Project Proposal for

Smart Home Guard System

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Figure & Table

Revision History

Doc. Name	Date	Reason For Changes	Version
Proposal	21th of Sep	Initial version of proposal	V 0.1
Proposal	22th of Sep	Korean version of proposal	V 0.2
Proposal	23th of Sep	Complete version of proposal	V 1.0

Table 1. Revision History

1. Introduction

1.1. Motivation & Background

The population that live alone is increasing rapidly. This is mainly because the twenties tend to be "Sampo generation" who gives up courtship, marriage and childbirth. According to the Korea National Statistical Office, the ratio of single household is 23.9 percent in 2012, compared to 9.0 percent in 1990. The most recent research, which is conducted in August 2015, shows 26.0 percent of single household ratio, and it looks to be 34.3 percent in 2035 [1].

There is the other statistics that conducted a research on single household of women from 25-year-old to 49-year-old living in Seoul. It is conducted by Seoul municipal office with Ministry of Gender Equality and Family. The characteristics of single family is the highest portion is in elder people above 60 ages, and the portion of women increased a little from 66.1 percent in 2010 to 69.0 percent in 2014 [1].

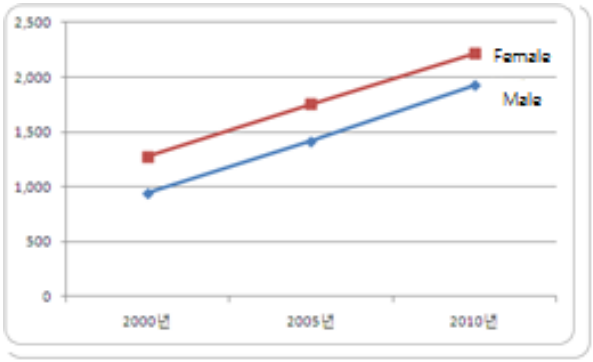

Figure 1. The rate of "Single household" is 23.9 percent in 2012, Rate of female is higher than male [1]

Private security guards said that the most unsafe areas are daycare center, institution for people with disabilities, and single-women household. They said there is need to strengthen social security system, because the crime for the weak is increasing. The majority of security guards said that the most urgent people are the women who live alone [2].

1.2. Objective

Socially the "Single Household" has increased dramatically. Socially the "Single

Household" has increased dramatically. It is necessary to prevent unexpected intrusion, that causes greater damage and to get away from crime for women and the elderly. For this reason, we propose a "Smart Home Guard System" that prevents the sneak thief and sex crimes targeting women. And also, this system makes user control the house conveniently while they are out of the home.

1.2.1. Away from Home

During absence, Smart Home Guard System prevent crime target by controlled like someone in the house. When did intrusion detection, the attacker cannot get out of the house by lock is operated. So, police can catch the crime scene in the meantime.

- Lock the front door and windows by TIZEN phone through the wireless [3]
- Turn on the TV and lighting as people at home
- If someone ring a doorbell, user can watch a video of front door and talk over TIZEN phone
- If intrusion is detected, lock the front door and windows, and report to the police

1.2.2. Stay at home

When user is at home, system is on Half-Lock Mode. It doesn't detect the motion in house. When it detect external intrusion, it reports to the police and family for preventing the bigger crime.

- System Half-Lock Mode on
- When it detect external intrusion, report the warning to the police and family

2. Project Problem Statement

While the single household has been increased, consumption for them has been too increased. Also, a neologism was economically formed which is called "Solo Economy". However, crimes which is targeting the single household has increased [4].

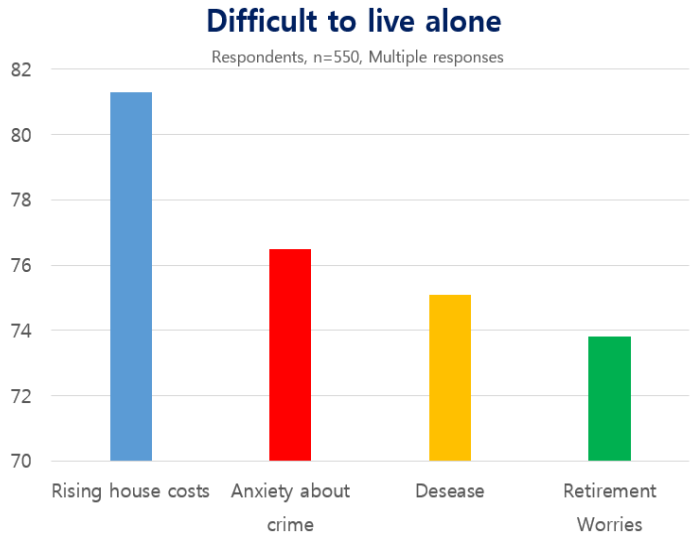

Figure 2. Seoul Foundation of Women & Family, Difficult to live alone. 2012 [4]

When asked a question 'Difficult to live alone', women responded that "Anxiety about crime, such as sexual assault" secondly high. That is, women who live alone are feeling uneasy. Due to the relentless news about female crime, they would anxious a lot. The crime for women who live alone is really happened much?

Figure 3. 45 people of 357 people among the female Single household in Seoul [4]

From the 20-year-old to the 50-year-old woman hit 12.6 percent of 357 respondents replied that the case went through the crime or injury. Also, they hit about 80 percent near the house (around the building (39 percent), inside building (29.3 percent) and in the home (19.5 percent)). This mean that about 13 women out of every 100 people living alone suffered crime. It was higher than previously thought. Now that most of the crimes occur near the house, even what women living alone sleep fitfully is not an idle fear. The most comfortable and safe home more than anything that you need to place surely that cannot shake the "anxiety" is ironic [4].

In spite of the implementation of "women assured home services" and "women assured courier service" currently in Seoul, which is not enough to be away from crime. Surged the single household and sending most of the day while the house is empty for a long time for the company, a crime aiming for the elderly and socially disadvantaged women by increasing. So, it requires the introduction of the institutional system to prevent this kind of crime.

3. Related Work

Although currently security system are applied to Home-IoT technologies on the market, there is not the system with the concept of integrated security system. We enhance the competitiveness of the Home Guard System by benchmarking them.

3.1. Existing system

3.1.1. Samsung "Smart Things"

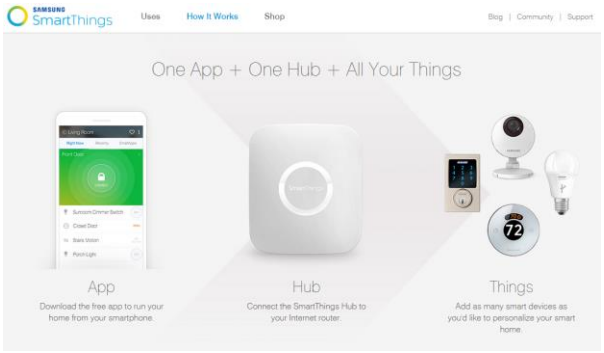

Figure 4. Smart things [5]

Their concept is controlling the Smart home devices connected to the home hub using Smart Phone. By connecting all devices in the home to be controlled by APP Hub. The system contains a number of objectives of Security, Monitoring, Energy, Convenience, Entertainment [5].

3.1.2. LG HomeChat

Their concept is controlling the refrigerators, washing machines, audio, and boilers over a messenger after they register their LG Home Chat with friends. Smart appliances used for purposes other than security purposes that can be used just externally [6].

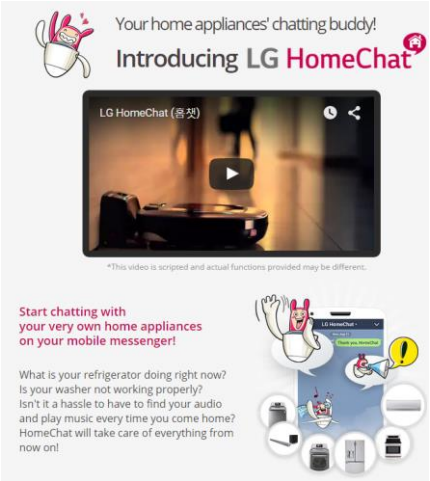

Figure 5. HomeChat [6]

3.1.3. Google "Brillo"

Brillio is new operating system to operate the multiple device by smartphones on their IoT platform. It is improve convenience over the mount all IoT Device which is Bulbs, car, TV, air conditioners, washing machines and house key [7].

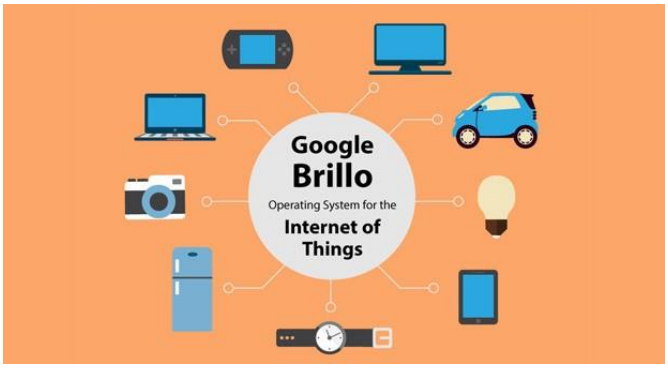

Figure 6. Brillo [7]

3.1.4. Apple "Homekit"

Homekit is a platform that can communicate with Apple products, and home appliances used the iOS. Their motto is "all the controls of the house is safely in your hand" [8].

Figure 7. Homekit [8]

The Global Company introduces a comprehensive IoT services platform. Solution to introduce all synthesis, but it is still too early to apply all of the feature in the current Home environment. In particular "Single Household" who, they must have been too heavy and difficult to apply the system.

The system we are proposing specialized in "Single Household". We are going to design a device with a minimum infra, light performance. So, the actual user is not difficult to use.

3.1.5. Home Automation Systems background

With home automation systems, you can forever banish concerns over unnecessary home energy expenditures and stop wondering whether or not you locked the front door. These high-tech solutions can help make your home into a smart home. In fact, a smart home system can control every light, appliance and compatible peripheral in your home [9].

As we look for a smart house system, there are several things to keep in mind. A system with strong compatibility, the right functionality and excellent technical support is our best bet. Above all, we should try to look for a system that best suits our needs. The possibilities for automated intelligent home control are nearly limitless.

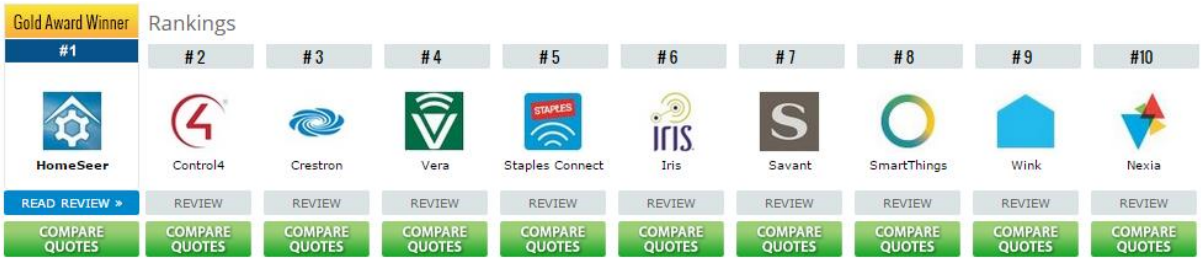

Figure 8. Top 10 Home automation system [9]

- Compatible Peripherals

A hardware controller is designed to be the control center of a home, so try to look for one that can manage a multitude of devices. Each of the systems can control lighting, thermostats, door locks, security cameras, and has environmental sensors and energy management tools to improve system efficiency. However, not all smart home systems support window coverings, garage door openers, entry sensors or home theater systems.

- Functionality

A good system is easy to use, promotes energy efficiency and improves the safety of your home. Home automation software allows you to create custom programs to easily perform a variety of actions. Randomized programs are especially valuable, as they turn peripherals in your smart home on and off to deter criminals by making the home look occupied when you're away.

There are various method of wireless communications. Z-Wave is a wireless communications specification designed to allow devices in the home (lighting, access controls, entertainment systems and household appliances, for example) to communicate with one another for the purposes of home automation. ZigBee is an IEEE 802.15.4-based specification for a suite of high-level communication protocols used to create personal area networks with small, low-power digital radios.

4. Proposed Approach

4.1. Scenario flowchart

Figure 9 shows a Scenario flowchart of Smart Home Guard System.

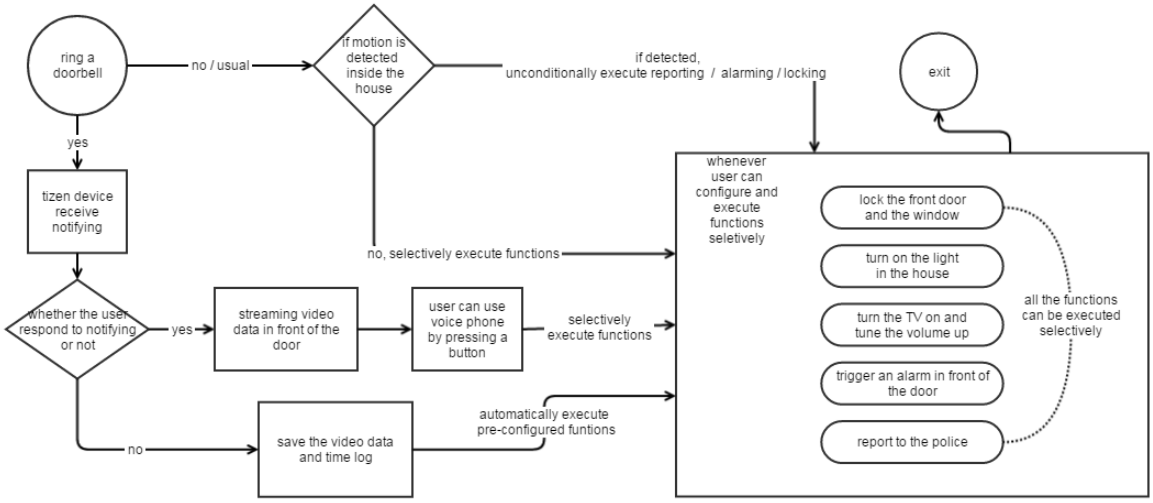

Figure 9. Scenario flowchart of the System

4.2. Proposed Scenario

■ Actor ■ Background / Domain ■ Goal / Objective

Lily is a woman that live alone and work in Electronics Company. She bought 'Smart Home Guard System (SHGS)' of which purpose is preventing intrusion in house. Lily usually controlled the house by SHGS when she was at work. It means that she usually made TV and light turned on. (When it is needed, she turned TV volume up.)

Some day at no distant date, she received TIZEN smartphone notification, when working at her company. So, she pressed a 'confirm' button and she could watch video. The visitor was a parcel delivery man. She pressed 'talk' button and she said that please hand over the parcel to the janitor's office. The same day night, her department was having a get-together. So, she forgot to turn on the light and TV in the house. And then, TIZEN smartphone received a notification that somebody visited her home. By watching the video using TIZEN smartphone, she could know that a man wearing a mask is standing in front of the door. Lily was so astonished. She locked the front door and the windows and asked who you are at this time of night. And the man suddenly disappeared.

The following day, she was in project meeting at work. The TIZEN smartphone is in her bag and Lily could not recognize the phone notification. At that time, the TIZEN smartphone received a notification. Consequently, Lily could not confirm the notification. Automatically, the functions that Lily had configured in advance are executed. The front door and the windows are locked. And, TV and light was turned on. After meeting, she saw that the notification had been received. The man who had visited yesterday was hanging around the house. Lily was afraid and angry.

Next day, Lily overslept and forgot to close the windows. She was working at 3 p.m. And then, suddenly, her TIZEN smartphone received that the motion in the house is detected. She was astonished and went to home. And, there were many people. Passers-by simply looked on. And also, the policemen are in front of the door. She checked what the matter is. The matter was that the man who had visited and wearing a mask was in the house. The man was trapped in the house. It is because the SHGS had locked all the windows and the front door. And, SHGS reported to the police and trigger a noisy alarm in front of the door. Therefore many people were looking on. Lily had the only device that could unlock the front door. It was her TIZEN smartphone. The policemen opened the door with it, and enter into the house. After getting into hand-to-hand fight with the man, the policemen arrested him. Lily was very relieved that she had equipped with Smart Home Guard System.

5. Technical Solutions

The figure 10 represents the conceptual framework of the Smart Home Guard System. Our system consists of Raspberry Pi for main server and calculations, Arduino Uno for getting sensor values, and TIZEN Application for user's controller.

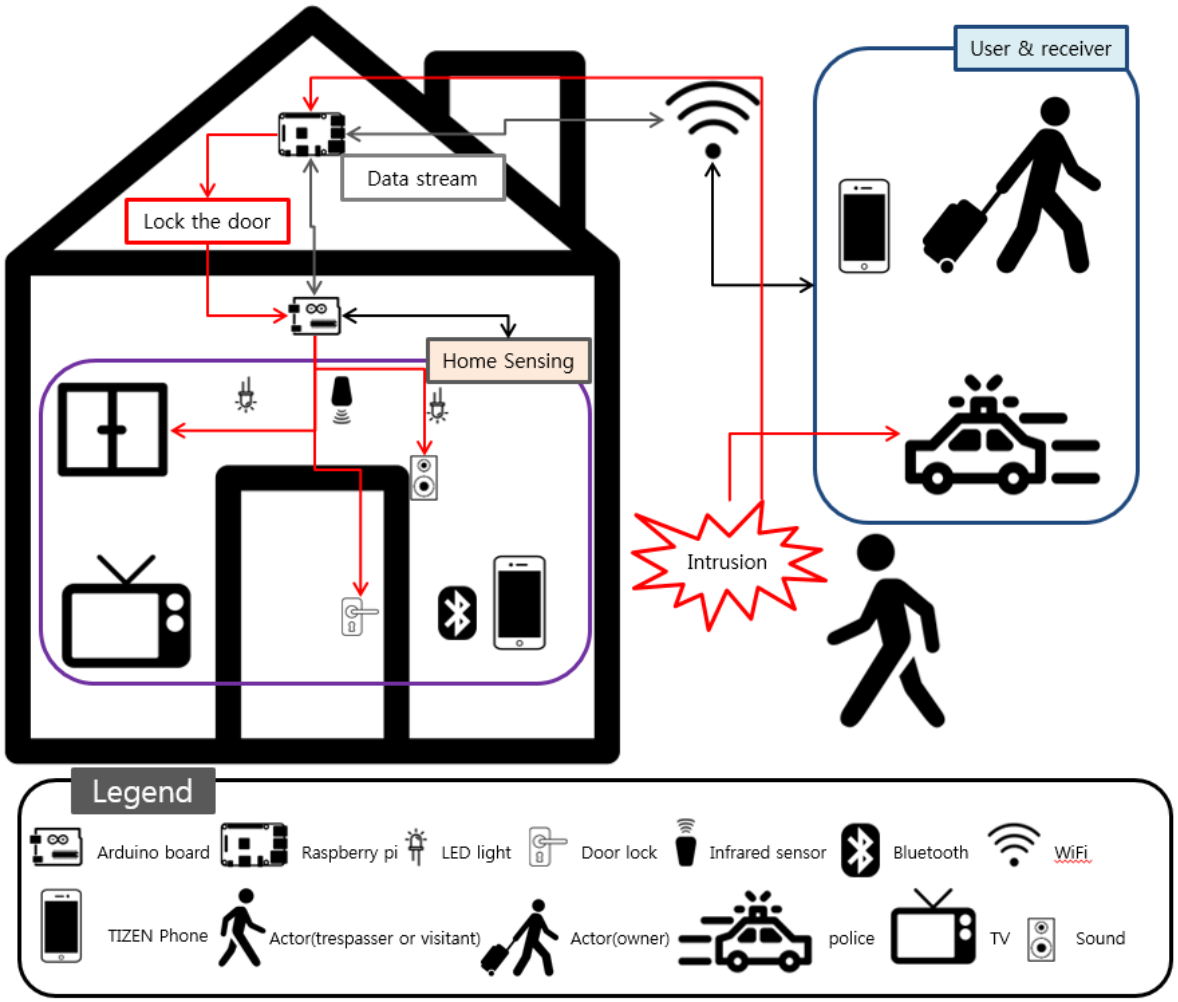

Figure 10. Conceptual Framework of the Smart Home Guard System

The Smart home Guard System is the core of the Home-IoT technologies which are sensing an activity of household, real time streaming for sending a video to user who has TIZEN phone and so on. Devices and techniques used in our system is as follows

5.1. TIZEN Mobile Device

For the user's controller, we use the Samsung Z1 Device based on the TIZEN Operating System.

The TIZEN application working in this mobile device is made of the Native Project based on C/C++ language and the Web Project based on JaveScript which is web language [10]. We are going to build the application using the Native project, because our members are familiar with the C language.

5.2. Arduino & Raspberry Pi

5.2.1. Arduino

We use Uno version of Arduino which is kind of Micro-Controller board, and build the program on Integrated Development Environment (IDE) based on C language [11]. In the Smart Home Guard System, Arduino also is in charge of external control and intrusion detection using LED light, Servo motor, Infrared sensor, Bluetooth, Television and sound sensor which are connected with the Arduino.

Figure 11. Arduino Uno [11]

5.2.2. Raspberry Pi

In the Smart Home Guard System, Raspberry Pi is going to be used for controlling the data and main server connected with WiFi router. Raspberry Pi can perform more complicated tasks than Arduino because Raspberry Pi has operating system. Also, it can build a software using C/C++ language as well as Python, BBC BASIC, Perl and so on. It is performed at Terminal and developed on Raspbian operating system which is embedded OS based on Linux [12]. Among them we will create a program based on C/C++ language.

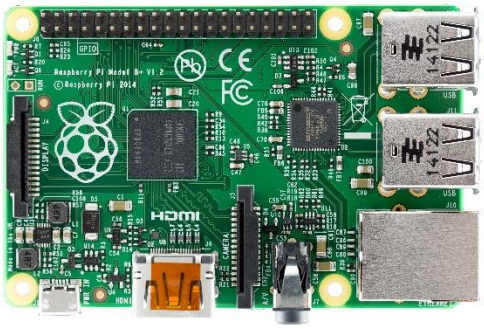

Figure 12. Raspberry Pi [12]

5.3. Sensor

The below Table 2 shows the sensor that is connected to the Arduino and Raspberry Pi.

Sensor	설명(Description)	note
LED light	This is LED actuator for indoor light, and also using for inside presence	Arduino
Door lock	This is a motor actuator for controlling the door and windows. It is used as the locking mechanism for security.	Arduino
Infrared sensor	This is an infrared sensor for sensing at indoor movement in smart home.	Arduino
Bluetooth	This is a Bluetooth for controlling the door which connects user with the door lock.	Arduino
WiFi	This is WiFi router for wireless communications between user's TIZEN phone and Raspberry Pi.	Raspberry
Television	This is a TV which is controlled by home system or user for inside presence.	Arduino
Sound sensor	This is a sound sensor for notification when the attack occurred.	Arduino

Table 2. Sensor Description

6. Expected Results

6.1 Business Plan

Develop the user friendly, safety, security, useful Application and Platforms by TIZEN. Go over from existing Android market to TIZEN by providing a system that satisfies customer's needs.

- Corporate Status
  - The current project practitioners are graduate students and colleagues studied together in the lab
- Organizational and workforce planning
  - Three developers, it will work with all
- Technology and Development Plan
  - It will be described in the technical area.
- Production and Facility Planning
  - Use the TIZEN, Arduino Uno, Raspberry Pi, and IPTIME router from the Funding.
- Sales Plan
  - After the completion of the project should contact the partnership with SKT running at the forefront of the smart home market.
- Finance and Revenue Planning
  - The necessary equipment is provided by the school.

6.2 Contribution

- Social Effects
  - Reducing the likelihood of crime, blocking the instrument which can be expanded to a large crime
  - By providing a safe living environment for residents satisfy and improve the quality of life of citizens
- Business Effects
  - Synergistic effect occurs in the technology of related industries by the implementing

IoT service -related skills which is growth engines industry

- Positive influence, individual's performance has been enhanced. Impact of the expected improvement in the economy and Social Group

- Technical Effects
  - Secure related technologies by designing a security centric architecture
  - Improve the developer skills by developing TIZEN, Arduino, and Raspberry Pi

6.3 Project Management

During performing the project, we will set a moto as participation of all members in the Advanced Software Engineering Process in order to learn the process and techniques. We also have a stand-meeting once a week and share the progress of our project. Figure 13 is the Gantt chart about our plans following the Software Engineering Process.

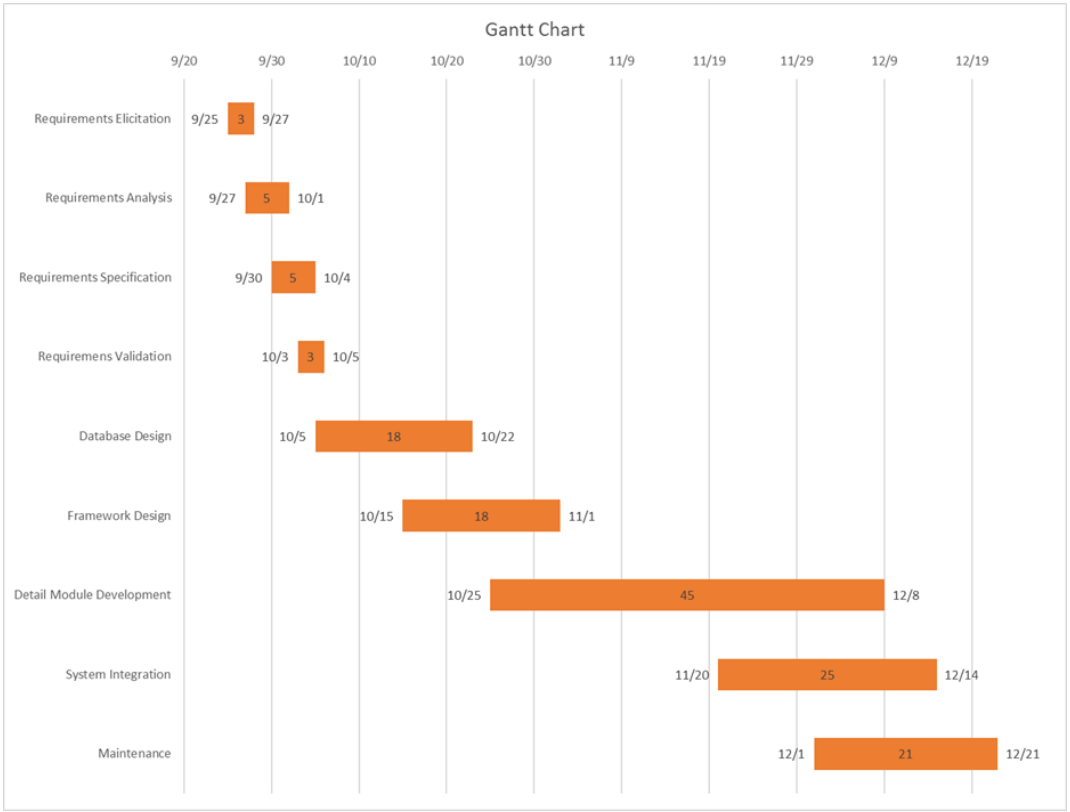

Figure 13. Gantt chart for Software Engineering process

6.4 Risk Management

6.4.1. Risk Analysis

This Proposal Document does not contain a comprehensive set of risks however we think its importance to identify key risks at this early stage. We will elaborate on risks during the Analysis phase of this project.

Possible risks	Probability[1]	Effects[2]
We have no real devices to build Smart Home Guard System and we will have to perform analysis based on small actuator or sensor.	high	tolerable
Team has other courses and responsibilities.	high	**serious**
Team members do not have experience performing analysis on the IoT domain and TIZEN IDE.	high	tolerable
The team conducts business in English but not all members are native English speakers.	very high	tolerable
Technology may not support the findings of the analysis document.	medium	**catastrophic**
There are some privacy problem.	high	**serious**

Table 3. Risk Description

[1] The probability of the risk: very low (<10%), low (10-25%), moderate (25-50%), high (50-75%), or very high (>75%)

[2] The effects of the risk: catastrophic(threaten the survival of the project), serious(would cause major delays), tolerable(delays are within allowed contingency), or insignificant

6.4.2. Risk Management

The below table shows possible risk management strategies that have been identified for the key risks (i.e., those that are catastrophic or serious)

Effects	● **Possible risks** - **Strategies**
serious	● Team has other courses and responsibilities - Breaking up deliverables into each week so that the team is delivering and progress is visible.
catastrophic	● Technology may not support the findings of the analysis document. - We will cover the details of the requirements so that this analysis can be transferred to another technology space.
serious	● There are some privacy problem - We will conduct secure coding so that prevent the privacy problem.

Table 4. Risk Management Description

7. Reference

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