Development of a voice interface application for self-management with type 2 diabetic elderly patients

Amy Cheng, Vaishnavi Raju, and Dr. Yi Shang
Auburn University, University of Cincinnati, University of Missouri

THE PROBLEM

- Patient self-management of type 2 diabetes mellitus (T2DM) is crucial to reducing its chronic progression and serious future health complications.
- Due to the comorbidity of T2DM and depression, constructing a routine screening protocol is necessary for healthy coping [1].
- The current state of the art mostly assists patients through mobile applications. For the elderly, these mobile apps are marginally effective and even frustrating to use [2].

OUR SOLUTION

- This project proposes Healthy Coping with Diabetes, a Google Home & API.AI application that acts as an innovative intervention strategy to assist elderly patients with self-management of T2DM.
- Emphasizes the use of a voice interface rather than a strictly tactile one in order to provide older patients with the opportunity to easily engage in practical application of clinical care management.
- Framework combines the voice interface of Google Home for hosting the chat bot and a web interface for data visualization in order to reduce the burden of monitoring diabetic consequences for the user.

APPLICATION FRAMEWORK

GOOGLE HOME & API.AI

- Conversational agent
  - A Natural Language Understanding module that transforms natural user requests into actionable data
  - Transformation occurs when an utterance given by the user matches one of the intents inside the application agent
- Intents
  - Main intents correspond to AADE DSM guidelines (ie. Healthy coping, monitoring, healthy eating, medication, etc.)
- Entities
  - Represent parameter values from natural language inputs
- Webhook
  - A REST API that handles routing and business logic of intents

See the flow diagram below [3]:

WEB INTERFACE

- Serves as data visualization component
- Allows for patients to track their responses on interactive graphs and charts without having to manage their data themselves.
- Allows for physicians to monitor a patient’s status without in-person appointments

WEB INTERFACE

Figure 1. Illustration of the entire application framework, showing the directional organization of input and output data.

RESULTS

- Feedback from experts in elder care:
  - Speed of Google Home commands
  - Accommodations for hearing and speech disabilities
- 80% prefer voice interface, 10% prefer the tactile interface, and 10% are neutral
- Usability metrics of the application for satisfaction

CONCLUSION

- By utilizing the Google Home and API.AI platform, we are able to deploy the Healthy Coping application on a voice interface and eliminate the struggles that are associated with strictly tactile screens.
- By combining the functionality of the conversational agent and the simple web interface, we allow for a less cumbersome way for geriatric T2DM patients to effectively adhere to DSM guidelines.
- Based on our test results, our application improves upon the current state of the art by increasing user satisfaction and convenience.

REFERENCES


Acknowledgements: This material is based upon work supported by the National Science Foundation under Award Number: CNS-1659134. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Figure 2. Sample data visualization for a patient’s depression level, represented by user data that has been extracted from answers to the depression screening survey given by the Healthy Coping agent.