ELEC4010i Assignment2

CUI Zhiwei, LIU Yuchen, HU Litao, MAO Zhiyuan

Hong Kong University of Science and Technology

1. CALL FLOW DESIGN

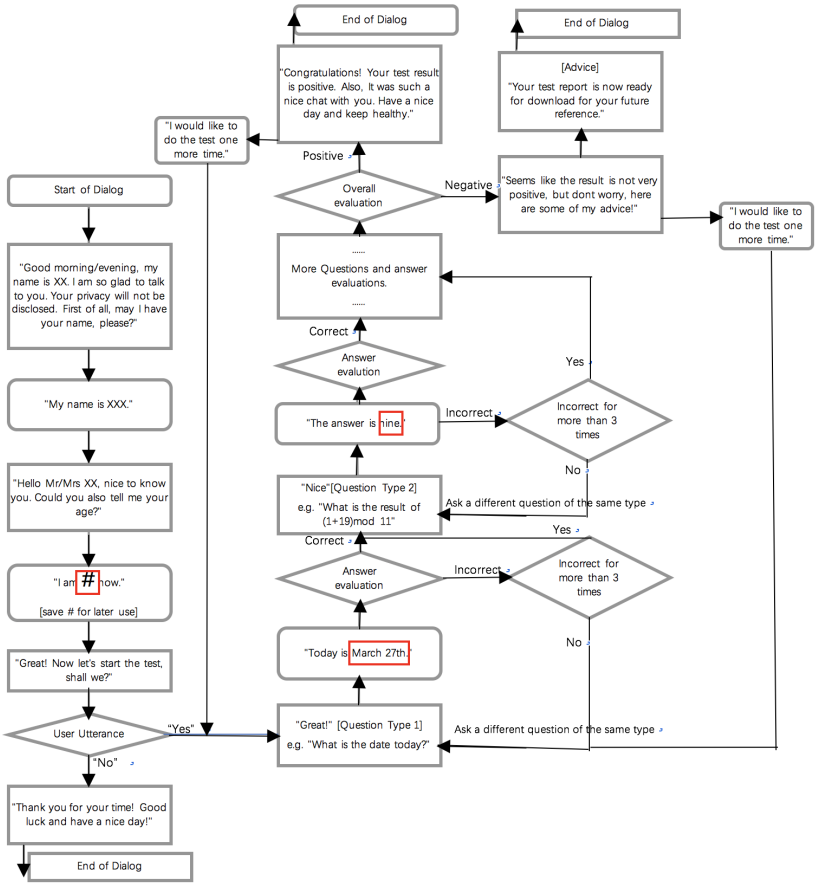

Figure 1: Call Flow

This is a user-initiate system where users need to click a start button to start the test.

As shown in Figure 1, before the test, our system will double check whether the user wants to start right now. If the answer is yes, we will then start asking a series of test questions. If the answer is no, the system will exit for now and wait until a next user click the start button.

During the test, answers of test-takers will be evaluated and recorded. The system moves to the next question type only when the test-taker answer correctly or three attempts on the same type of questions are incorrect. Moreover, test-takers will be able to receive real-time feedbacks from the responses given by our system.

By the end of the dialog, test-takers are allowed to request another test. Otherwise, a overall test evaluation report will be generated and the dialog comes to an end.

2. USE CASE

Scenario: Whole process of the project Give start button for user to click Double check for the user to start the test Give question to the user Record the answer and give another question to the user After the user finished all questions, he/she can request to view the evaluated results or start again If he/she choose to start again, give start button to him/her again.

Scenario: Make sure the user is ready to be tested Give the start button for user to click When the button is clicked, give another button to double check his willingness to start the test When the yes is clicked again, test begin

Scenario: Ask questions and evaluate the answers Give a question to uesr after the test start Record the user's answer, evaluate whether it is right

Scenario: Feedback when the project cannot get clear input: Output: I cannot hear you well, please repeat your answers Then give the question to the user again

Scenario: Continue test for correct answers If the user give the correct answer, move to the next question

Scenario: Circulate test for incorrect answers If the user give the incorrect answer, give another 3 attampts to answer similar questions If the user give the correct answer, move to the next question If the 3 attampts are all failed, move to the next question

Scenario: Feedback for users After finishing all the questions, give 2 options: request another test or view the results If clicked request another test, another similar test will be given to the user If clicked view the results, a overall test evaluation report will be generated and finish the dialog.

3. FRONT-END DESIGN

3.1. UI design

Our UI are basically two web pages built in the sever with one of them to be the portal and another for the test.

Our portal basically serves as a hub that brings information about Alzheimer's diseases together from diverse sources in a uniform way. You could find buttons that link to starting the test, checking out more information of Alzheimer's disease, seeking help from professional doctors and so on.

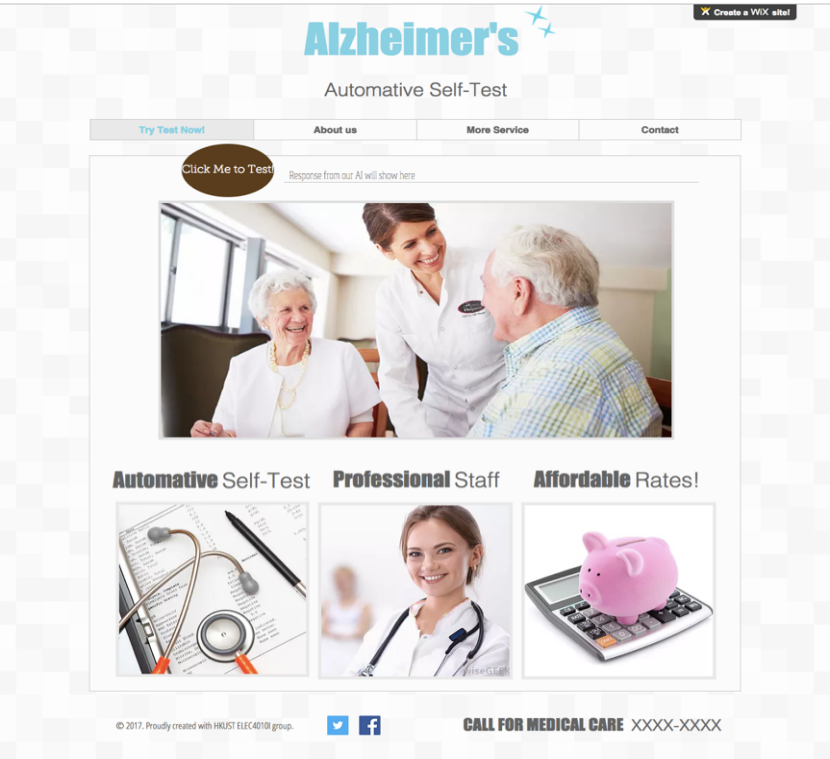

Figure 2: Portal Page

Once you click the buttons captioned with "Click Me to Test!" in the middle, you will jump to the test page shown below. This page is served as site for the test. We include a figure of the health as we thought it would be suitable for our theme. A text box is included for test-display.

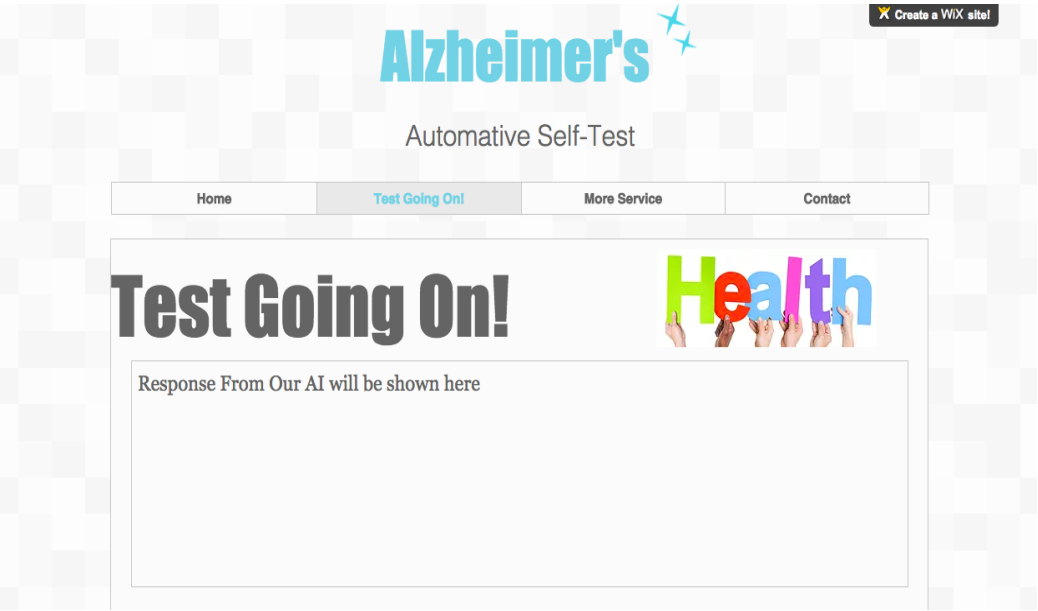

Figure 3: Test Page

3.2. Interactive Design

The test page will interact with users in forms of both voice and text. Once a user hits the button and enters the page, our AI will start the test via showing its greeting to the user and asking his/her basic information. After these chitchats, it begin to ask question that relates to consciousness, perception, ordering and so on, which helps evaluation of Alzheimer's disease. Note that the AI is literally "speaking" and "writing" simultaneously, i.e., the question asked will also be shown in the text box to avoid users' misunderstanding.

At the end of the test, our system will notify the user by saying "We appreciate your participation in the test and wish you a healthy life". The text box will disappear as the result of the test, the score will be displayed right at the same spot. Based on different ranges of the score, the AI will indicates the potential of the Alzheimer's disease of a user. It will provide him/her with links like finding more information about Alzheimer's or making appointment with doctor if the user appeared to be suspected.

3.3. Acknowledgement

We would like to acknowledge following sources for our UI establishment.

- www.wix.com
- www.homehelpershomecare.com/media/20169/full-dementiacare.jpg
- shannonmiller.com/wp-content/uploads/2011/07/know-your-health-test-result-numbers.jpg
- http://blog.idateasia.com/wp-content/uploads/2015/03/smiling-female-doctor.jpg

4. BACK-END DESIGN

4.1. Software architecture

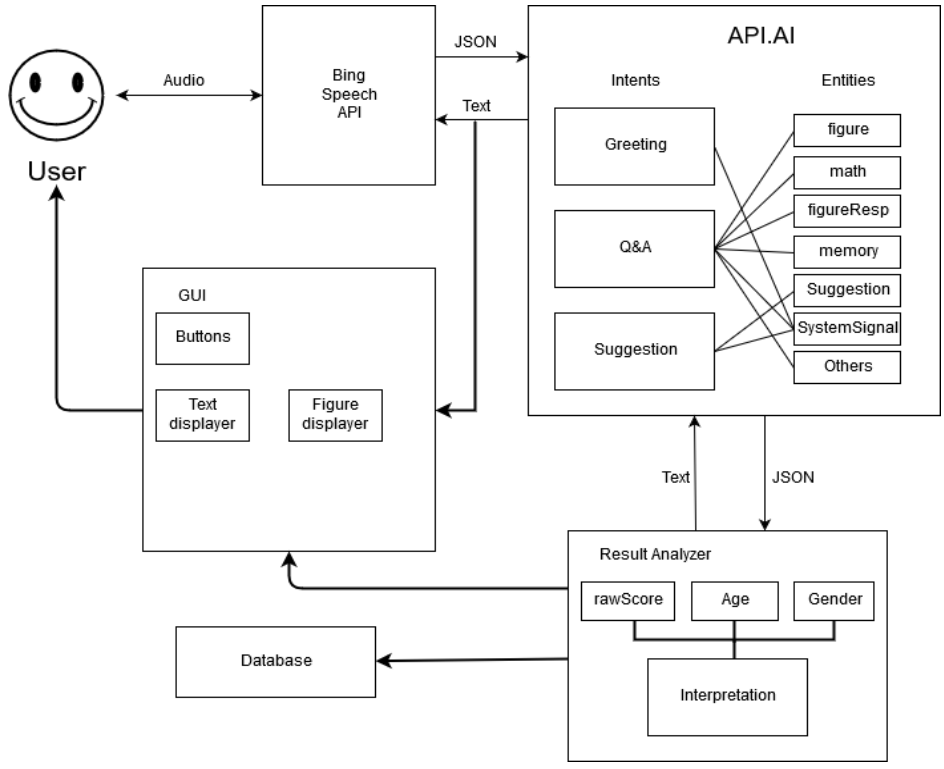

Figure 4: Software Architecture Diagram

The user's audio input will be post to the Bing Speech API. The Bing Speech API will send back a JSON file containing the corresponding text.

This text will be passed to the API.AI for further interpretation and processing. The result will be send back to the analyzer, which will record the performance of the user in the test. The final interpretation will be made based on the raw scores, type based scores and the age of the user. The user's information and the test result will be recorded in the database for future training and study use. The final interpretation will be send back to the API.AI and the suggestion intents in API.AI will gives out some suggestion accordingly. This suggestion will be passed to the TTS API.

4.2. Data flow diagram

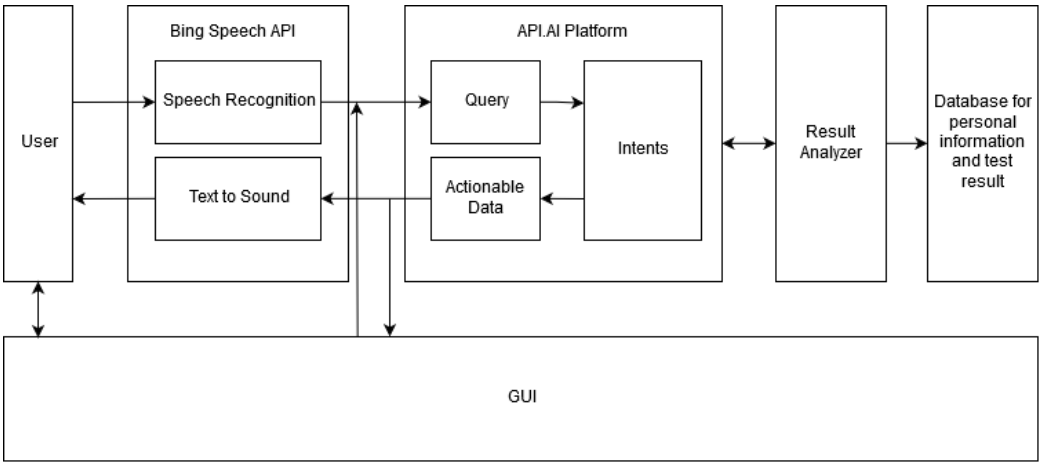

Figure 5: Data Flow Diagram

4.3. Api.ai module design

Module Name: Q&A

1. Intentions:
   (a) Intent 1: Welcome
      - Context: None
      - Candidate Response: Welcome.....
   (b) Intent 2: Q&A
      - Context: Type#&Num#
      - Candidate Response: @Questions
   (c) Intent 3: Suggestion

- Context: Fine, Early, Severe
- Candidate Response: Suggestions

2. Entities:
   - figure: a data that represent the figure to be shown on the screen
   - math: to record the response of math related questions.
   - figureResp: to record the respond of figure recognition questions.
   - memory: to record the response of memory test questions.
   - systemSignal: signals to activate certain behavior of the system.
   - other: to record the response of other types.

4.4. Other APIs

Automatic Speech Recognition - Text To Speech

- Functionality: convert the user's responses into text and convert the system's output into sound to talk with user.
- Input: sound / text
- Output: Output: text / sound

4.5. Standard Test Problem Set

Our problem set mainly comes from two sources, the Self-Administered Geocognitive Examination (SAGE) test[1] and the Test Your Memory (TYM) for Alzheimer's Disease in Five Minutes[2]. SAGE is a brief self-administered cognitive screening test used to identify mild cognitive Impairment (MCI), Alzheimer's disease and early dementia. It has been showed that shows that 80% of the people with memory issues will be detected by this test. The TYM test is a quicker and more accurate test than many other current tests and could help diagnose Alzheimer's or a related dementia.

1. Type 1: Personal Info and Syndromes
   (a) What's your name?
   (b) What's your date of birth?
   (c) What's your Gender?
   (d) How far did you get in school
   (e) Have you had any problems with memory or thinking?
   (f) Have you had any blood relatives that have had problems with memory or thinking?

(g) Do you have balance problems?
(h) Have you ever had a major stroke?
(i) Do you currently feel sad or depressed?
(j) Do you have more difficulties doing everyday activities due to thinking problems?
(k) What is today's date?

2. Type 2: Picture Recognition There are more pictures for the user to recognize and here are only a few examples.

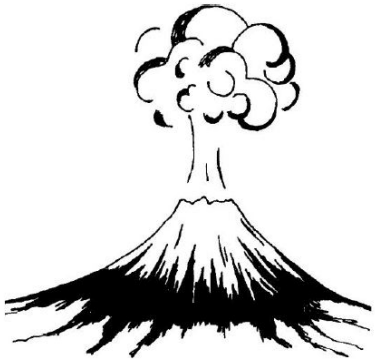

Figure 6: Picture Recognition Problem Example 1

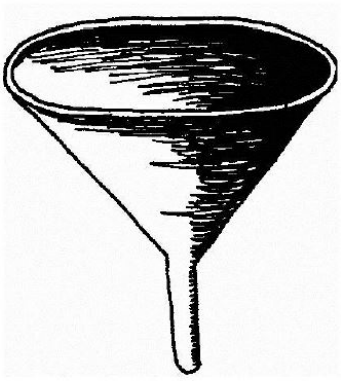

Figure 7: Picture Recognition Problem Example 2

3. Type 3: Math Type Problems Again, only a few examples are provided here.

   (a) How many nickels are in 35 cents?
   (b) You are buying $2.55 of groceries. How much change would you receive back from a 5 bill?
   (c) Do the following calculation: 5 + 6 = ?
4. Memory Test: For memory test problems, the reader is asked to memorize a sentence which will be tested later in the test.
5. Other Types:
   (a) Please List four Creatures Beginning with 'S'. i.e. 'Shark'
   (b) Who is the President of United States?

5. Reference

[1] Bob DeMarco; http://www.alzheimersreadingroom.com/2010/04/test-your-memory-for-alzheimers.html

[2] BMJ and Addenbrookes researchers; http://www.alzheimersreadingroom.com/2009/06/test-your-memory-tym-for-alzheimers-or.html