Home Automation

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Section 1 : Project Vision

Background

Home automation or “the internet of things” is not a new concept, however the benefits of an effective automation and monitoring system is something that cannot be overlooked. Elements such as building security, utilities system monitoring and even energy consumption analytics can help both a tenant or building supervisor become alert to an issue before an incident occurs. Take for example a building’s water pressure, where a small leak in the piping can eventually lead to water main break that would not only leave the building’s residences without water, but can cost management thousands to repair. Should a monitoring system be implemented to identify these issues early on, these types of scenarios can be avoided. As a result, the purpose of the home automation system is to allow for the automation of a low income housing facility consisting of monitoring and controlling security, lighting, climate, all focusing on energy saving and cost reduction.

Business Objectives

* Provide building supervisors with a cost effective way to monitor various housing utilities including lighting, humidity/climate, water pressure, etc. to identify any issues as early as possible
* Improve housing security with the remote access of automated security systems via a web browser or mobile application
* Provide both tenants and building supervisors with various cost saving analytics that can assist in cost reductions
* Provide both tenants and building supervisors a convenient automated method of controlling lighting, temperature and other various building utilities

Glossary of Terms

* End-User - The intended users of the Home Automation system which is commonly referred to in this document as 1. Tenant and 2. Administrator.
* End-User Application - Refers to both the end-user web and mobile applications that are used to interface with the Home Automated System.
* Tenant - Refers to the building occupant/resident that is an end user for the Home Automation system.
* Administrator - Refers to the building manager/supervisor that is an end user for the Home Automation system.
* Arduino Microcontroller - Refers to the microchips that directly interface with the various system sensors including lighting, temperature sensor and security.
* Python - Refers to the programming language that utilized by the arduino microcontrollers.
* MQTT Server - Refers to the back-end network server that allows for the integration of all the various system sensors (temperature, lighting, etc.) with the end user software applications and MySQL Database.
* MySQL Server - The back-end database that allows for the storing of end user account information in addition to the data recorded from the automated sensor information.
* Raspberry Pi - Refers to the physical device that hosts the virtual MQTT server in addition to the MySQL Server.
* NodeRed - Refers to the backbone software framework that supports the communication between each of the following; MQTT Server, MySQL Server, Arduino Microcontrollers, end-user Web application and end-user mobile application.
* Android Studio - Refers to the software framework that was used to develop the end-user mobile application.
* Hypertext Markup Language - Abbreviated as HTML and refers to the scripting language that was used to develop the end-user web application.
* Cascading Style Sheets - Abbreviated as CSS and refers to the scripting language that was used to better enhance the visual appeal and ease of reading in the end-user web application.
* Microsoft Project - The scheduling software developed by Microsoft that was used in the team planning of this project.
* Gantt Chart - Refers to the visual work schedule chart as featured in Microsoft Project that outlines the various timeframes and deadlines for the team developing this project.
* Android - Refers to the required operating system that is required to use the end-user mobile application that accompanies the Home Automation System.

Section 2 : Project Execution and Planning

Team Information

* Ben Seiber - Hardware Development, System Integration
* Thomas Pionk - Hardware Development, System Integration
* Jheryl Lezama - Mobile Application Development, System Documentation
* Jeff Wallace - Mobile Application Development, Database Design
* Daniel Wilmot - Web Application Development, Database Design

Tools and Technology

Automation Hardware

* LED Lights - Responsible for simulating a building’s internal lighting system.
* Temperature Sensor - Responsible for simulating a building’s internal heating and cooling thermostat system.
* Humidity Sensor - Responsible for monitoring the humidity content of a simulated building space.
* Arduino Microcontrollers - Responsible for interfacing with the various Home Automation system sensors (lighting, temperature, humidity, etc.)

Back-end Network Hardware

* MQTT Server -
* Raspberry Pi -
* MySQL Server -

Software Application Frameworks

* NodeRed
* Python
* Android Studio
* Sublime Text

End User Application Hardware

* Laptop/Desktop (for use with web application)
* Mobile Android OS Device (for use with mobile application)

Project Plan

Project Schedule

Gantt Chart

Best Standards and Practices