experience.