Module 5- Computer Systems
(2021-22)
Project

UNIVERSITY OF TWENTE.

Requirement Analysis Document Template

Project Name: Smart Home	**Team Members: Hein Huijskes, Julia van der Geest, Ujjwal Dodeja, Jose Gavilanes, Maouheb Bessi, Mengmeng Li**
Team ID: 17	**Mentor(s): Ramish Bhutto, Wenjie Zhao**

1. Introduction

Smart Home is a personal voice assistant for a house owner which can be used to control all the smart devices present within a household. A user can control all the devices just by using voice commands such as lights, speakers and smart TVs. It is based on the concept of smart things.

All the devices have to be paired separately by logging in to a portal i.e. either an application or a website. Smart Home can also be accessed using a personal login code in case of issues with voice recognition.

Smart Home is based on existing products like Google Home and Amazon Echo etc. These are also voice assistants or smart speakers which provide wireless connectivity to all smart devices within a household or within their respective range.

1.1. **Purpose**:

The purpose of Smart Home is to provide a user-friendly and unified access to all the smart devices based on voice commands. It will act as the centralised access point to the IoT's. It will provide both wired and wireless connectivity within the devices. Unauthorized access will result in a snapshot of the person being sent to the homeowner.

1.2. **Limitations of the current system (If any)**:

- No alternative in case of failures with voice recognition, only option is to reset the assistant and re-train the voice model

- No facility of wired connectivity among the devices. (Only very specific devices with bluetooth are supported.)

1.3. **Intended Audience**

Our target audience is the youth who have grown up with technology and enjoy being surrounded by them, and also middle aged people who know the convenience of using smart devices or are ready to adapt to it. Although the product can be used by every individual and doesn't have any limitations based on age or group, it is completely based on an individual's acceptance to the concept of smart things.

1.4. **Define SMART Goals**:

For example

The goals for the smart home are as follows:

Specific (What)	Measurable (Up to)	Attainable (How)	Relevant (Why)	Time-bound (when)
*1. To improve the **usability** of the system by having a user- friendly application.*	*To see if users interact with the system in the intended way.*	*To test the system with the improved application.*	*To enable users easy access to set up and if necessary reboot the system.*	*To finish the task between Week 8-Week 9.*
*2. To improve the **productivity** of the system by adding a microphone.*	*To see if the microphone records sound.*	*To test if the microphone correctly records sound.*	*To record voices of users to be parsed to usable text.*	*To finish the task between Week 4-Week 5.*
*3. To improve the **efficiency** of the system by having a modular structure for connecting devices.*	*To be able to use modules.*	*To test if the modules work in the intended way.*	*To ease the use of the system and speed up the set up time.*	*To finish the task between Week 6-Week 7.*
*4. To improve the **security** of the system by recognizing familiar voices.*	*To check if familiar voices are recognized.*	*To test against different voices.*	*To make sure that only the intended user can issue voice commands.*	*To finish the task between Week 6-Week 7.*
*5. To improve the **security** of the system by using log-in for the application.*	*To see if a user can log-in.*	*To test log-in using real and fake users.*	*To protect the account and settings of the user from malicious parties.*	*To finish the task between Week 4-Week 5.*
*6. To improve the **security** of the system by adding a camera.*	*To see if the camera can capture images.*	*To test if the images are of good quality.*	*To be able to take pictures in case of unauthorized use of the system.*	*To finish the task between Week 4-Week 5.*

1.5. **Scope:**

- System boundaries (Software and hardware):
    - Software: Python language, Mobile application, Voice recognition software, Voice parsing software, Log-in, Database
    - Hardware: Raspberry Pi 4, Microphone, Camera, Power supply, Cable access to other devices
- Interfaces:
    - Internet via WiFi
- Limitations:
    - This project is completed within 10 weeks
    - This project can only access devices connected to it by cable in one home
    - This project can only control 15 devices at a time
    - This project uses basic voice recognition libraries

2. **Product features:**

2.1 **Functional requirements:**

1. The systems should be able to turn specific circuits on and off.
2. The system should be modular, so more devices can be added
3. The system should include an application for setup and reset purposes
4. The system should be manually accessible via securely logging in to an application using an admin account.
5. The system should have a microphone for voice recognition.
6. The system should have a camera that can take pictures.

2.2 **Nonfunctional requirements:**

1. The system (software) should not take more than 10 minutes to set up.
2. The system should recognize the home owner's voice.
3. The system should display a warning message to any unrecognized party attempting to use a voice command.

3. **Appropriate security controls**

The security requirements are as follows:

1. The system should be manually accessible via securely logging in to an application using an admin account.
2. The system should recognize the home owner's voice.
3. The system should display a warning message to any unrecognized party attempting to use a voice command.

We need voice recognition software, log-in, and a database to store this information. We need a microphone and camera to execute these functionalities. We need authentication software and password management software.

When setting up the system the owner has to make a password and add their voice to the system. These will both function as the authentication for the system. After the setup, it should not be possible to reset the system without the identification of the owner.

Next to that, if the system is used by someone unauthorized the camera should take a snapshot of this person and notify the owner of a possible security issue.

Security Policy				
Security Requirements	**Security mechanisms(List down for your application)**	**Remarks on why you considered these requirements**	**Supplement requirements for your application(user story/abuse story)**	**Risk identification/Threat Assessment(At least one risk identification/abuse case)**
Authentication	checking passwords	The admin can use an admin account to manage the application and system.	user story "as an admin , I want to setup and reset system by an application." Abuse story :"as an attacker , I can enter the default passwords to access the application"	The length of passwords is not very strong
	Speech Recognition	For granting access to multiple users and for users to have their individual profiles, we need to check speech.	User story :"As a user, I want to use my speech to control the system by microphone." Abuse story: "As an attacker, I can imitate speech to get access to control system"	if your voice has changed a bit, you cannot use this system by your voice.
Authorization	Access control role_based	The general users only control the system, Well the admin can manage the application	User story :"The system should be manually accessible via securely logging in to an application using an admin account." Abuse story: "general users change the set of application"	the admin forget his password
Audit	Protection of log files	To enhance the stability and security of the system, we need to protect log files.	User story :"As a user, I want the system to display a warning message to any unrecognized party attempting to use a voice command." Abuse Story :"As an attacker, I can try different speech to grant access to system"	the log file could be delete or modify by attackers

	Backup files	For restore system settings when the system occurs some problems	User story :"As an user, I want to restore the system fastly" Abuse story :" As an attacker, I want to plant some virus "	the backup files is incomplete
	software and database license	To protect users information	User story :" As an user, I want to protect my information."Abuse story :"As an attacker, I want to steal users information "	simple database is not enough safe

4. **Conclusion:**

The project is going to be a smart device, which will act as a switch for all connected devices in the circuit. The system will be modular and will act on voice commands depending on whose voice it is. An extra feature which will be added will be the camera system. Whenever a voice does not get recognized, we will send a snapshot to the email or app of the homeowner. There are going to be some obvious challenges with the project. First, we will have to make the voice recognition and speech recognition work on the smart system, after which we will have to program certain commands which can be acted upon by the system. The next challenge will be the security part, the system must only authorize certain people to act within the system. This means that we need to design the app and the raspberry pi with security in mind.

5. **Reference**: List the existing literature (documents/articles/blogs/research papers) references you have considered for finalizing the project idea.

- Sanjeev, A. (2018, 23 march). The best voice recognition software out of three we tested, and how to set it up on Raspberry Pi. maker. https://maker.pro/raspberry-pi/tutorial/the-best-voice-recognition-software-for-raspberry-pi
- Google Nest https://store.google.com/category/connected_home?hl=nl
- Amazon Alexa https://www.amazon.com/smart-home-devices/b?ie=UTF8&node=9818047011