

Practical Project Plan

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Date 09/04/2023

Smart Home Security System Using AWS services

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Executive Summary

This project aims to design and implement a Smart Home Security System by using AWS services to provide homeowners with a secure and convenient way to monitor and control their home security. The project will consist of various hardware and software components such as IMU sensors, cameras, microcontrollers and cloud services.

The goal of this project is to create a system that is easy to install, user-friendly, and highly effective in preventing intrusions and alerting homeowners of potential security breaches. The system will use IMU sensor to detect unusual movement at the front door and windows and send alerts messages to the homeowners' mobile devices as well as triggers alarms.

The project will involve several phases, including system design, development, testing, and deployment. It will offer several benefits to homeowners, including increased security, convenience, and peace of mind.

Project Summary

Purpose

The purpose of this document is to apprise about the project plan and how we going to implement it along with its complexity and as well as to get feedback at the end of the project.

Background

Smart home security system is an advanced security solution that can be easily integrated into our existing smart home devices, including our smartphones, tablets, and other smart devices. It offers a range of features that can provide a comprehensive security solution for our home. It has become increasingly popular in today's world as they provide homeowners with an added layer of protection for their property and loved ones. Many people are currently working from home especially after covid now that means lots of sensitive data are stored at home and to protect those data or anything valuable, cost-effective home security is necessary.

Objectives

The main objective of this project is to provide better smart home security with the help of AWS services and be cost effective where a normal person can also afford it as well as to design and implement a secure and scalable smart home security system that utilizes AWS services for data processing, storage, and communication.

Some key objectives about the project:

- Securely store data: Securely store the data collected from the security devices and sensors, ensuring that it is encrypted and only accessible by authorized users.
- Detect and prevent intrusions: able to detect and prevent intrusions using sensors, cameras, and other security devices.
- Alert users in real-time: able to alert users in real-time when there is any unusual activity or when an intrusion is detected by using push notifications or alarms
- Utilize AWS services: The system should utilize AWS services such as AWS IoT, AWS Lambda, AWS Kinesis, AWS S3, and AWS DynamoDB to enable secure data processing, storage, and communication.

Project Complexity

The project is expected to be of medium complexity due to the connection of sensors and microcontrollers to AWS cloud and database.

The project is based on sensors and cameras that are integrated into security systems which may require different configurations and integrations methods. Collecting and processing data from the security devices and sensors requires advanced data processing and analytics skills, which can increase the complexity of the project. Security is a crucial aspect of smart home security system projects, and ensuring compliance with data protection regulations and standards can make it complex.

Similarly, designing a user-friendly interface and experience for controlling and monitoring the security system can be challenging, especially when integrating with multiple devices and sensors.

Hardware Used

There are overall three hardware components used for this project including sensors and cameras.

MPU-6050(IMU Sensor)

The first hardware component for this project is MPU-6050 IMU sensor. It is very cheap in price in market. It can detect movement within a specific range which includes a 3-

axis accelerometer and a 3-axis gyroscope. Once movement is detected, the sensor will send a signal to the central hub of the security system with the help of micro controller, which will then trigger an alarm, and send a notification to our smartphone or other connected device.

The sensor also includes a Digital Motion Processor (DMP), which can perform complex calculations on the sensor data and provide useful information such as quaternion values, Euler angles, and more. It can detect motion and changes in orientation. For example, it can detect when a door or window has been opened or closed, or when someone is moving around in a room.

One potential drawback of the MPU-6050 IMU sensor is that it can be sensitive to vibration and noise. To minimize these effects, we can mount the sensor securely and apply appropriate filtering techniques to the sensor data.

Arduino Uno Wi-Fi

For the micro-controller component, we will be using Arduino Uno Wi-Fi integrated to connect our sensor into the cloud. It is based on the Atmel ATmega328P microcontroller which means high in performance and low in power consumption and provides built in Wi-Fi connectivity. It also allows us to create a customized and scalable system. It has the feature of a USB interface for programming and communication and has digital input/output pins that can be used to connect to sensor and other devices.

We will first Connect the sensors and camera module to the Arduino Uno WiFi board using the appropriate wiring then we will write a program for the Arduino Uno WiFi board that will monitor the sensors and camera module and send alerts to your smartphone or email in case of a security breach.

Arducam Mini Camera Module

We will be using Arducam Mini Camera module to capture pictures and record videos of unauthorized people or intruders. It features a 5-megapixel sensor and can capture video at up to 1080p resolution. We will connect the Arducam Mini Camera Module to the Arduino Uno using SPI or I2C interfaces Then we will write a program for the Arduino Uno that initializes the camera module, captures images or video, and sends alerts to our smartphone or email in case of a security breach. The program will also be able to handle any necessary image processing, such as motion detection or object recognition.

AWS Service

AWS cloud services will be our webserver and data processing management for our project

AWS IoT Core

AWS IoT Core is a managed cloud service provided by Amazon Web Services that allows you to connect IoT devices securely to the cloud, collect and analyze data, and interact with other AWS services. All the sensors, controllers and cameras will be connected to AWS IOT core and will be managed.

AWS S3 database

AWS S3 (Simple Storage Service) is a cloud-based object storage service that provides highly scalable, reliable, and cost-effective storage for various applications, including smart home security systems. S3 buckets will be used as a database to store video footage from security cameras, allowing us to access and review footage from anywhere using a smartphone app or web browser. The footage can also be used to train machine learning models for object detection and motion tracking.

AWS Lamda

AWS Lambda will be used to process sensor data and trigger alerts based on certain conditions. It will also be used to process video footage from security cameras, enabling real-time analysis and object detection. This can be used to trigger alerts based on certain events, such as detecting an intruder or identifying a familiar face.

Project Milestones

Time	Area	Progress
Week 1-2	Project Topic	Get approval for project topic from the admin panel
Week 2-3	AWS account	Create AWS and set its Services
Week 4-5	Hardware components	Research for compatible hardware components
Week 5-7	AWS Services	Setting up AWS services like S3 bucket, IOT core and Lambda
Week 7-8	Integration or connection	Connecting or wiring sensors and cameras to microcontroller
Week 8-10	Built connection	Wirelessly connecting microcontroller to AWS IoT Core
Week10-11	Testing	Testing the sensor with sample video footage and addressing any issues.

Cost

The cost of this project will not exceed 150\$

Component	Price in AUD
MPU-6050	\$10

Arduino Uno	\$45
Arducam Mini Camera Module	\$25
AWS Services	\$15 and free tier for 12 months

Risk Assessment

	Impact				
Likelihood	Insignificant	Low	Moderate	Major	Critical
Certain	MEDIUM	MEDIUM	HIGH	EXTREME	EXTREME
Likely	LOW	MEDIUM	MEDIUM	HIGH	EXTREME
Possible	LOW	LOW	MEDIUM	MEDIUM	HIGH
Unlikely	LOW	LOW	LOW	MEDIUM	HIGH
Rare	LOW	LOW	LOW	LOW	MEDIUM

This project involves implementing a complex system that integrates various devices and technologies to secure a home. Like any project, there are certain risks and issues that need to be identified and mitigated.

Some of the key risks and Issues are:

1. Compatibility issues: The project may face compatibility issues when integrating various devices and technologies from different vendors. This risk can be mitigated by selecting devices that are designed to work together and testing them thoroughly before implementation.
2. Cybersecurity risks: One of the main risks of this project is the potential for cyber-attacks that can compromise the system's security. This risk can be mitigated by implementing strong security measures, such as encryption, two-factor authentication, and regular software updates.
3. Data privacy: The project will involve in the collection and storage of sensitive user data, such as video footage and access logs. This risk can be mitigated by implementing strong data privacy policies and controls, such as encryption and access controls.
4. Integration challenges: Integrating various devices and technologies may be a complex process that requires careful planning and execution. This risk can be mitigated by breaking the project down into smaller phases, each with its own milestones and testing requirements.
5. System reliability: A smart home security system must be reliable and available at all times to ensure the safety and security of the home. This risk can be mitigated by conducting thorough testing and monitoring of the system to ensure that it is functioning as intended.

Likelihood	Description
Compatibility issues	Unlikely
Cybersecurity risks	Likely
Data privacy	Possible

Integration challenges	Possible
System reliability	Unlikely

References

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