System Requirement Specifications (SRS)

Ang Zhan Phung
Ang Yong Xin
Brenda Ng Xin En
Emmanuelle Vania
Sam Jian Shen
How Mo Xuan
CoronaSG
Computer Science Department, Nanyang Technological University

1 Table of Contents

2 Problem Statement

Dementia is not a part of normal aging. It is a condition that causes progressive intellectual decline leading to increasing difficulties in coping with everyday activities. This condition affects the brain, causing the brain cells to die at a faster rate than normal. There is currently no definitive test for diagnosing dementia, findings from a variety of sources and test must be pooled before a diagnosis can be made. [1]

Trail Making Test (TMT) is a neuropsychological test which was originally used for assessing general intelligence. The Trail Making Test performance metrics have clinical utility in diagnostic classification of cognitively healthy older adults and patients with dementia.

As the performance of individual doing the test may vary due to age and other factors. We believe that the idea of individual assessment should be improved. Furthermore, this platform should be online for ease of access and view individual track record easily.

With the widespread of Machine Learning and big data, these data gathered could increase the accuracy of predicting dementia.

3 Overview

3.1 Background

With the growing concern of ageing population in Singapore. One in 10 people aged 60 and above may have dementia, according to a study by Well-being of Singapore Elderly (WiSE). Families are unprepared when their loved ones are diagnosis with dementia. There is evidence that medications for dementia may be more beneficial if given early in the disease process. Even though the medication is not a cure, early diagnosis allows prompt access to medication and medical attention.

With the consideration in mind, LarkDetect is an online platform for age 40 and above where they will be needed to do the test annually. This will enable records to be stored and analyzed for individual assessment.

LarkDetect will be designed with the consideration of integrating with HealthHub (Singapore Health Platform). This way even if the elderly is not tech savvy or forget their annually test, their family member will be aware and ensure they are able to get their test done.

3.2 Overall Description

This document proposes a comprehensive solution to the mentioned problem LarkDetect, an online trail making test that users need to complete once a year. LarkDetect will be available in the web to cater for individuals who are unable to visit a clinic to undergo the test.

The key features provided by the web platform are as follows:

There are two parts to the test. User will be prompted to complete the test in the following order:

(1) Cognitive Processing Speed (Test 1):
   a. The user is required to connect a set of 25 dots as quickly as possible while simultaneously maintaining accuracy.
   b. Each test is given a session period of 3mins for age 40 (increase of 30 sec every 10 years onwards)

(2) Executive Functioning Test (Test 2):

    c. Alternate between number and letters (1-A, 2-B, ... L)
    d. Each test is given a session period of 3mins for age 40 (increase of 30 sec every 10 years)

(3) View Report
    e. Individual Time Taken
    f. Individual Error rate
    g. Average time taken and error rate to determine the user health risk
    h. User information

4 Investigation & Analysis Methodology

4.1 System Investigation

The LarkDetect system is based on the idea of reaction time and thinking time. For the first time user of LarkDetect, the user will require to register with their Name, NRIC, date of birth, and password. The login ID will be based on the uniquely NRIC numbers where the results of the user's test will be stored in the SQL database.

Using the NRIC where we will know the age of the user from their date of birth, it would allow the database to generate the reports based on their age to deem if they are at risk of dementia. Users and doctors will have access to their test reports and history of previous years.

4.2 Analysis Methodology

4.2.1 Feasibility study and requirements elicitation

To understand the requirements of the system in terms of the system, a development and implementation team will be formed by recruiting members who are proficient in their own fields, i.e. HTML for the front end, SQL for the back end, to ensure the development of the system will go efficiently. Regular meeting between the teams responsible for different part of the system will be done in order to synchronize and update the other teams about the progress on their components, and to ensure that any irregularities between the interface and frameworks will be resolved at the earliest time possible.

Interview with the teams and the general public will be required to further understand on the feasibility and requirements of the system as a whole, to ensure that any concerns and issues will be resolved before any development is started, ensuring that only useful work is done to prevent any delays to the project and system development. A Feasibility and Risk Assessment study will be conducted to determine which solutions are most appropriate based on the results on the interview.

4.2.2 System analysis and requirements specification

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

Once the requirements have been properly elicited, an external view of the enterprise model will be formed via Unified Modeling Language (UML), and some of the desired features of the new system includes:

- ➢ The ability to view reports

- ➢ Able to store records in the database

- ➢ Evaluate the risk of dementia

- ➢ Doctors to be able to view records of users through the database

4.2.2 Object-oriented design using UML

A detailed object-oriented design for the LarkDetect System will be developed. UML will be used again for the graphical representation and documentation of the design. The system will concern itself with the login, reporting and management of new incidents and the feature to alert users upon entering an area of high risk. In addition, public users can apply as eyewitness, while the police department can view and manage all applications to be eyewitness. The system will be secured with the user's NRIC and password.
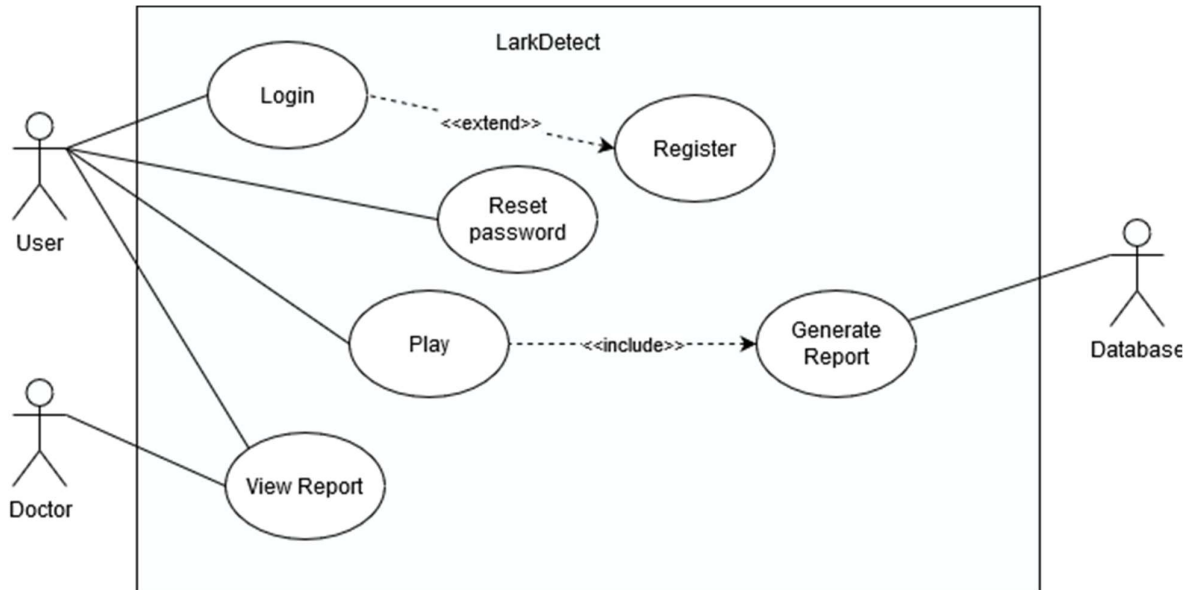
4.2.3 Prototyping

The Object-Oriented Rapid Prototyping (OORP) method will be used to implement a functional prototype for the LarkDetect system. The prototype will be a working example of part of the system for demonstration and proof of concept purposes only. The prototype will be presented to the implementation team.

5 Constraints

5.1 Scalability

The LarkDetect scalability will depend on how well the SQL could handle.

5.2 Data and Function Mapping

The login function will call out the database to match the user information and history.

5.3 Proprietary hardware and software

LarkDetect would require linkage with HealthHub and Singpass for family members to remind or login on behalf.

5.4 Batch updates vs (close) Real-time updates

LarkDetect will update the database at the end of every test.

5.3 Project Schedule

There is a one-year timeframe to implement a production system of the LarkDetect system from project commencement in time for its launch date at the start of year 2021.

6 Operational Requirements

6.1 Help Desk Support

LarkDetect will provide 12x7 guidance from various channels such as telephone assistance, website and email to troubleshoot and answer any technical questions such as slow system response time, incompatible browser features, system downtime inquiries etc.

6.2 Application Services and Technical support

Software engineers and developers of LarkDetect will have access to the source code. Network and Database Administrator support is likewise required to keep a 24x7 system uptime.

6.3 Administration Features

LarkDetect implements different types of layers in system security and system access. Each public user does not have rights to view other public user's personal information such as name and test results. Only authorized system administrator and doctors has the access to all public users' personal information.

7 Functional Requirements

The following functional requirements will specify on the list of functions, where the inputs, behaviors and output will be defined. The requirements will be separated into 2 test cases, and a report will be generated for the doctors to analyze.

7.1 Play

The web platform main aims to target the citizens as users, allowing them to access and interact with the application and receive updated incidents and crimes, or report any crimes which they witness on the go.

7.1.1 Cognitive Processing Speed (Test 1)

7.1.1.1   The user must complete the test within time limit.

7.1.1.1.1   If the user exceeds the time limit, the user fails the test.

7.1.1.1.1.1   The system must logout the user once exceeds time limit.

7.1.1.1.3   An additional of 30 seconds is added to the time limit for every 10 years of age, starting from age 40 (I.e. 40 years old – 3mins, 50 years old – 3.5mins, ...).

7.1.1.2   The system must generate the dots randomly from 1-25 to be displayed on the screen.
7.1.2.1.   The system must track the movement of the mouse/pen.

7.1.2 Executive Functioning Test (Test 2)

7.1.2.2.   The system must generate the dots randomly from 1-13 and A-L to be displayed on the screen.
7.1.2.3.   The user tasked to join dots starting in the manner of A-1, B-2, C-3... and end at number 13.
7.1.2.4.   The system must track the movement of the mouse/pen.

7.1.2.5.   The user must complete the test within 3 minutes.
7.1.2.4.1   If the test duration exceeds 3 minutes, the user fails the test.

7.1.3 Generate Report

7.1.3.1.   The system must generate a report that include test completion time.
7.1.3.2.   The system must generate a report that include error rate.
7.1.3.3.   The system must generate a report that include the average statistics.
7.1.3.4.   The system must generate a report that include user's personal information.

7.2 Login

7.2.1. The user must login with their NRIC and password as per registration.
7.2.2. The system must verify the account.
        7.2.2.1 The system must check for valid NRIC.
        7.2.2.2 The system must check for valid password.
7.2.3   The user can reset their password upon successful login of their account.
        7.2.3.1 The system must verify existing password.
        7.2.3.2 The system must update the database with the new password.

7.3 Register

7.3.1. The system must check if the user's NRIC has an existing account.

7.3.1.1. If the NRIC has an existing account, the system must display a message to inform the user that an account exists.7.3.2.

    .

8 Non-Functional Requirements

8.1 Performance Requirements

8.1.1. Report should be generated within 5 seconds upon finishing the second test.

8.2 Security Requirements

8.2.1. LarkDetect must protect against unauthorized access by requesting login information and user authentication.

8.2.2. LarkDetect must provide additional blockage to some part of its application based on the user type.

8.2.3. Each user will be identified by the system by their Identification number.

8.3 Software Quality Attributes

8.3.1. Availability

    8.3.1.1. LarkDetect must be available 99% of the time.

8.3.2. Correctness

    8.3.2.1. LarkDetect UI must be clear and clean enough for users to understand each of the component function.

    8.3.2.2. LarkDetect must be able to handle errors made by the user.

    8.3.2.3. LarkDetect must be able to prompt and alert the users to any errors occurred

8.3.3. Efficiency

    8.3.3.1. LarkDetect webpage must be able to load within 5 seconds.

8.3.4. Integrity

    8.3.4.1. The system shall request and verify id and password at login page to ensure authenticity of the user.

8.3.5. Portability

    8.3.5.1. The LarkDetect web application must be available on multiple web browsers such as Firefox, Safari and Google Chrome.

8.3.6. Reliability

    8.3.6.1. LarkDetect must have proper data management.

        8.3.6.1.1. LarkDetect must retrieve data correctly.

        8.3.6.1.2. LarkDetect must store data correctly.

8.3.6.1.3. Error checking must be done by the system.

8.3.6.1.4. Exception handling must be done by the system.

8.3.7. Usability

8.3.8.1. The system interface shall use English as its main language.

9 Input Requirements

9.1 Login & Personal Identification

Each user is required to create an account with their NRIC in order to take the Trail Making Test. Detailed personal information are essentials in order to retrieve age to know the duration of the test.

10 Process Requirements

The following are among the inherent requirements that the LarkDetect application must be able to handle.

10.1 Database transaction

The system must be able to send, receive and update transactions to the LarkDetect database system.

10.2 Data integrity

Transactions that are completed should be committed to the LarkDetect database, whereas transactions that are unfinished or have timed out must be rolled back and they must not be updated to the database.

10.3 Data validation

Data error from the user's end and from the back-end database-processing end must be gracefully handled. The LarkDetect system will perform error checking and data validation to ensure that there will be no error.

10.4 Performance

LarkDetect must perform efficient querying such that it is able to handle concurrent use of the system on a 24x7 basis. The application must send, receive and display user messages to ensure good overall user experience.

10.5 Data repository

LarkDetect will maintain the same database as the main repository of data.

11 Output Requirements

11.1 Test Results

After each test, a test report will be generated. It will display the personal information of the patient and whether or not he/she is at risk of dementia.

11.2 Test Report

This test report will be viewed by the patient and doctors. This report must include all pass history of the patient for the doctor diagnostic.

12 Hardware Requirements

12.1 Network

The user must have an Ethernet or Wifi connection.

12.2 Client Computers

Computers with:
- x86 or AMD64 processors launched in 2009 or later.
- At least 1GB of RAM.
- Screen resolution of 1280x720 or greater.

12.3 Production support systems

Web server computers with a 24/7 internet connection, built-in hardware RAID controllers and UPS.

13 Software Requirements

13.1 Web Page
13.1.1 Operating systems
Client computers must have at least one of the following OS installed:

- A Linux-based OS with kernel version 2.6.20 or newer and a GUI system such as Ubuntu 10.04 or newer, centOS 5.6 or newer, Debian 6.0 or newer.
- Microsoft Windows 7 or newer.
- Apple macOS 10.10 or newer.

13.1.2 Applications

Client computers must have at least one of the following browsers installed:

- Apple Safari 8 or newer.
- Microsoft Internet Explorer 10 or newer.
- Microsoft Edge
- Mozilla Firefox 34 or newer.
- Chromium-based browsers with Chromium version 40 or newer such as Google Chrome, Opera, Vivadi.

13.2 Common requirements

13.2.1 Network system

Network software and protocols in order for systems to communicate:
- TCP/IP
- HTTPS

13.4.2 Licenses

Valid licenses are required to run software from third-party vendors:
- To use application development tools.
- To use web server, application server and database software in development, test and production mode.

14 Deployment Requirements