Digital Home

Version 1.1

Document Control

Approval

The Guidance Team and the Customer shall approve this document.

Document Change Control

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Change Summary

The following table details changes made between versions of this document

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# 1. Introduction

The following section lays out in subsections the Purpose of the Feasibility Report, the Justification of the system, a summary of the Requirements Definition Document, a level one Use Case diagram as well as the actors involved, the description of the use case events, and finally any and all assumptions that we have made.

## Purpose of the Feasibility Report

The purpose of this document is to determine if creating such a system within the scope given to us is possible to be developed. We will also be analyzing any considerations that we feel are important in the development of this system, possible solutions that we feel will meet these considerations, and finally the recommended solution that we feel would be the best solution to implement. Our intention is to provide our client, Dr. Salamah, with enough information to know whether the project could be done, whether the final product benefit it’s intended users, and finally to show the alternatives.

## Justification for the Proposed System

Given the advancement of technology over recent years there has been a demand to develop systems that help make people’s lives easier, and to provide a safer and more secure environment. With this in mind our client feel that the development of this system will give him, and his family the ability enjoy a better life knowing that his personal belongings as well as his family are safe and secure. The client feels that by being able to easily manage his daily life, he will be able to spend more time with his family and enjoy engaging in activities.

## Requirements Definition

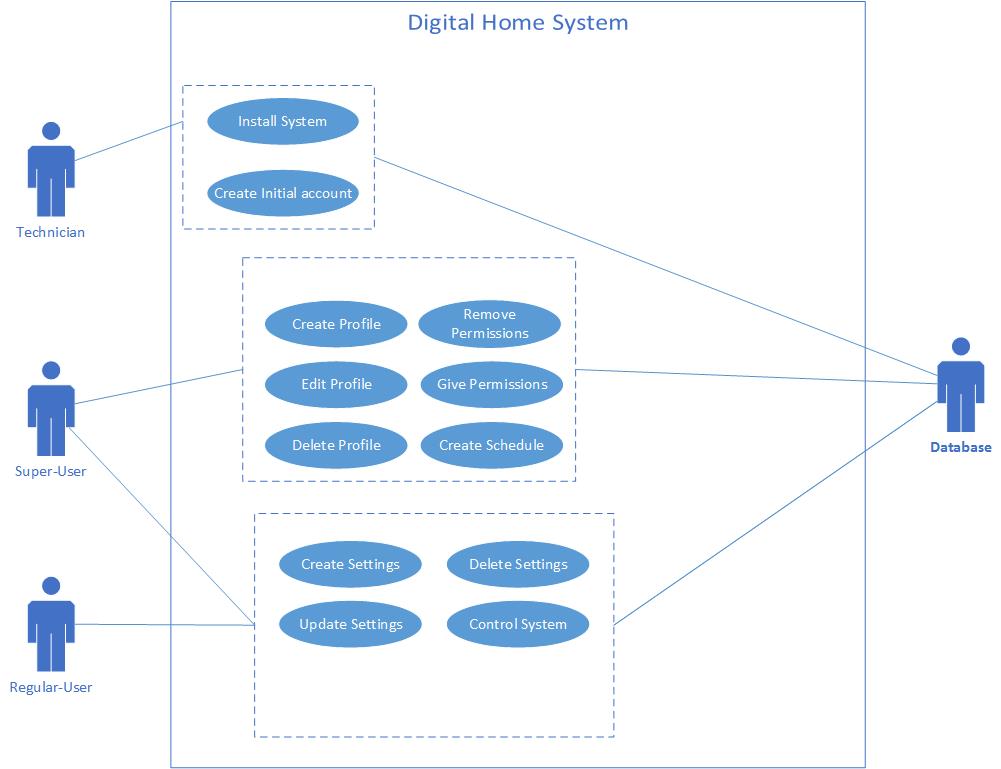
The following is a summary from the Requirements Definition Document. The full document is included in Appendix A. The Digital Home System provides the capability for home owners to easily manage their daily lives by bringing together security, environmental and energy management, as well as entertainment, and communications. The Digital Home system will allow the owner to use their own personal web page available on any web ready computer, cell phone or other device to control the house’s temperature, lighting, state of household appliances, and a planner that will allow the owner to set home parameters for specific periods of time. Through wireless communication the house will communicate with the various sensors, (e.g. temperature, power, contact, humidistat, light, and water sensors) installed thought the house. The security system of the Digital Home will consist of contact sensors that when triggered will communicate to the master control unit of the home, as well as sound both a light and sound alarm. The temperature and humidistat sensors will allow the home owner to control both the temperature and humidity of individual rooms, and the entire house. The power sensors will allow the home owners to control household appliances, control central lighting in each room, monitor the state of the appliance, and provide information on whether a light and/or appliance is on or off.

## Use Cases

The following subsections contain the Use Case Diagram (first-level abstraction), the description of the actors involved, description of the Use Case events, and finally any and all assumptions we have made.

### Use Case Diagram (first-level abstraction)

Below is a first level abstraction Use Case Diagram, which we feel would best model the system.



### Actors (descriptions)

The following section describes the actors involved in our use case diagram, the organization of the list will be the actor, followed by functionalities that the actor has in the system.

* Super-User
  + Can create regular users for the system.
  + Overrides any setting that is created/planned by a regular-user.
  + Can give permissions to regular users to control home system.
  + Can control alarms, temperature, sensors, humidity, and lights.
  + Can delete regular users.
  + Can create new daily planners.
  + Can decide when to back up the power consumption history in the database.
* Regular User
  + Can control the home system within permissions given to them by Super-user.
  + Can also create their own settings (always overwritten by Super-user)
  + Can delete their settings.
  + Can update their settings.
* Database
  + Stores the planner data set up by any kind of user (super-user gets priority.)
  + Keeps a log of the activity within the house (when a light or appliance is on/off).
  + Stores regular users created by Super-user or Technician.
  + Stores Password for Super-user and Regular user.
  + Stores profile for Super-user and Regular user.
  + Stores power consumption history to be made into reports as per the Super-User.
* Technician
  + Can create Regular-users.
  + Can create Super-users.
  + Can install new sensors and add them to the system

### Use Case Descriptions

The following section describes the use cases involved in our use case diagram, the organization of the list will be the use case, followed by the purpose of the use case.

* Install System
  + Installation of sensors, alarm system, wiring home to master control box.
* Create Initial Account
  + Used to create new Super-user account for new homeowners, as well as other Regular-users of the home system.
  + Can also be used to remove old Super-user in the event the house becomes sold.
* Create Profile
  + Create a new Regular-user by the Super-user.
* Edit Profile
  + Allows Regular-user and Super-users to change password as well as other information relevant to signing into the system.
* Delete Profile
  + Allows Super-users to delete Regular-users.
* Remove Permissions
  + Action used by the Super-user to remove certain functions of the home to Regular-users.
* Give Permission
  + Actions used by the Super-user to add home functionalities to Regular-users.
* Create Schedule
  + Allows the Super-user the ability to set up parameters for specific periods of time.
* Create Settings\*
  + Allows Regular-users, as well as the Super-user to create a new setting.
  + Can be used to set temperature, humidity, lighting, etc. in Regular or Super-users’ room.
* Update Settings\*
  + Allows Regular-users and Super-users the ability to update existing settings they have made.
* Delete Settings\*
  + Allows Regular-users and Super-users the ability to delete existing settings
* Control System\*
  + Allows both Regular-users and Super-users to control alarms, lights, door and window sensors, entertainment centers, ect. Note: For Regular-users control of system depends on the permissions given to them by the Super-User.

\* Note: Super-user settings and control of the system overwrite all Regular-user settings.

### Use Case Assumptions

The following section states any and all assumptions that we have for the use case; our assumptions are presented in list format.

1. The system will have its own dedicated Wi-Fi separate from the owner’s personal Wi-Fi, which will be used for the sensors, and all of the functionalities.
2. The homeowner will not have permission to use the system’s Wi-Fi for personal reasons (e.g. surfing the internet, using phone apps, etc.)

# Considerations

## Existing Systems

There are many smart home systems available in the market currently, many of these implement some of the features wanted in Digital Home; however, most are missing elements wanted by the customer. Next, we explore some systems that assimilate the needs of Digital Home found on the market currently.

### Savant Systems

Savant Systems also offers custom Apple-based smart home technologies. These systems offer automation & control over: audio, video, Internet devices, media, lighting systems, climate, security, and surveillance among others. These systems also feature an HVAC scheduler that allows users to create different temperature and humidity schedules. Savant smart homes also feature intelligent lighting control that uses sensors to turn off lights when a room is unoccupied. [\*\*\* ADD Savant Systems REFERENCE NUMBER \*\*]

### Iris

The Iris smart home system kits offer a variety of things, these kits need to set up and customized by the customer. Some of the features offered by Iris are: Iris Hub (connects to Internet connection in order to control smart devices, contact and motion sensors, keypad (conveniently mounted near entry/exit point for easy control), smart plug (allows control of power outlets), smart thermostat.

All of Iris’ features are customizable and monitored easily from computers, tablets, or smartphones. Through the use of Iris, users are able to: adjust the lights, control the climate, arm the security system, and unlock doors among other things – these activities are also control via voice control using Iris app. [\*\*\* ADD Iris REFERENCE NUMBER \*\*]

### IntelligentHome

The IntelligentHome system by Time Warner Cable is one of the many smart home system solutions on the market. This particular system offers security measures to the house (alerts) triggered by events. It also employs a planner and remote access to lights and thermostat settings among others. Furthermore, the IntelligentHome’s controller is available on computers and smartphones. Finally, the IntelligentHome system is energy efficient. [\*\*\* ADD IntelligentHome REFERENCE NUMBER \*\*]

## Technology

### Web Interface

One thing that should be kept in mind while designing the system is that the look and functionality of the system can change as the devices from which the users access the Digital Home’s controller and planner (e.g. Adobe Flash technology is incompatible to an iOS device). Devices and Internet browsers change and evolve, while different frameworks and components might not be universally supported for most devices.

## General

### ADA Compliance/GUI

Digital Home should be highly accessible to everyone; this includes going a step further and keeps in mind the human computer interaction side of the system (e.g. color-blind).

## Heading 3

### Option 1

### Option 2 … Option n

# Solutions

## Technology

Next we will describe the technology solutions alongside their description, resources needed and limitations.

### Description (include requirements met)

A solution to compatibility and versatility of the Digital Home web interface should be to use widely compatible components that will be usable on most devices for a substantial amount of time (e.g. HTML5).

### Resources Needed

Training for the NP-Soft members in web technologies that work on most devices (e.g. HTML, PHP, JavaScript).

### Limitations

While trying to make the system highly accessible to devices, and extend the lifetime of the system, there may be some elements (frameworks, programming languages) that might be overlooked and ignored due to these constraints.

## General

Next we will describe the solutions to general problems alongside their description, resources needed and limitations.

### Description (include requirements met)

Digital Home should follow ADA design standards throughout its design and implementation phases in order to accommodate all types of users.

### Resources Needed

Training will be required for the designers of the system alongside the programmers to make ensure that the system follows ADA guidelines in order to satisfy this need.

### Limitations

The system while accommodating ADA guidelines might be handcuffed for some functions that are simply not able to follow these guidelines.

# Comparison of Solutions

<< This section should discuss how each option measures up against any constraints set forth in the statement of requirements and how each compares with the others.

Include the following:

* Specific hardware and software requirements
* Time constraints
* Ease of use
* Staffing levels and training required
* User preference
* Security issues

A matrix that compares features is required. >>

# Conclusions

<< Summary and recommendations >>

# References

IntelligentHome (Existing Systems)

<http://intelligenthome-texas.aiprx.timewarnercable.com/intelligenthome/>

Savant Systems, LLC designs

<http://www.savantsystems.com/smart_home_solutions.aspx>

Iris:

<http://www.lowes.com/cd_Iris_239939199_>

# Appendix A

Requirements Definition for Digital Home

DigitalHomeOwner

Division of HomeOwner Inc.

**Introduction**

A “Smart House” is a home management system that allows home owners (or renters) to easily manage their daily lives by providing for a lifestyle that brings together security, environmental and energy management (e.g., temperature, humidity and lighting), entertainment, and communications. The Smart House components consist of household devices ( e.g., a power and lighting system, an air conditioning unit, a sound system, a water sprinkler system, small appliances, and security system), sensors and controllers for the devices, communication links between the components, and a computer system that will manage the components.

The Requirements Definition Document describes the system‘s operational characteristics from the end-user’s viewpoint. It is made up of a list of the principal features of a prototype Digital Home system, and its main purpose is to support an effective project planning activity. The document was prepared by the Marketing Division of HomeOwner Inc, as part of a needs assessment for the DigitalHome project.

**DigitalHome Prototype Features**

The DigitalHome System will allow any web-ready computer, cell phone or other device to control a home's temperature, humidity, lights, and the state of household appliances, e.g., coffee maker and microwave.

The communication center of the system will be a personal home owner web page (maintained by DigitalHomeOwner - at http://www.DigitalHomeOwner.ccc ), through which a user can monitor and control home devices and systems.

Each DigitalHome will contain a master control device that connects to the home’s broadband Internet connection, and uses wireless communication to send and receive communication between the DigitalHome system and the home devices and systems.

The DigitalHome will be equipped with various environment sensors, e.g., temperature sensors, light sensors, humidity sensors, power sensors, contact sensors, and water sensors. Using wireless communication, sensor values can be read and saved in the home database.

The DigitalHome security system will consist of a set of contact sensors and a set of security alarms, which are activated when there is a security breach.

The security system will use wireless signals to communicate, through the master control unit.

The system will use both sound and light alarms and will be able to manage up to thirty door and window sensors.

The DigitalHome programmable thermostat will allow a user to easily monitor and control a home’s temperature from anywhere, using any web ready computer, cell phone, or other device.

Thermostats can be placed throughout the home and can be controlled individually or collectively, so that temperature can be controlled at different levels in different home spaces.

A thermostat unit will communicate, through wireless signals, with the master control unit.

The system will support Fahrenheit and Celsius temperature values.

The system will be compatible with most centralized HVAC (Heating, Ventilation and Air Conditioning) systems: gas, oil, electricity, solar, or a combination of two or more.

The user will always be able to override the scheduled settings at any time.

The DigitalHome programmable Humidistat will allow a user to easily monitor and control a home’s humidity from anywhere, using almost any web-ready computer, cell phone, or other device.

Humidistats can be placed throughout the home and can be controlled individually or collectively, so that humidity can be controlled at different levels in different home spaces.

A Humidistat unit will communicate, with wireless signals, through the master control unit.

A Humidstad unit will manage humidity sensors and dehumidifiers/humidifiers located in a specified home space.

The user will be able to select the humidity levels found most comfortable — from 30% to 60%.

The DigitalHome programmable Power Switch will provide management of a home’s household appliances and will allow the user to turn appliances and lights on or off as desired.

The Power Switch unit can control the central lighting in each room and up to forty 115 volt, 10 amp appliances that plug into a standard wall outlet.

The system will be able to provide information about whether an appliance or a light is off/on.

A user will be able to monitor the state of the appliance, and turn on or off any appliance through any web ready computer, cell phone or other device.

The DigitalHome Planner will be able to provide a user with the capability to direct the system to set various home parameters (temperature, humidity, security level, and on/off appliance/light status) for specified time periods.

DigitalHome provides a monthly planner on its web site.

Parameter values can be scheduled on a daily or hourly basis.

All planned parameter values can be overridden by a user.

Various plan profiles (normal monthly profile, vacation profile, summer profile, holiday profile, etc.) may be stored and retrieved to assist in planning.

The DigitalHome Planner will be able to provide various reports on it management and control of the home (e.g., historical data on temperature, humidity, lighting, etc.).

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