Smart Home

Automation Through Arduino

CSE272 – Embedded Systems

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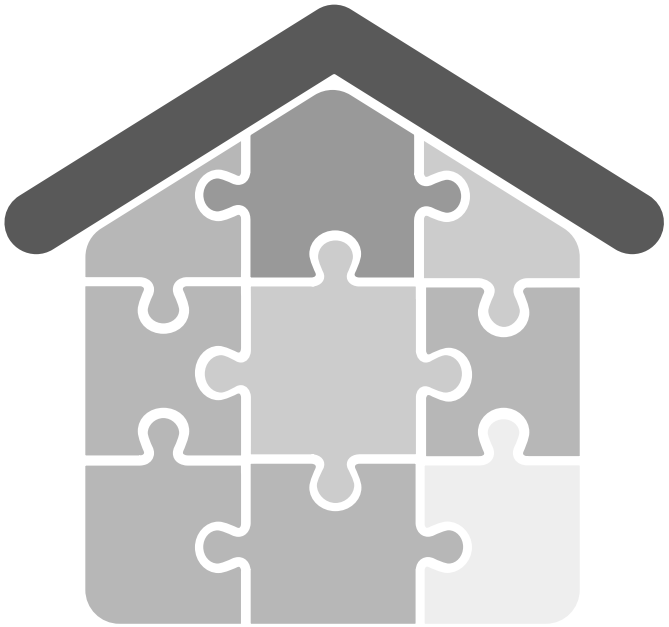
What is a Smart Home?

“allows homeowners to **control** appliances, thermostats, lights, and other devices **remotely** using a smartphone or tablet through an internet connection”

Aim & Objectives



To design a **functional prototype**, leveraging home automation through arduino

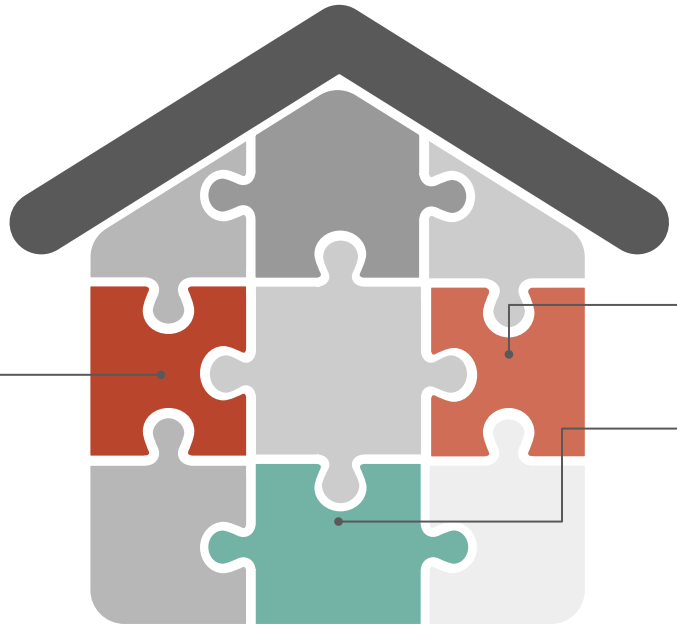
- Integrate various sensors and actuators to **monitoring** and **controlling** home appliances and environmental conditions.
- Test the system for **reliability**, **efficiency**, and **usability**, ensuring it meets the desired standards of convenience, security, and energy efficiency.

Aim & Objectives

Automatic Lights

Using a Motion sensor to detect if there's any movement, when detected lights will automatically be turned on.

In the future could learn to adapt to the homeowner's preference and schedule



Appliance Management

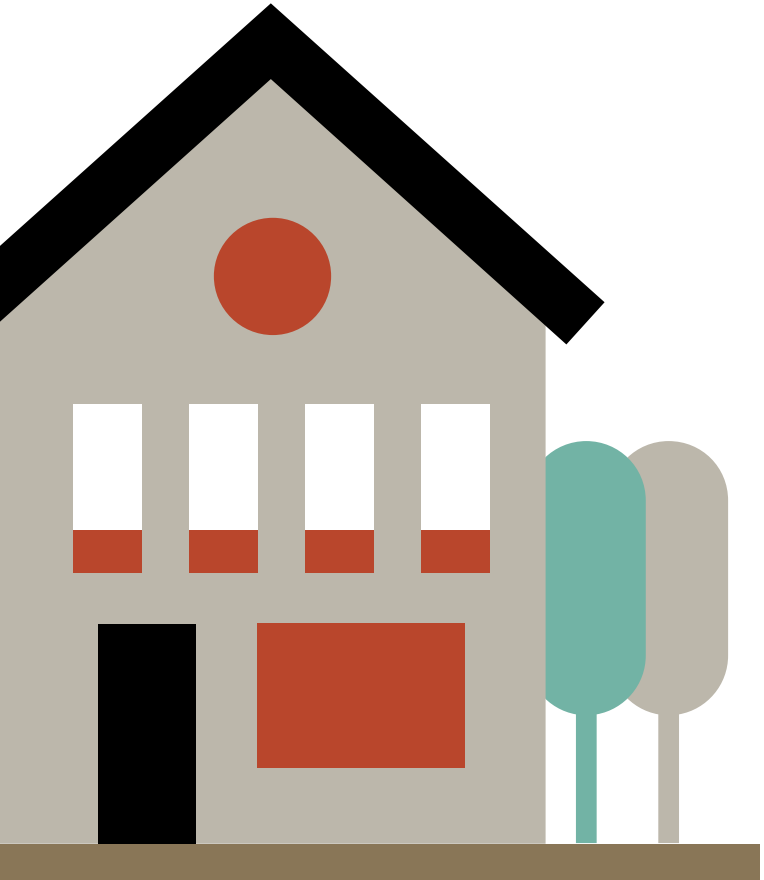
The system will enable remote activation/deactivation of specific appliances like air conditioners or ovens.

Security Monitoring

Integration with sensors can enable features like motion detection, door/window breach alerts, and notifications sent to the user's mobile app.

Motivation

Provide **convenience** and **comfort** and **Safety of mind** for a homeowner.



Problem Statement

"Our project aims to develop a smart home system using Arduino-based automation, integrating sensors and actuators for intelligent monitoring and control of home appliances. This system will enhance energy efficiency, convenience, and security, providing a responsive living environment. Robust security measures will be implemented to safeguard against unauthorized access and protect user privacy."

Literature Survey

IoT in Smart Home Systems

Sharma et al. (2021) Importance of communication protocols, security, and data management

Bluetooth Communication

MIT App Inventor, resources for creating mobile apps that interact with Bluetooth devices

Automation Through Arduino

Vijayaraghavan et al. (2022) propose a system with light and appliance control, along with security features like door/window monitoring

Voiced-Controls Automation

Jain et al. (2020) explore voice-automation using Arduino with speech recognition, highlighting the potential for user-friendly interfaces.

Proposed Work Procedure

Sensor Experimentation

Testing and integration of various sensors

Outer Body Insulation

Installation of the outer body housing the sensors around the home

User Interface

Testing of the user interface elements

Application Integration

Integration of a pre-developed mobile application

Functional Testing

Comprehensive testing of all sensors, actuators, and components

Finial System Integration

Integration of all components and the application

Methodology

1 System Design & Hardware Selection

Researching components based on requirements

2 Software Development

3 Testing & Evaluation

Individual testing for each components

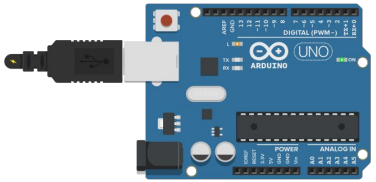
4 Security Considerations

5 Documentation & Refinement

System Description

Secure and User-Friendly Smart Home Automation System.
Using Arduino and Mobile App Integration

MICROCONTROLLER

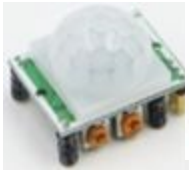


Arduino Uno

Arduino Shield

HM-10 Bluetooth

SENSORS



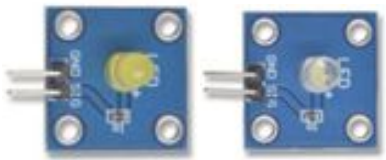
PIR motion Sensor

MQ-2 Gas Sensor

Buttons

Steam Sensor

ACTUATORS



LEDs

Fans

Servo Motors

ACTUATORS

Passive Buzzer

Relay

LCD 1602 display module

System Integration

Enhance functionality and connectivity of Arduino project with external systems.

Integration Options:

- Home Automation Hubs
- Cloud Platforms
- Smartphone App (Direct)
- Additional Sensors

Benefits:

- Enhanced Functionality
- Remote Monitoring and Control
- Improved Automation
- Scalability

Considerations for Successful Integration

- **Communication Protocols**:
  Choose based on range and complexity.
  Ex: Bluetooth, WiFi, Ethernet.
- **Security**:
  Implement encryption, authentication.
  Regular updates and monitoring.
- **Power Requirements**:
  Ensure reliable power for Arduino and peripherals.
  Consider alternative sources (e.g., solar, batteries) for remote installations.

Conclusion

The Smart Home Prototype project aims to develop a miniature system using Arduino-based automation to enhance comfort, security, and energy efficiency.

The project addresses the need for accessible smart home solutions by demonstrating practical benefits such as convenience and remote monitoring.

Through sensor experimentation, application integration, and outer body installation, the team is progressing towards creating a functional prototype.

With successful completion, the prototype will showcase the potential of home automation, paving the way for future innovations in the field.

Future work

Enhance Security Features

Using Facial & Voice Biometrics

Energy Optimization

Use machine learning to optimize energy usage

User Interface

Enhance overall user satisfaction and experience.

Remote Monitoring

Monitor air quality, temperature, etc., remotely. Provide real-time feedback via mobile apps

Expandability

Design for easy integration of new sensors and actuators.Adapt to evolving user needs seamlessly

Finial System Integration

Integration of all components and the application

Thanks for Listening!!!

Any Questions?