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## Personalized Trip Planner for Seniors

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FINAL RESEARCH REPORT

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## Final report for #168 Personalized Trip Planner for Seniors (PTPS)

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The Personalized Trip Planner for Seniors project has this year produced a complete dialog agent that functions in real time over the phone called GetGoing. The goal of the project has been to create a transportation information system that is usable by seniors. GetGoing takes into consideration changes in cognition as we age in order to make the information on transportation more understandable and memorable. GetGoing's unique features were also tested to ensure that they did indeed afford better comprehension and retention. It has also gone through several iterations of user feedback (from various sources including AARP, and most recently UPMC).

### The system

Much of the focus this year has been on ensuring that the information given by GetGoing is understandable and retainable by older users. Some of the features and design decisions that make this possible are:

- **Slower Synthesized Speech.** As we age, we process information more slowly. By inserting pauses prior to synthesizing the speech signal, GetGoing effectively slows down the speed of information delivery.
- **Attention-Grabbing Prefix.** As we age, we are less and less able to multitask – dealing with several tasks at the same time. This means that it is necessary to attract the user's attention and be sure they are focused on GetGoing before giving out any important information. GetGoing inserts an attention-grabbing prefix (for example, “the time of the next bus that you want to take is”) prior to providing important information. This allows users to switch attention, tune out distractions, and focus on the system output.
- **Confirmation of understanding.** Along with the issue of processing information more slowly, it is sometimes hard to get an agent to repeat information or to give out information in small chunks. GetGoing chunks information into small pieces and delivers them one at a time. It does not go on to the next piece of information until it has confirmed that the user understood the system output, and had sufficient time to write it down if they desire. This feature was strongly requested by the AARP focus group.
- **Barge-In.** Allowing users to interrupt the system shifts control of the dialog toward the user. Since some seniors may be unfamiliar with voice-based assistants, barge-in allows them to correct system mistakes without having to wait for the system turn to finish. This avoids the user's turns getting "out-of-sync" with the system.
- **Flexible Dialog Manager.** Seniors may have a different order in which they want to give the agent information (telling it when they want to be somewhere instead of when they want to leave somewhere, as the AARP group suggested). GetGoing's dialog manager is flexible in the order of turns. This flexibility is in part due to our **generalized natural language understanding** which is a deep learning model that relies on language embeddings pre-trained on large amounts of text (including all of Wikipedia). The flexible dialog manager allows users to easily correct the system, provide information out of turn, or fill multiple slots at once which in turn makes the whole dialog more natural.

- **Telephone Connection.** GetGoing's user interface is the telephone, which reduces the entry barrier for senior users who may not own a smartphone or may be uncomfortable using one. Users can presently call a publically available local phone number and ask the system for directions in Southwestern Pennsylvania.

## Testing results

The system was tested to determine if it did make comprehension and retention better for seniors. We found that the seniors who used the version of GetGoing with the senior-friendly features remembered the key travel instructions better than those who used a version of GetGoing without those features. Please refer to the attached conference paper for details.

## The outreach for partners

Once GetGoing was functional, we reached out to find potential partners for its testing and development. We are currently in discussion/preliminary collaborations with several organizations and companies, both with the goal of improving GetGoing and advertising it to real users:

- **UPMC** has several departments who supply information to patients as to how to get to doctors appointments and to its hospitals and back home again. They are interested in incorporating GetGoing with their system and to give people who ask about transportation at their information desks the way to access GetGoing.
- **AARP** of Southwestern Pennsylvania invited us to two meetings of its chapter presidents and served as a focus group and sounding board, providing feedback and suggestions after hearing demos of the system. We maintain our work with AARP, returning soon to demo new features of the system and to encourage their members to use GetGoing on a regular basis.
- **ACCESS** has expressed interest in the system. We are in the process of incorporating an advertisement for ACCESS into GetGoing, and are discussing how they can help advertise GetGoing through ACCESS.
- **OSHER Lifelong Learning, CMU Chapter** has expressed interest in the system and a willingness to help get the word out. We plan to give a lecture to familiarize their members with the system.
- **PathVu** is a startup that is interested in collaborating with us. They have mapped sidewalks in Pittsburgh with accessibility ratings, which we can orally communicate to callers who may suffer from a disability and need accessible directions (e.g., wheelchair directions).

## PRODUCTS

### Publication

A paper describing GetGoing, titled “*CMU GetGoing: An Understandable and Memorable Dialog System for Seniors*” was recently submitted to the Dialog for Good Workshop (DiGo). DiGo is being held in Stockholm, Sweden on September 10th, 2019. It is a workshop at the SIGDial conference (Special Interest Group in Dialog). It is included in this report. This paper describes the system, with specific attention to the features that improve accessibility for seniors. As mentioned above, a thorough user study was carried out, which demonstrates that the system is quantifiably better at ensuring that older adults understand and retain information.

## **Technology Transfer**

GetGoing has been developed as a senior-friendly system. We quickly realized that many users who are not senior may benefit from this technology as well. We separated many of the features into a *layer* that could potentially be used on top of other existing spoken dialog agents to make them more accessible for a wider portion of the population. A disclosure of intellectual property for ABLE (*AccessiBility LayEr*) was submitted to the CMU Center for Technology Transfer and Enterprise Creation. We have a meeting scheduled with representatives from the Center to discuss the next steps in this process.

## **Data**

Given how recently the system was publicly available, we have not yet collected enough data to be useful enough to share. We are actively advertising the system, and hope that the coming year will see a significant influx of calls from real users and thus a consequent dataset to share.