**Introduction**

Vision Changes with Age

Age-related macular degeneration (AMD) is a disease affecting the central retina causing vision loss and accounts for a leading cause of blindness worldwide [1]. It is often a difficult decision for older adults to give up driving completely. One study found that a little over a third of older adults may restrict their activities due to lack of transportation options or will often adjust their driving behavior around their disability [2].

**Objective**

**Preliminary User Research**

Interviewed 5 individuals over age 55 with age-related visual impairments – then categorized interview responses into key topics that recurred among respondents to identify frequency of behavioral characteristics & themes.

**Methods**

Developed a user persona based on the results and a use-case scenario for testing and prototype design. We focused on designing for a user affected by macular degeneration with a long history and experience with driving, the desire for freedom, and who still has/wants to have an active life on their own schedule.

**Persona:**

Kelly Smith
55 yrs old

*The thought of getting in the car and going for a drive really excites me.*

**Scenario:**

1. Kelly is ready to visit her new friend. She is able to find and get into her car with the help of her guide dog.
2. Kelly gets into her vehicle and would like to know that the car is aware that she and her guide dog are inside.
3. Kelly wants to communicate with the vehicle her intended destination and which route she would like to choose. She does not feel comfortable going on the highway on her way home, so she chooses the route without.
4. She also wants to make sure everything is in order before the vehicle drives off. She’s worried her car might not have enough battery/fuel to complete the trip and would appreciate reassurance from her vehicle.
5. As the vehicle is driving, Kelly realizes she’s a little anxious because she is not familiar with the route and would like details of where she is and every step of the way.

**How might we make navigation features easier to engage with in fully-autonomous vehicles for visually impaired adults with age-related macular degeneration (AMD) during a trip?**

**Prototype**

After brainstorming different ideas using the Crazy 8’s method, we developed a “test drive” scenario in which participants would have their vision restricted (via closing eyes, blindfold) and would engage with pre-recorded voice prompts that would be given by the “AV system”. Users were asked to respond to prompts for the following 5 tasks involved in a simulated trip in the AV:

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
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<tbody>
<tr>
<td>Task 1</td>
<td>Prompt to turn car on with voice command</td>
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<tr>
<td>Task 2</td>
<td>Vehicle checklist: vehicle diagnostics, seatbelt, cabin conditioning (AC, radio, seat adjust); Prompt navigation level select: 1 (advanced) or 2 (basic)</td>
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<tr>
<td>Task 3</td>
<td>Prompt to provide destination and select a route; prompt to accept or cycle through additional route options</td>
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<td>Task 4</td>
<td>Informing user of trip start and vehicle action (e.g. Backing out of parking space)</td>
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<tr>
<td>Task 5</td>
<td>Inform user of navigational movements; prompt user for any actions to take en route (e.g. Turn on red, take detour)</td>
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The prototype includes a button to activate the system on the side of each seat, dashboard camera to confirm user presence, and retractable microphone for voice commands. Users were also shown this sketch prior to the test drive, indicating their position within the vehicle and where key components of the system are located.