

System Requirement Specification

GuessWho!

Face Recognition Game to aid Dementia Patients

Submitted to –
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Bookies

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1 Problem Statement

Dementia is a syndrome that causes deterioration in cognitive function exceeds the expectation from normal ageing and affect a person's daily life with a decline in memory or other thinking skills. It comes from a variety of illness and injuries that affect the brain (World Health Organization, 2016). It is a persistent problem with no known memory which mostly affects generations of elderly and their families. It causes the person to loss of memory, communication and language, ability to focus and pay attention, reasoning and judgement, and visual perception. There are currently 35.6 million victims with dementia globally, with 7.7 million new cases each year suggesting that there is a new case every four seconds (Alzheimer's Disease Association, 2012).

2 Overview

2.1 Background

Ageing population is a prevalent and unfortunate phenomenon that occurs in first-world countries including Singapore. Some forecasts estimate that by 2030, the elderly population (age 65 and above) in Singapore would triple to approximately 900,000 as the post-war baby boomer population would be approaching their silver years (Population SG, 2016). As the majority of dementia patients are the elderly, there is an urgent requirement to provide assistance for those who are diagnosed with the illness.

Older adults who received as few as 10 sessions of mental training not only improved their cognitive functioning in daily activities in subsequent months after the training, but continued to show long-lasting improvements after 10 years (Help Guide, April). This illustrates those activities that require communication, interaction, and organization, which include recognizing traits such as face and engaging in games that provide mental stimulation and improve mental capacity, contribute immensely to cognitive functioning for dementia patients, thus establishing mental stimulation as one of the 6 pillars of dementia prevention (Help Guide, April).

As an attempt to provide a meaningful platform for the elderly to train their cognitive abilities, Bookies has embarked on designing an interactive and user-centered application. It is hopeful that GuessWho! will aid in tackling the difficulties that dementia has brought about.

2.2 Overall Description

GuessWho! aims to improve the users' memory through a simple yet engaging game of Face Recognition. Following are the features included in the game to meet the objectives:

- › Develop an intuitive and user-friendly interface
- › Enable the caregiver to track the progress of a patient
- › Allow the patient to track his/her score and progress

The face recognition game requires the users to identify the face of the person appearing on their screen. The faces that appear on the screen will initially be taken from the user's personal collection. Eventually upon seeing improvement, the caregiver could allow the patient to proceed to the next difficulty level which has faces of famous personalities for the patient to recognize.

GuessWho! would be extended to allow the caretakers of the patients to keep track of the patient's condition through a progress-tracking feature. The application would tabulate the user's scores every week and present it in the form of easy-to-read graphs. The caretakers can then get a rough idea as to how the patients have been performing and use it as a tool to gauge the patient's condition - a rise or plateau indicates the patient's condition might be under control, or even showing signs of improvement, whereas a continual fall in the score would indicate deterioration in the condition. Based on the performance, different and specialized methods of treatment or therapy can be given to different patients.

3 Investigation & Analysis Methodology

3.1 System Investigation

As the application is novel and is not based on any previous work, the focus of system investigation shall be on what the new application is able to do, how it can be done, and what the users expect from the application.

3.2 Analysis Methodology

Analysis methodology will involve business analysis, requirement analysis, data analysis, process analysis, (web) and application architecture:

- › **Business analysis:** The budget requirement and sponsorship details are elaborated in the project proposal.
- › **Requirement analysis:** The elderly can access this application using smart phone devices that have internet connectivity.
- › **Data analysis:** Elderly can play the face match game and the names and faces are stored in the database. All custom components of the game are stored in the database. The scores obtained by the elderly is stored in the database for the purpose of making reports.
- › **Process analysis:** Data/process flow analysis, process decomposition and system interfaces
- › **Application architecture:** The application's user interface is made to be as intuitive as possible because it is aimed at the elderly who generally are not avid smartphone users. Devices with bigger displays are preferred, as the text font used is better and number of buttons on one screen is reduced to keep the design as simple as possible.

3.2.1 Feasibility Study and Requirements Elicitation

1. Gather a team of talented people with the knowledge of mobile game development and memory games for development and implementation.
2. Conduct interviews with elderlies, caretakers, friends and relatives of the elderlies. In order to, get a clear understand of their needs and behavior.
3. A Feasibility and Risk Assessment study will be conducted to select which solution(s) are/is the most appropriate based upon the outcome of the interviews.

Those interviews and feedbacks are critical in determining the current environment and future system requirements.

3.2.2 System Analysis and Requirements Specification

3.2.2.1 Perform an analysis of the problem using object-oriented techniques

A Unified Modelling Language (UML) to represent an external view of the game's model. It consist of the various levels and components, including the sending of reports the caretakers. System Requirement Specifications document is part of the project's documentation. The features consist of the following:

- › In the face matching game, the elderly will be able to interact with the game. They can do so by adding name and photos of their own family members, friends and other close ones.

Object-oriented Design using UML

UML will be used to graphically represent the documentation.

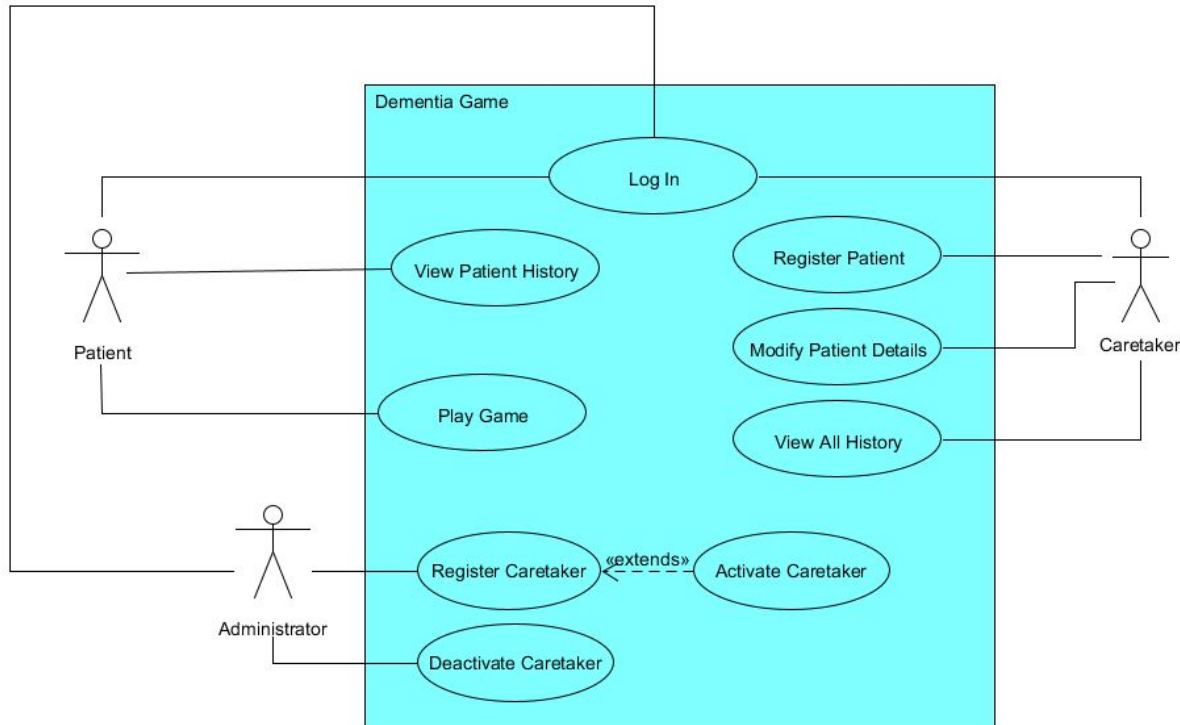


Figure 1: Use Case Model

3.2.3 Prototyping

Object Oriented Evolutionary Prototyping will be used to apply a more robust prototype for GuessWho! in a structured way. It will be constantly reviewed to ensure quality towards building the final game. The prototype will be fully functional but does not consist all the features that have been planned. The implementation team will be presented with the prototype. It can also be used for an interim/beta release before the released of the final system.

4 Constraints

4.1 Scalability

The application is being implemented based on the single responsibility principle such that each module or class within the application is only responsible for a single functionality. This allows low coupling between each module and therefore, increasing the flexibility of the application significantly.

Flexibility and modularity results in high scalability, allowing new functionalities to be added into the application with relative ease in the future. In addition, by grouping all system dependent code into the same module, it allows extension support to other platforms with ease, where only the system dependent code needs to be modified instead of the whole application's code.

4.2 Proprietary Hardware and Software

The proprietary hardware tools for the application includes standard Desktops for implementation and testing of the application. As the application is to be run on open-source software browsers such as Google Chrome, there will be no proprietary software tools involved in this project.

4.3 Project Schedule

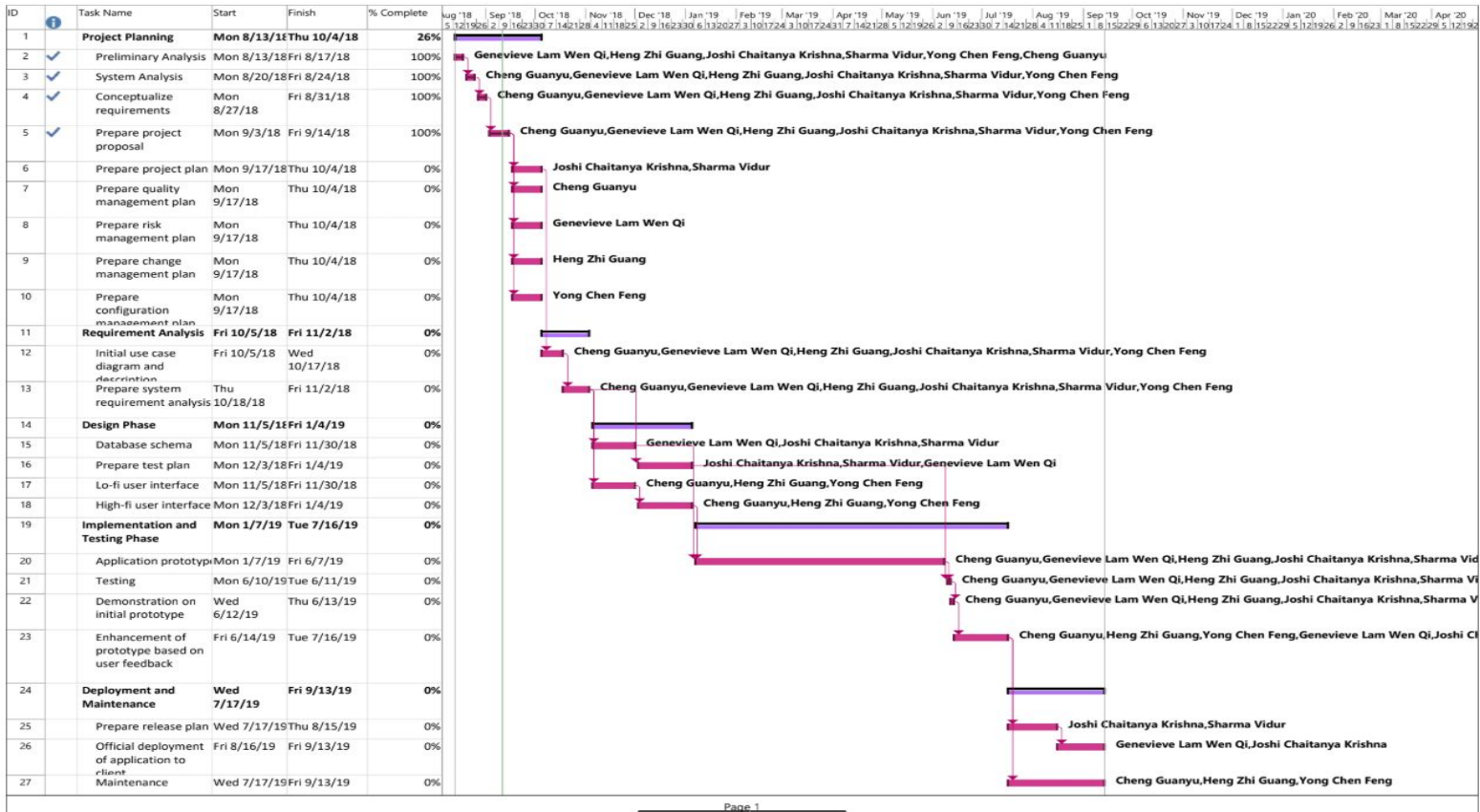
The project is scheduled and planned to be completed and deployed within one year. Prototypes will be launched before the final product is released to receive user feedback and testing results. The first prototype is scheduled to be released after 3 months, where it will include basic functionalities of the application to showcase the application's interface and demonstrate how the application will interact with the user.

The second prototype is scheduled to be released after 9 months, where all the functionalities are being implemented and tested. This prototype will be demonstrated to the client to gather user feedback for the subsequent 2 months.

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After the extensive testing and fixing of bugs, the project will then proceed to the deployment phase, which will start at the 11th month of the project, and end with full deployment and release of application at the end of the final 12th month.

Below is a simple gantt chart that illustrate the project schedule described.



5 Operational Requirements

5.1 Help Desk Support

System users have access to send an email through the application to contact the team for technical support with issues encountered in the system, such as application errors, software compatibility issues, or server downtime enquiries.

5.2 Application Services and Technical Support

Programmers and Application Developers have to send an email to the development team to access the source code of the application in the event of addressing bugs or system enhancements whenever necessary.

Both the Network Administrator as well as the Database Administrator support will also be required to maintain a 24/7 system uptime to ensure maximum availability of the system.

5.3 Administration Features

System security and different identity access levels will be incorporated into our system. An authorized System Administrator account can reset and modify both Caretaker and Patient account and have access to all the details in each and every account in the system. The System Administrator have the rights to remove, modify, or add features into the game.

On the other hand, a Caretaker account only have access to all the details of the Patient accounts that is tied to their account. Both the Patient and Caretaker account will be able to access and play the game within the System.

5.4 System Hardware Fail Over and Routine Backup

System is required to do a backup of all information and records of the game on a monthly basis to prevent the loss of data in the event of a system failure.

Backup will be scheduled by the development team on a fixed date of every month unless new features are being implemented into the system or a bug fixes is required.

5.5 Audit Trail

An audit trail will log every modification of action taken from each account in the System with a time-stamp. Modification of actions include changing of account profile, updating of records of

games played in an account, as well as implementation of features in game by System Administrator.

6 Functional Requirements

1. System must allow Users (Patients, Caretakers, and Administrator) to log in.
2. System must allow Patients to play game.
 - 2.1. System must provide a tutorial to Patients before the start of their first game.
 - 2.2. System must save the scores of Patients at the end of the game.
3. Patients may query the System for a history of scores of their played games.
4. Administrator may register Caretakers into the System.
 - 4.1. Administrator may deactivate Caretakers within the System.
 - 4.2. Administrator may activate Caretakers within the System.
5. Caretakers may register Patients within the System under their account.
 - 5.1. Caretakers may modify Patients' account information within the System.
 - 5.2. Caretakers may query the System to view all Patients' score history.

7 Non Functional Requirements

1. Usability:
 - 1.1. The system must be easy for the user to learn and use.
 - 1.1.1. The user must be able to learn how to use with minimal instructions.
 - 1.1.2. The user must be able to retain the knowledge of usage over time.
 - 1.2. The system must be appealing and consistent to the user.
 - 1.2.1. The GUI must be standardized in every section of the application.
 - 1.2.2. The layout and color must be simple and show minimal user interface.
 - 1.3. The system must provide accessibility features to the user.
 - 1.3.1. The system must have a font size of at least 18.
 - 1.3.2. The system must provide a magnifier tool for images.

2. Reliability:

2.1. The system must be able to perform CRUD operations accurately.

2.2. The system must ensure privacy and security.

2.2.1. The system must not reveal confidential information to any third party without consent or authorization.

2.3. The system must maintain 99.99% uptime.

3. Performance:

3.1. The system must fully load within 3 seconds.

3.2. The system must have a maximum response time of not more than 3 seconds.

3.3. The system must display feedback within 2 seconds from user input.

4. Maintainability:

4.1. The system must be able to make changes for future enhancement easily.

8 Input Requirements

The system must provide a default and complete database of paired images and names in order for the user to play by matching a randomly selected face images from the personal collection with a set of random names.

9 Process Requirements

The following are the processes that must be handled by GuessWho! application:

9.1 Database Transaction

The system must be able to send, receive, and trigger transactions to the database system through MongoDB.

9.2 Data Validation

The system must handle every data error posed by the back-end process. Data validation must ensure error-handling for every action done by the users.

9.3 Data integrity

The system shall store all information with accuracy and consistency, ensuring all data are recoverable and searchable. When a record is added or modified in the database, the changes must be cascaded to all relevant tables.

9.4 Performance

The system must resolve any issue related to concurrent use and internal/external locking. The process shall be fast and smooth during the gameplay, maintaining 99.99% uptime.

9.5 Data repository

The database system shall store all relevant information related to the users, game metrics, and personalized data in a main data repository.

9.6 Activity Diagram

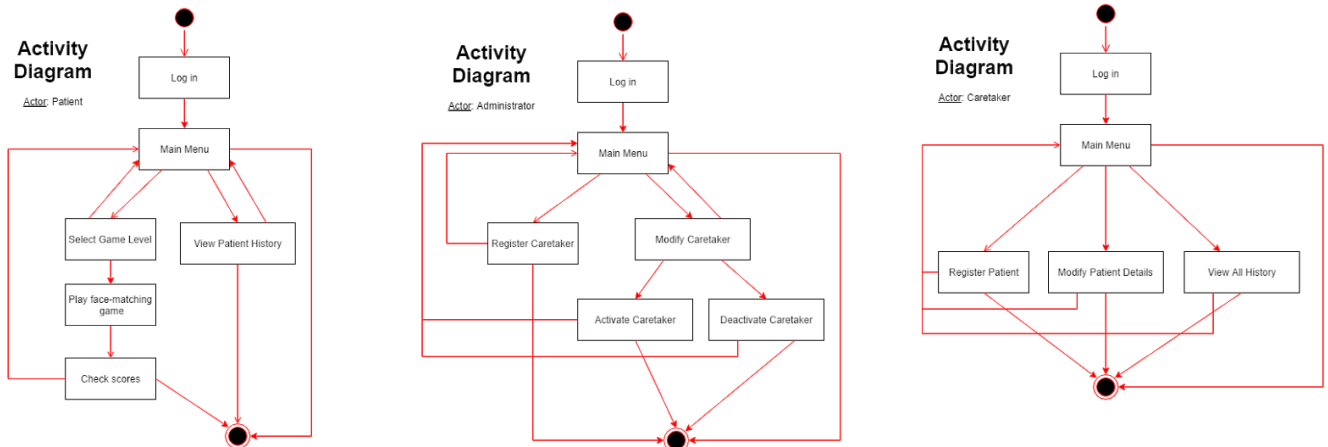


Figure 2: Activity Diagram

10 Output Requirements

The application will display the total score by the user after the game has completed. Correct answer of each question will be shown after two incorrect tries or when the user answered it correctly.

The application will also display user's score history. This data will be stored for future medical statistics.

11 Hardware Requirements

The application to be developed is a web based application designed for patients suffering from dementia that requires them to match faces to the correct names. As a result, all devices that are able to access the internet with a web browser that has Javascript enabled will be able to run this application. The hardware used must be connected to the internet before the application can be run.

11.1 Client Devices

The client can use any form of smart device to run GuessWho!. The minimum system requirements for GuessWho! are listed below.

For Computers:

	Minimum Requirements	Recommended Specification
Processor	Intel® Dual Core™	Intel® Core™ i5
Memory	2 GB RAM	
Internet	Broadband internet connection	
Resolution	1024 x 768 minimum display resolution	

For Smart Devices:

	Recommended Specification
Memory	512 MB RAM
Resolution	640 x 960 minimum display resolution

11.2 Device Capabilities

GuessWho! can be run on 2 types of devices in general: smart devices or computers. Smart devices running GuessWho! should have touch screen capabilities. Computers running GuessWho! should have a mouse cursor and a functioning speaker. To allow the clients to connect to the internet, network connectivity of the device should also be functioning.

11.3 Production Support Systems

One of the production support systems to be used for this project is the Uninterruptable Power Supply (UPS). As a key feature in computing, it acts as a contingent power source when the regular power source fails (“How UPS (Uninterruptible Power Supply) Systems Works”, n.d.). This way, data loss is averted and productivity is boosted as there is no fear of a possible power disruption. One of ways a UPS is implemented is through a Standby Power System (SPS).

(“How UPS (Uninterruptible Power Supply) Systems Works”, n.d.). Unstable electrical current can prove detrimental to the system, as noise and power surges can occur (“Common issues with power supply”, n.d.). By connecting the SPS to the server, the power line is constantly being observed. Once a problem is discovered, the SPS will switch to battery power. This way, the website hosting server can be online at all times and users will be able to access it without any interruption.

Another production support system to be used for this project is the use of cloud computing. Making use of the cloud to store our data will bring many advantages such as cost efficiency and not having to worry about the lack of storage. The cloud is also reliable as host applications can be transferred to other available servers in the event that a server fails. Caretakers will be able to access the results from the gamplays of the dementia patients on the cloud anywhere without having to physically carry around hard drives as long as an internet connection is available. As a result, the convenience brought about from this removes any geographic barriers preventing caretaker access to information.

Finally, one other production support system to be used in this project is to have different servers located at different geographical locations. It is imperative that the GuessWho! website has a fast loading time. From a user’s perspective, most would not come back to a website if they had a bad experience with it. This underscores the need to host the website on servers that are located in locations that are near to where the target audience will be using the website.

12 Software Requirements

12.1 Client Operating System

For Computers:

	Minimum Requirements	Recommended Specification
Operating System	Windows®7/Vista/XP / Mac OS X 10.6.6 or higher	Windows®7/ Windows®8/ Windows®10 64-bit / Mac OS X 10.10 or higher

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For Smartphones:

	Recommended Specification
Operating System	iOS 8 or higher/ Android 4.1 or higher

12.2 Client Application

The application must be run on a web browser that supports Javascript.

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