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CS 4590

CS 4590 PD3: Simulator Design Document

Overview of Project Idea: There are many users who suffer from various kinds of nerve damage, and this hinders them from being able to complete basic tasks like eating, writing, and even walking. And nerve damage goes further than just not being able to feel things directly, some can even have trouble with their sense of balance or temperature. But with my project, users can wear a variety of physical devices on their person and receive auditory feedback to help them be in control of their situation. The device can act as a support that provides context to their current environment or whatever task they might be performing. It will collect information about the user's environment and situation which will then get translated into sound data that the user will be able to listen to. The data that the user will hear will vary based on the user's desires, but it can range from simple beeps to indicate a yes or no situation, and it can be as advanced as hearing detailed cautions and messages if the user is in a potentially dangerous situation.

Final versions of your user persona and scenarios: Jenny is a 27 year old woman who was recently in a bad bus crash that left her with severe injuries. After multiple surgeries and extensive physical therapy, she is finally able to live her life again, but she has permanent nerve damage in various areas of her body which cannot be cured. She struggles with many activities now, and describes it as “not being in 100% control of her body”. Because of this, she is unable to do her hobbies as easily as she once was able to. Some of her hobbies included going for walks in the park, drawing, and even baking. But with my project design, Jenny can once again be able to perform all these activities and not have to worry about getting in any potential danger.

Scenario 1: One of Jenny’s favorite hobbies and required day-to-day tasks was walking around the city. She does not have a car, so she must walk to all the places she needs to be. This was no problem for her, and she enjoyed it a lot. But after the accident, she struggles with walking for continuous periods of time, and she often needs to rest on a railing to catch her breath. But another problem is that she lives in a very hot city, and the metal railings she rests on can be extremely hot. Jenny isn’t aware of this since her hands are unable to get a good sense of the scalding temperature. But with my solution, Jenny can wear a modified bracelet and is able to be notified about potentially dangerous temperatures. Anytime Jenny needs to rest on a railing, she can wave the bracelet and it will let her know via a simple beep if the surface is safe to touch. If it is not, she will receive a different beep that informs her that she shouldn’t touch it.

Scenario 2: Another hobby Jenny had was walking on various hiking trails. This required a bit more than just walking on mostly flat paths in the city as she chose more adventurous, hilly trails. But yet another problem she faces is that she isn’t always aware of her footing, and she’s unsure if she might trip on a rock or fallen branch. But with my solution, she gets a continuous

stream of auditory cues that tells her if she's on a safe path or not. She receives voice messages if she's within a concerning distance from something that could make her fall. For example, if she's about to walk on a jagged rock, the device will inform her that it's coming up on her left foot. All Jenny has to do is confirm that she's overcome the obstacle, and she can press on.

Scenario 3: While not a hobby, one thing that Jenny needs to do daily is taking various supplements for different health conditions. She has to take them with food as per the instructions. However, her mouth is one of the places where she suffered the worst damage. She can't really eat properly, and that could be potentially dangerous. If she's eating, she has a hard time telling if her teeth are getting a proper bite of the food. If she doesn't properly chew the food, she could possibly choke. But with my solution, she can keep a special microphone close to her ear, and she will receive cues if she's chewing properly. If she's chewing properly, she hears a soft but constant beep. But if she's not chewing properly, she will hear a double beep which lets her know that she should rearrange the food in her mouth. Now, she can eat food properly and take her supplements, worry-free.

Event Description:

Events:

- TouchObject
- Eat
- Walk/Run

Event Parameters:

- AudioType (int) (0 is beeps and 1 is AI Voice)
- Temperature (int)
- CautionScale (value range from 1-10)
- DangerPresent (boolean)
- Location (Address String)

There will be UI elements do decide what kind of audio type to pick (beeps or AI voice - this is covered in the next section in better detail)

Example Event 1: TouchObject (Room Temp Table)

- AudioType: 0
- Temperature: 70F
- CautionScale: 1
- DangerPresent: false
- Location: Home

Example Event 2: Eat (Potato Chips)

- AudioType: 0
- Temperature: 65F
- CautionScale: 4 //Be careful of sharp or unchewed chips before swallowing

- DangerPresent: True //refer to CautionScale
- Location: Home

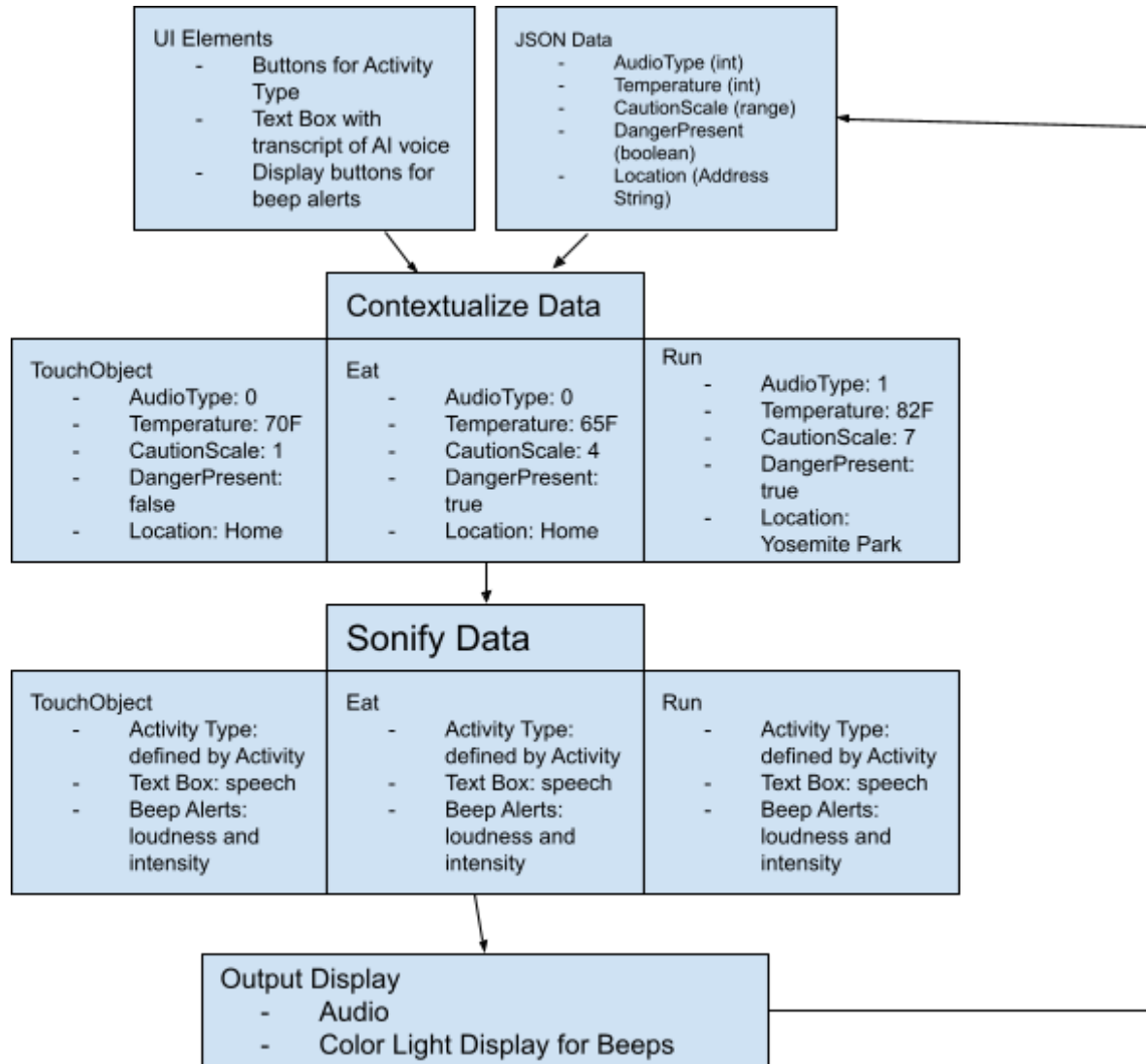
Example Event 3: Running (Hiking)

- AudioType: 1
- Temperature: 82F
- CautionScale: 7 //Jagged Rocks and fallen branches are present
- DangerPresent: True //refer to CautionScale
- Location: Yosemite Park

User Experience: For the user experience itself, the user will have an app with simple configurations based on what sort of activity they wish to complete. There will be button options for passive movements (like eating, drawing, and doing any sort of small activity that requires just hands) and options for active movements (like walking, running, and exercising). In the case where the user's activity does not fit any of the presets, there are button keywords in which they select to help them narrow down which sort of movement fits that activity best. This would be different from the normal options, and they can be imagined as a filter of sorts. Finally, there is a last button option in which the user can create their own movement program by describing what kind of auditory feedback they want to hear based on the activity they will be doing. I envision this last button for users who are extremely comfortable with the project and are able to make configurations appropriately.

As for what the user will hear, each activity will have two different options, a set of simple beeps or a full AI implemented voice that gives detailed feedback. The beeps can be as simple as a yes/no beep, or something more advanced like a pitch changing beep (imagine playing hot and cold). The AI voice will be simple, but efficient. It can provide context based on the user's surroundings, give continuous updates for when a user is doing an action, and also alert the user when they are about to be in potential danger. The event stream will mainly be modified depending on what activity (active or passive) the user chooses and what kind of auditory feedback (beeps or AI voice) they want.

Software Architecture:



Detailed Timeline: I plan on making implementations for the milestones on a weekly basis (I will shoot for every Thursday). Every week, I hope to add some sort of addition or modification to my project outline or the code that is part of the project.

Thursday, Nov 3 - Submit final version of PD3 and start working on PD5

Thursday, Nov 10 - Start working on PD5 and create rough version for PD4 part

Thursday, Nov 17 - Submit completed PD5 and continue working on PD4

Monday, Nov 22 - Submit completed PD4 and also Thanksgiving Break (No work will be completed during the break)

Thursday, Dec 1- Start working on PD6

Tuesday, Dec 6- Submit completed PD6