

ELEC4010I Assignment1

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1. INTRODUCTION

1.1. Purpose

The purpose of our project is to build an interactive system for diagnosis of Alzheimer's disease. The diagnosis is made by asking the users a set of standard check problems and analyzing the response from users. This document will serve as a guide to those who are responsible for the engineering of the project.

1.2. Scope

This document contains a complete description of the functionality of the project. It includes platform, functional and non-functional requirements that together form a complete description of the software.

1.3. Definitions, Acronyms, and Abbreviations

Alzheimer's disease (AD), also known as just Alzheimer's, is a chronic neurodegenerative disease that usually starts slowly and gets worse over time.[1][2] It is the cause of 60% to 70% of cases of dementia.[1][2] The most common early symptom is difficulty in remembering recent events (short-term memory loss).[1] As the disease advances, symptoms can include problems with language, disorientation (including easily getting lost), mood swings, loss of motivation, not managing self care, and behavioral issues.[1][2] As a person's condition declines, they often withdraw from family and society.[1] Gradually, bodily functions are lost, ultimately leading to death.[3] Although the speed of progression can vary, the average life expectancy following diagnosis is three to nine years.[4][5]

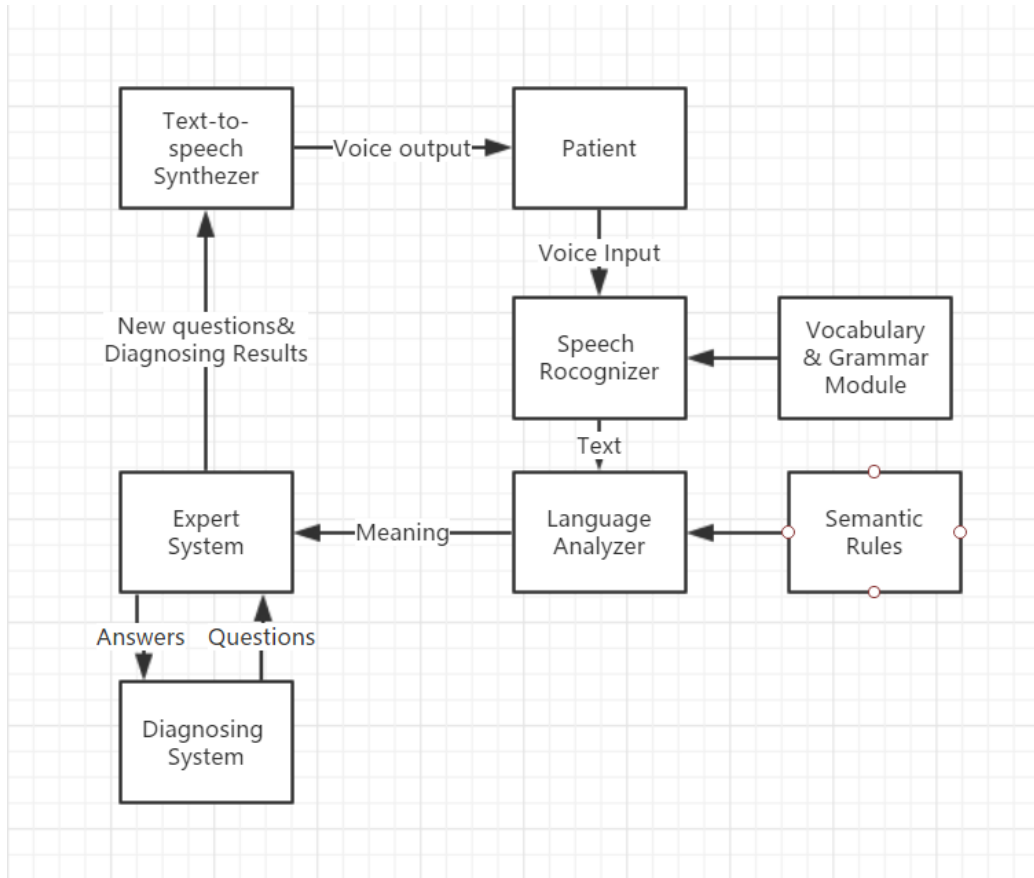


Figure 1: System Overview

1.4. System Overview

The system will be able to detect the Alzheimer's disease through dialog with its user and give out some useful advise. The system consists of a speech recognition module, a dialog system framework and a TTS module.

The system block diagram is shown in Figure 1.

1.5. Product Prospective

There is not such a product like ours exist in the market yet. Currently most tests for Alzheimer are based on a tedious writing examination where potential patients have to write down answers for a bunch of problems including drawing and logic testing. Although this approach to some extend successfully distinguished some Alzheimer patients, more often is the case

that such kind of tests are too tedious and troublesome for some elderly who have limited vocabulary or might not even be able to write. Also, it might be inconvenient for elder people to go to the test center or clinic for such a test. With our product, no more writing is necessary. Potential Alzheimer patients can now simply take the test through chatting with a robot on a mobile phone or a PC and receive real-time feedback as well as suggestions right after an interactive talk.

1.6. References

- [1] Burns A, Iliffe S (5 February 2009). "Alzheimer's disease". The BMJ. 338: b158.
- [2] "Dementia Fact sheet N362". World Health Organization. March 2015. Archived from the original on 18 March 2015. Retrieved 13 January 2016.
- [3] "About Alzheimer's Disease: Symptoms". National Institute on Aging. Retrieved 28 December 2011.
- [4] Querfurth HW, LaFerla FM (28 January 2010). "Alzheimer's disease". The New England Journal of Medicine. 362 (4): 329-34.
- [5] Todd S, Barr S, Roberts M, Passmore AP (November 2013). "Survival in dementia and predictors of mortality: a review". International Journal of Geriatric Psychiatry. 28 (11): 1109-24.

2. PLATFORM REQUIREMENTS

2.1. Hardware Requirements

This smart speech recognition Alzheimer detector is expected to run on PC server.

2.2. Software Requirements

API Used: Speech recognition, entire dialog system framework and TTS(text to speech). Programming Language: C++, Python/MATLAB Libraries and Dependencies: api.ai

2.3. User and API Interfaces

The system will include a GUI to interact with the end users. A cartoon image of a doctor will appear on the screen and ask the standard questions. The facial expression of the doctor will change during the process of the system.

3. SOFTWARE REQUIREMENTS

3.1. Functional Requirements

ID: 01 Name: Alzheimer's disease diagnosis Summary: The system should be able to successfully detect whether the user has Alzheimer's disease or not. Rationale: In order for a user to judge his health condition. Description: A user will asked a series of questions from a standard Alzheimer's disease test. The result will be based on the responds from the user. References: none

ID: 02 Name: Suggestion Summary: The system will be able to give some tips on the recovery or caring of the patients Rationale: In order to improve the quality of the users' life. Description: Depending on the result and seriousness of the disease drawn from 01, the system will be able to give out some useful tips for the patients. References: 01

3.2. Non-Functional Requirements

- **Efficiency and performance:** The system is expected to make a diagnosis within a few seconds after the conversation is end.
- **Portability:** The system will be implemented in an online server when it is fully developed. This will enhance its accessibility for users and thus make it portable with mobile terminals.
- **Integrity:** All the data of the user will be kept confidential to protect the privacy of the users.
- **Reliability/Robustness:** The system will post exception once it cannot match user's answer to a specific designed pattern and ask the user to repeat.
- **Scalability:** The system can be expended through online server without extra hardware device.
- **Usability:** The diagnosis is conducted through normal conversation and it is user friendly and simple to use.