Faculty of Engineering and Applied Science

ENGR 4940U Capstone Systems Design for ECSE I

Design and Development of a Virtual Reality System to support Reminiscence Therapy for Patients with Dementia

R1: Project Identification, Research and Requirements Specification

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1. Problem Identification

The scope of this project is to design and implement a reminiscence therapy [2][3] system, addressing two needs of Ontario Shores Centre for Mental Health Sciences. The first need is a reminiscence system for general spaces, this will be used to create an atmosphere and make patients feel they are in a specific setting, for example a restaurant or an office. This will be achieved using a projector in a common space the patients gather in.

The second need is for personal reminiscence therapy for each patient, this includes personal photos, videos, audio files, and music[4]. This will be shown to patients using a portable system which can be taken to patient rooms or used in a dedicated therapy room.

2. Background and Research Review

Reminiscence Therapy today for the most part makes use of physical media. Photo albums and physical media players may be effective for patients suffering from dementia, however the question can be asked: Will a more immersive approach to reminiscence therapy be beneficial to patients suffering from moderate to severe dementia?

Digitizing of reminiscence media has begun on a small scale using portable devices such as iPads and TVs, however the devices requires constant interaction and manual operation. Patients suffering from moderate to severe dementia are prone to agitation and may not be comfortable having to constantly interact with a reminiscence system.

3. Design Process

The design process chosen for capstone project is the agile method [1], as shown in Figure 3.1.

Agile development is a great method for collaborative design. This model fits our project needs as Ontario Shores was unsure in their requirements and use cases. In the early meetings with Sheri, the project representative from Ontario Shores, we worked with her for gathering requirements as the technology and ideas are very new to the facility. This works with our

agile development process as it allowed us to design, develop, and test numerous scenarios for our project. On a conference call with multiple stakeholders we did a virtual deployment of our project where the stakeholders gave us their feedback on aspects of the project where they felt were good and bad. From there we then further refined our requirements and are back at the design and develop phase.

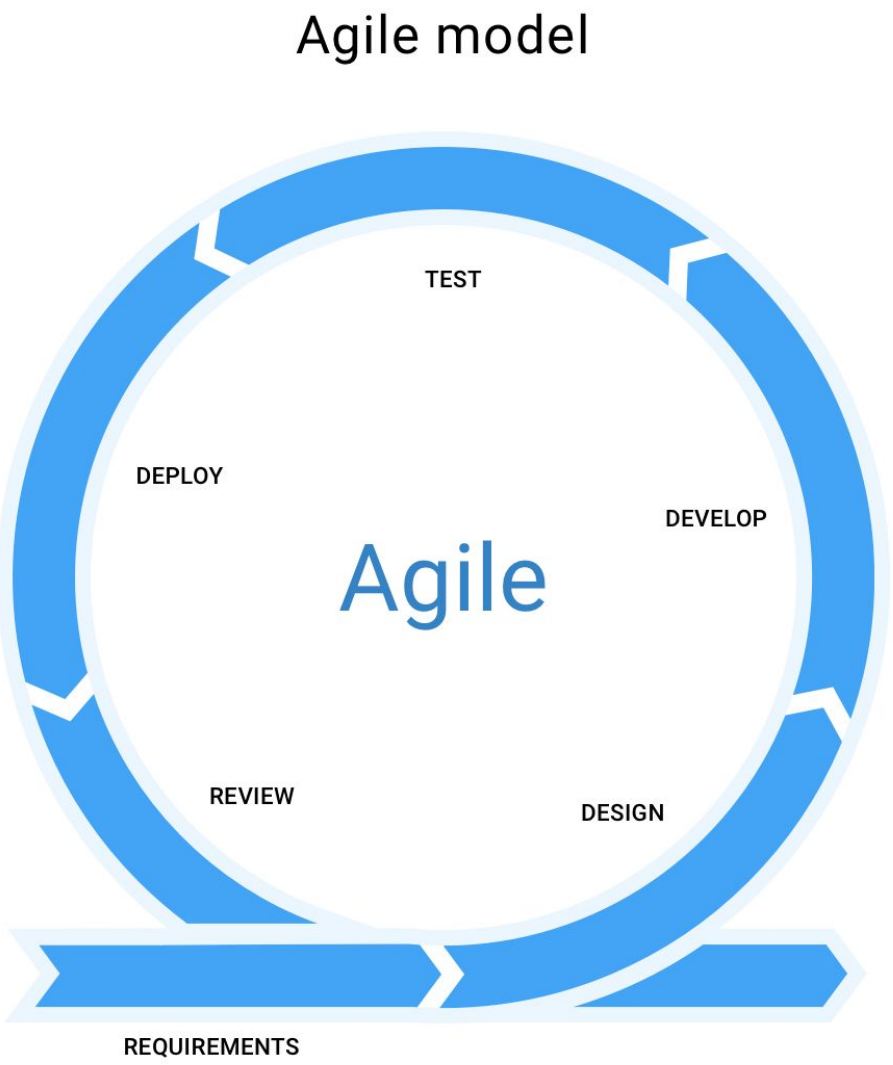


Figure 3.1: Stages of agile development (Illustration by NATALIIA PETERHERIA, ProductTribe)

4. Scenarios and Use Cases

Figure 4.1: Use case of general profile being displayed

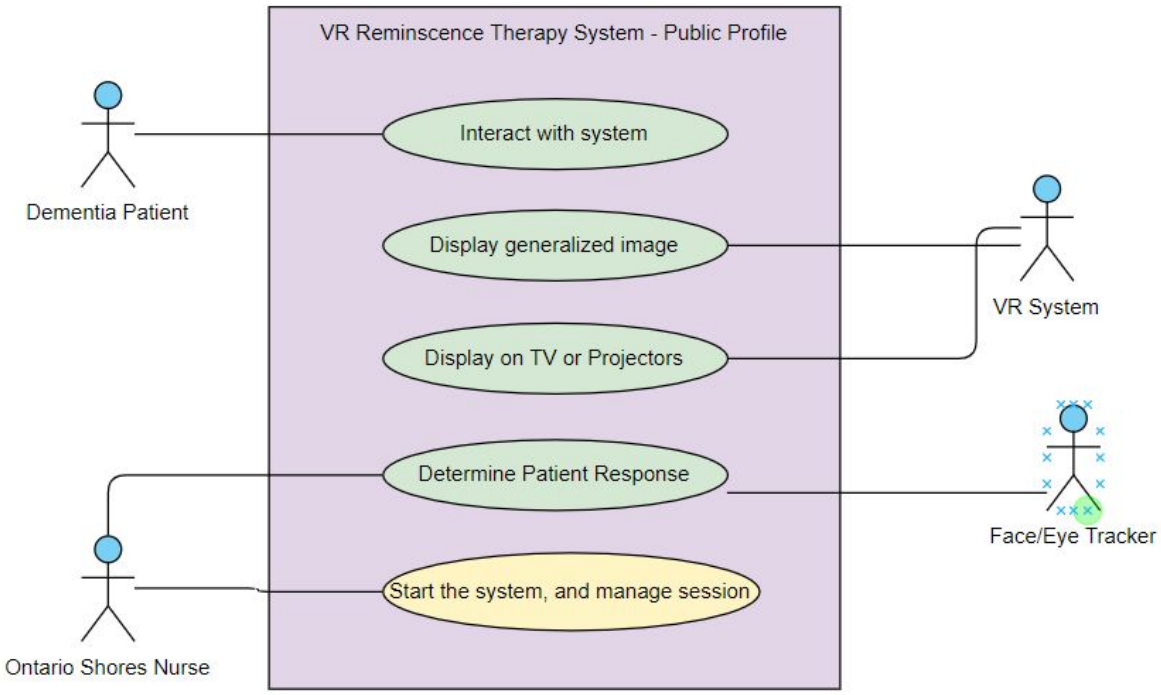
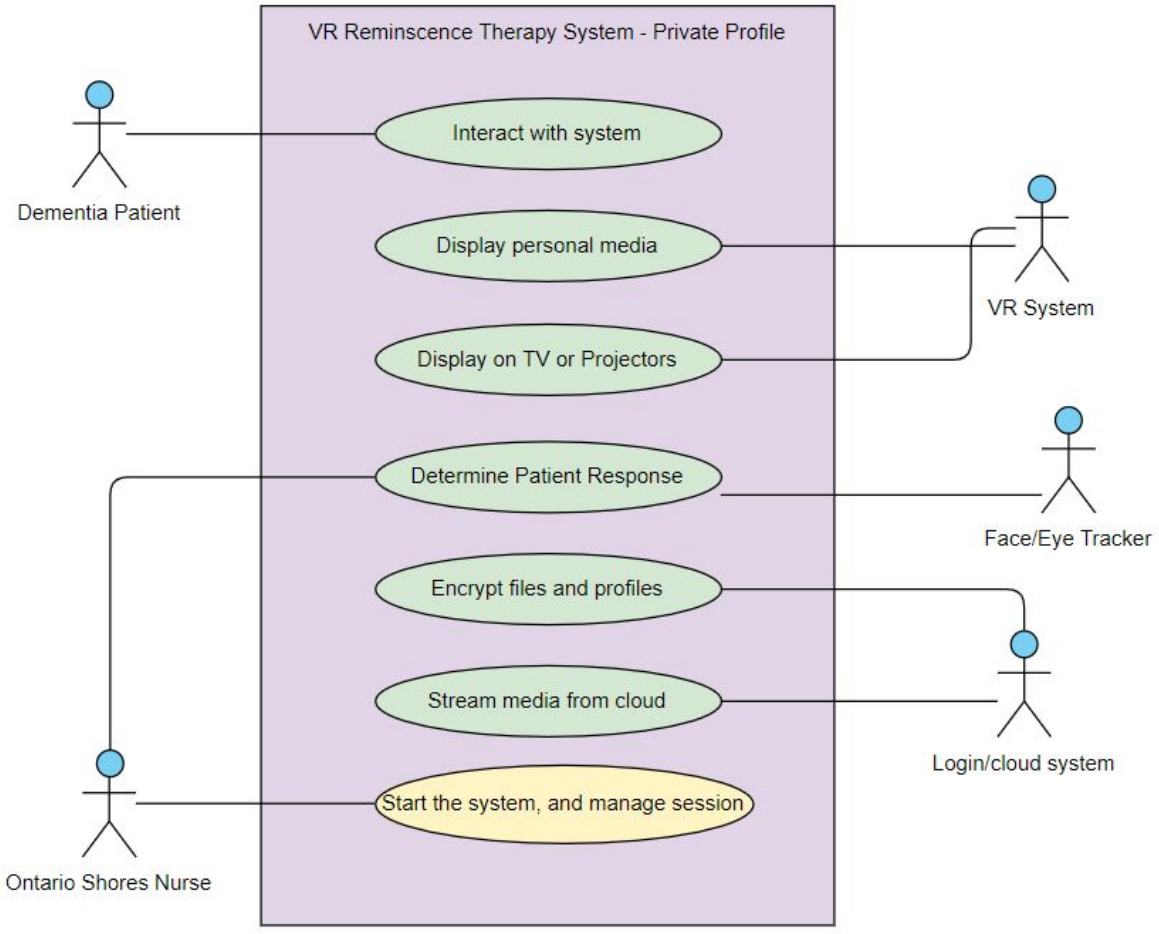


Figure 4.2: Use case of Private profile being displayed



5. Stakeholder Requirements and Traceability Matrix

This capstone project includes many stakeholders. The following tables show the different types of stakeholders, the role each stakeholder play, and the needs and requirements of each stakeholder. To note, facilitating stakeholders are the capstone project group members, including the faculty advisor.

Table 5.1: Needs and Requirements of Stakeholders

Stakeholder List	Stakeholder Role	Stakeholder Needs and Requirements
Dementia Patients	· Test and use VR system for therapy	· Most patients cannot wear VR hardware · Cannot have system last more than 15 minutes
Patient Caregivers	· Supplement Therapy by being a good support group · Provide answers to therapy questions	· Needs to have privacy/information protected

Ontario Shores Center for Mental Health Science	· Main contact between patients and facilitating stakeholders · Test effectiveness of Capstone Project	· Immersive experience using projectors, TVs, VR hardware · Public Profile to be used in public setting · Private profile used for individual therapy sessions · Facial and/or Eye tracking to determine response from patients
Investors	· Provide funds for the project · Set return on investment and profitability	· Market-ready, profitable and return on investment with minimal risk · Well understood and manageable risk for revenues and lifetime · Maintain reputation to ensure future market share as investor · Get good press
University Faculty and Staff	· Review how capstone project could impact university	· Get good press · Integrate project with other faculties to have a cross-disciplinary project

Health and Safety Regulators	· Reviews project for health or safety impact · Grants authorization and approves project for avoiding health and safety impacts · Prosecutes for violation of health and safety laws	· Regulatory requirements are met for health and safety impact
Environmental Regulators	· Reviews project for environmental impact · Grants authorization and approves project for avoiding environmental impacts · Prosecutes violation of environmental laws	· Regulatory requirements are met for environmental impact
Other Regulators	· Reviews project for compliance with other regulations (e.g., working conditions)	· Other regulatory requirements are met
Economic Development Agencies and Policymakers	· Facilitate VR System project Development	· Positive societal impact in their area, such as tax revenue, jobs generation · Acceptable environmental impacts
General Public and Society	· Lobbies for or against the Capstone project	· Positive impact for society

		· Acceptable environmental impacts

As shown in the above table, 10 different groups of stakeholders have been identified, and each stakeholder role and requirements were identified.

6. Definition of Acceptance Tests

There will be a number of different acceptance tests that will eventually be refined and executed to demonstrate that the product has met the requirements.

1) Add different profiles for each patient
2) Each profile has to be secure and safe
3) Administrative privileges should only be given to select people
4) Generalized media will play when in group setting
5) Personalized media will play when alone
6) Eye tracking to monitor patient responsiveness
7) Multiple user login

7. Project Plan

The project will be split between two semesters. Requirements gathering and initial prototype will be done during the first semester. Meanwhile the final product deployment will be done in the second semester. Detailed plan included below.

Table 7.1 Project schedule

Task	Start date	(Tentative) Finish date
Progress Report 1	2019-09-15	2019-10-24
Project topic	2019-09-15	2019-09-20
Background research	2019-09-21	2019-09-27
Stakeholders requirement	2019-15-09	2019-10-11
Planning	2019-10-06	2019-10-19
Finalize report	2019-10-17	2019-10-24
Progress Report 2	2019-10-25	2019-11-14
Finalize budget	2019-11-07	2019-11-08
Developing Prototype	2019-10-12	2019-11-29
Design	2020-01-10	2020-02-01
Develop	2020-01-15	2020-02-15
Testing	2020-02-01	2020-02-19
Touch ups and finalization	2020-02-19	2020-03-21
Capstone Presentation	TBD	2020-04-10

8. Contribution Matrix

The list of tasks and contributors are shown in Table 8.1.

Table 8.1: Contribution matrix

	People			
Task	Abdurrahman Ansari	Mohammed Hameeduddin	Dhanushga Lionel	Mingwei Zhang
Requirement Gathering	25%	25%	25%	25%
Creating Scenarios	25%	25%	25%	25%

Writing use Cases	25%	25%	25%	25%
Report 1	25%	25%	25%	25%

References

List of references should be formatted using one of the referencing styles: APA or MLA or **IEEE**. All references should be cited within the report.

[1] Peterheria, N. (2019, September 7). Make Your Startup Work With Agile SDLC Model. Retrieved October 24, 2019, from https://producttribe.com/project-management/agile-sdlc-guide.

[2] Woods, B., Spector, A., Jones, C., Orrell, M., & Davies, S. (2005, April 18). Reminiscence therapy for dementia. Retrieved October 24, 2019, from https://www.ncbi.nlm.nih.gov/pubmed/15846613.

[3] Woods, B. (2018, March 1). Reminiscence therapy for dementia. Retrieved October 24, 2019, from https://www.cochrane.org/CD001120/DEMENTIA_reminiscence-therapy-dementia.

[4] Klever, S. (2013, April). Reminiscence therapy: Finding meaning in memories : Nursing2019. Retrieved October 24, 2019, from https://journals.lww.com/nursing/FullText/2013/04000/Reminiscence_therapy__Finding_meaning_in_memories.11.aspx.

[5] Li, M., Lyu, J.-H., Zhang, Y., Gao, M.-L., Li, W.-J., & Ma, X. (2017, December). The clinical efficacy of reminiscence therapy in patients with mild-to-moderate Alzheimer disease: Study protocol for a randomized parallel-design controlled trial. Retrieved October 24, 2019, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5758240/.