

COMP4060 - Group 1

Group members:

1. Ta, Cuong - 7900562
2. Patel, Het - 7972424
3. Shah, Dipesh - 7882947

Assignment 4 Report

Task 1 Writeup

Introduction

The behavior implements design for the Sota robot that engages users in a simple quiz game. When motion (or face) is detected, Sota is designed to play a game with the user. By combining affective awareness (demonstrated in quiz feedback) and the ability to evolve interactions over time (through the quiz sequence), along with robot speech and body language, this Sota behavior creates a friendly, approachable environment for users.

Motivation

We are motivated to make Sota more user friendly and socially interactive through features like user detection and an engaging quiz game. Our goal when designing Sota's behavior is to let the robot appear as an empathic while humorous companion during interactions like the quiz game, using affective feedback. Our Sota uses adorable gestures and a funny quiz game to provide engagement and respond cheerfully or comfortingly based on game performance.

From HRI perspective

This behavior applies to **User-Centered Design** as Sota adapts to the user's input during the quiz game based on keyword recognition. The implementation includes basic **Situation Awareness** through motion and face detection to initiate interaction. This design also offers **Effective Time and Workload** during the quiz through interactions based on keywords, which can **reduce the user's cognitive effort** and allow users to engage more naturally.

From Social HRI perspective

The use of expressive motions during the quiz leverages human natural behavior towards robots, aligning with the principle of **Animorphism**. Also, **Affective Design** is used so that Sota can respond empathically and cheerfully encourage the user during the quiz based on performance, without the need to fully understand the user's broader emotional state. Finally, while the code focuses on the quiz game, Sota aims to act as a **Companion Robot Model** by providing engaging interaction rather than supporting general wellness or personal sharing.

Behavior Goals and User Experience

This behavior aims to achieve a more approachable method to robot through a simple flow of interactions involving user detection and a quiz game. Sota will engage the user by playing a game which offers emotional support through minimal dialog (via quiz feedback). From the user experience lens, the interaction should ease the user's negative emotion and uplift positive feelings through this engagement. While showing the users they would be heard (in the context of quiz answers) and supported (through affective feedback), the behavior would also give cheerful comments, creating a feeling that Sota is alive and really friendly.

Task 2 Writeup

This plan outlines how the Sota robot to be implemented with the **initial goal** of detecting a user, engaging in a brief, emotionally aware conversation about their day, and then potentially transitioning to a quiz game based on the user's expressed sentiment or choice.

Detection and Greeting: The process starts when Sota detects a user via motion and face detection. It would then offer a welcoming gesture and verbally ask if the user wants to "talk" about their day or "play" a game.

Getting User Choice: Sota listens for keywords ("talk" or "game") to understand the user's preference.

Conversation Path: If the user chooses "talk":

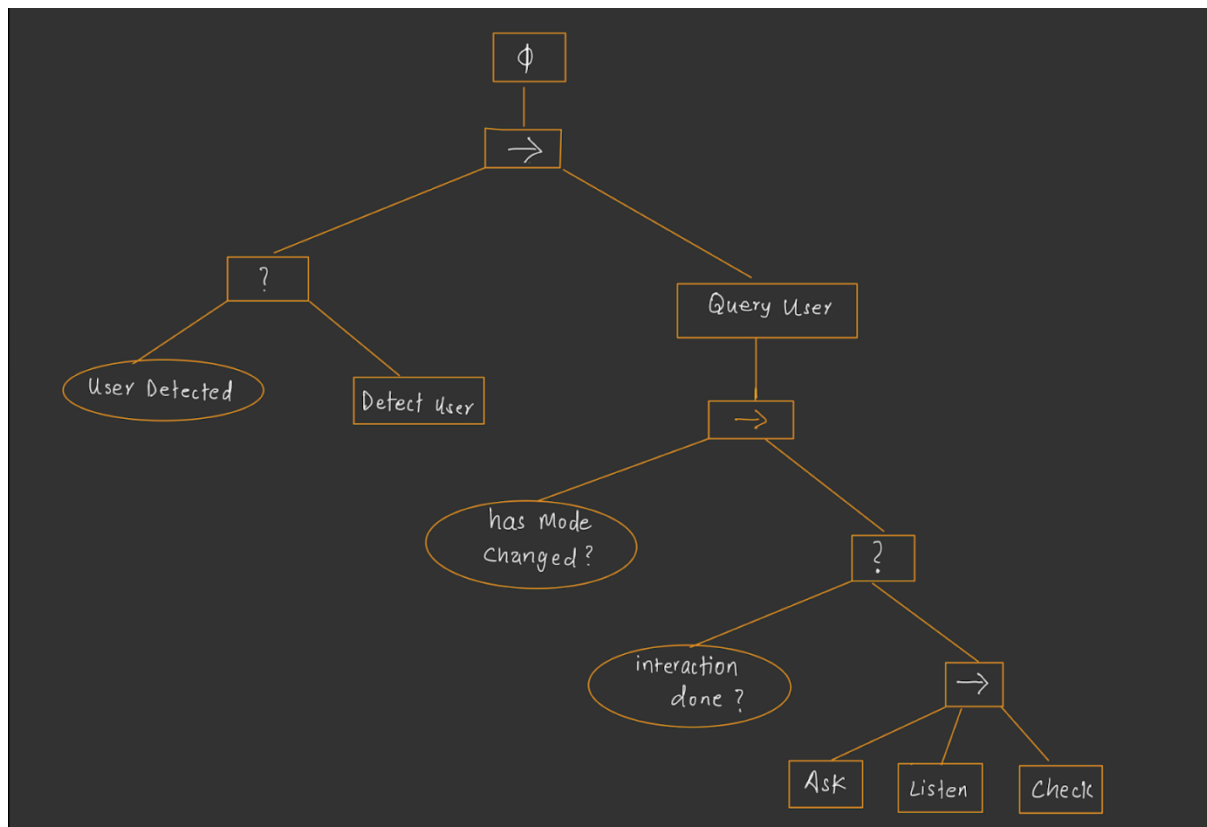
- Sota asks "How was your day?" and pauses briefly.
- It follows up by asking if the day was "positive" or "negative" and listens for related keywords.
- Based on the sentiment: If positive, Sota acknowledges it and offers to hear more or play the quiz. If negative, Sota responds with empathy and offers to hear more or play the quiz as a distraction.
- The interaction proceeds to the quiz game if the user chooses it or after they finish sharing.

Direct Game Path: If the user initially chooses "game", or selects it after the conversation, Sota proceeds directly to the quiz.

- **Quiz Game Execution:** The quiz involves asking questions, listening for specific keyword answers, and checking correctness. Sota provides feedback through expressive motions – complimenting and cheering for right answers and offering comfort with gentle correction for wrong ones.
- **Implementation Needs:** Achieving this requires creating new conversational tasks, modifying the listening setup, adding ways to track the conversation state, and significantly restructuring the main behavior tree logic compared to the current code.

Although we had this plan initially, we decided to remove the conversation branch due to handling natural conversation (like asking "How was your day?" and understanding the response) is much more complex than recognizing specific keywords for a quiz. It requires more advanced speech recognition and natural language understanding capabilities than might have been feasible or available. In addition to that, Sota's PocketSphinx language model was not working properly because of Sota's limited processing power.

Our Initial Behavior Tree

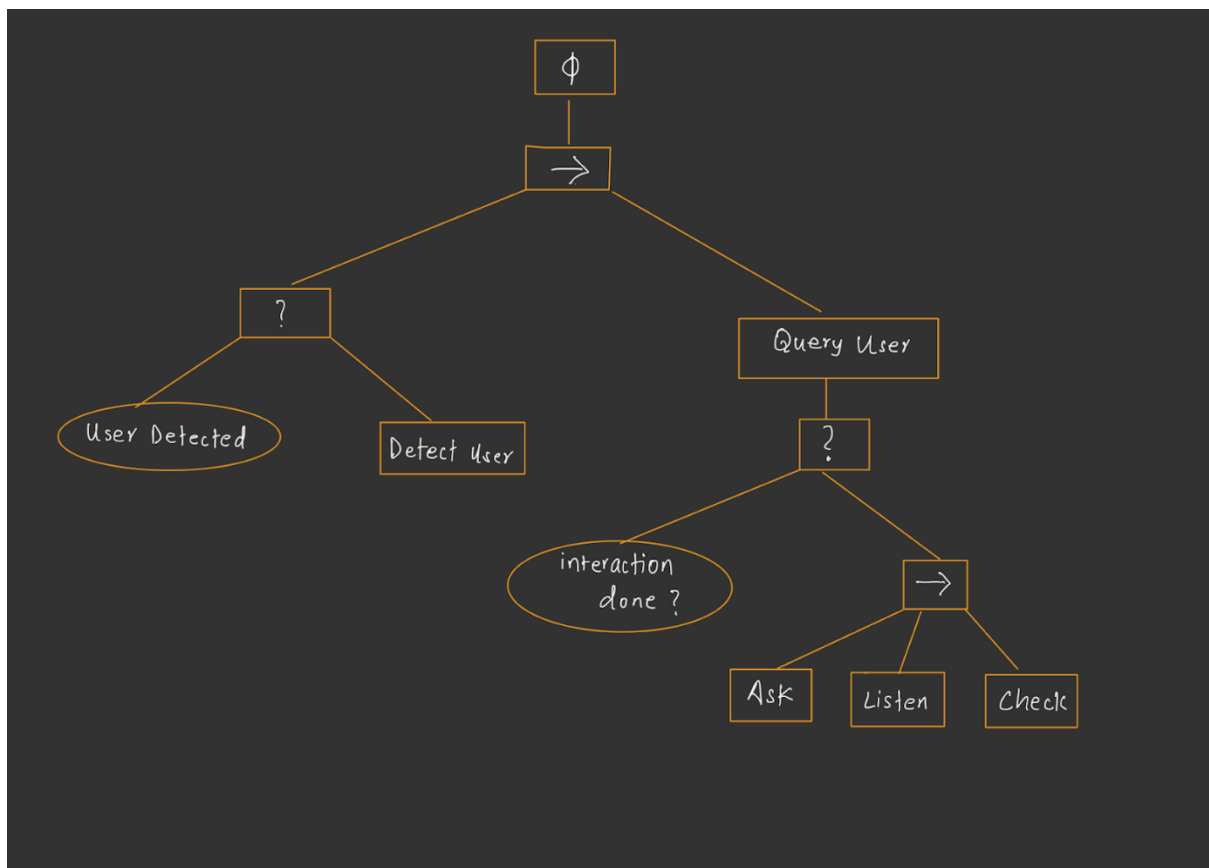


Task 4 Writeup

Looking back at our Sota project, we initially had a bigger idea involving a whole conversation where Sota would ask about your day and try to figure out if you were happy or sad before playing a game. Honestly, we realized pretty quickly that getting Sota to reliably understand casual chat and emotions was way harder than we thought; speech recognition can be tricky, and figuring out meaning is a whole other level of complexity. So, we made the practical call to cut the conversation part and focus just on making the quiz game really good. We're actually pretty happy with how the quiz turned out – we got Sota asking the questions clearly, listening for the one-word answers using keyword spotting, and then doing specific motions to either cheer you on if you got it right or offer some comfort if you got it wrong. Getting the robot to reliably spot someone with the camera also took quite a bit of fiddling; we actually spent a good chunk of time figuring out that some detection inconsistencies

stemmed from the robot's camera hardware itself, not just our code implementation, but eventually got a basic motion detection working to kick things off. We started with motion detection then proceed to detecting user's face. However, we could not figure out the optimal image quality for Sota to recognize user face, so we decided of moving forward with just motion detected only. Sota would attempt to detect user's face within 3 seconds after motion detected and move forward to quiz game behavior. While it wasn't the full conversational companion we first imagined, building the complete quiz interaction with its fun reactions felt like a solid accomplishment, teaching us a lot about making these robots interactive and the realities of working with speech and perception tech.

This is how our updated behaviour tree works now.



Note:

1. We used TTSMaker to generate Sota's baby voice
2. We used PocketSphinx Keyword recognition for recognizing keywords.

Group Report

Everything is going good and as expected in the group, there's no problem. Everyone of us understands if someone in the group needs help and tries their best to help them out.