Sprint Planning Document (Sprint 3)

March 25 - April 22 2025

Olivia Monteiro, Alicia Reed, Danny Steuer, Archer Taylor, Eli Weber

High-level Project Overview

Project Mission:

- Provide a client-server architecture to develop educational systems to support STEM interest in K-12 students

Problems We Are Solving:

- There is limited previous work in the field of quadruped research in K-12 students
- Development of interesting, child-friendly educational resources
- Develop STEM interest in young students
- Potential future use in search-and-rescue missions

Project Overview (High-Level Features):

- **Cloud Server**
  - Cloud connection to link the microphone & voice files with the PuppyPi
  - Support for quadruped control, sending and receiving commands, sending and receiving sensor data
- **Voice Recognition Using LLM**
  - Using a large language model to recognize & process voice data into words to transmit as commands to PuppyPi
- **Camera Recognition Using YOLOv8**
  - Additional goal added by project sponsor to use computer vision with the PuppyPi camera so the PuppyPi can follow commands such as “Find the blue ball”
- **ROS Programming**
  - Using action groups to take the PuppyPi through a series of preprogrammed motions
    - Sit, lay down, moonwalk, shake
  - Using publisher nodes to allow PuppyPi to walk, turn, etc.
  - Engineer app functionality with voice commands

Sprint 3 Planning

Sprint 3 Goals:

1. **Create complete app functionality including camera, lidar, etc.**
2. **Implement “length of time” commands (“walk forward for 5 seconds”).**
3. **Implement “stop” command / “stop” wakeword**
4. **Improve latency & transcription accuracy with noise reduction techniques to deal with ambient noise**
5. **Implement audio compression techniques to reduce the size of the payload being sent to cloud**
6. **Create handling for continuous thinking commands (“follow me”)**
7. **YOLOv8/computer vision functionality – object finding**
8. **Test commands/command interpretation**
9. **Implement interoperability with different types of networks (WPA Enterprise / Personal / etc…)**

Sprint 3 Deliverables:

- **Create complete app functionality including camera, lidar, etc.**
  - **Assigned:** Alicia Reed
  - Implement the final commands in the app that we do not have voice commands for yet
- **Implement “length of time” commands (“walk forward for 5 seconds”).**
  - **Assigned:** Eli Weber, Olivia Monteiro
  - Allows continuous commands such as walking to be timed
- **Implement “stop” command / stop “wakeword”**
  - **Assigned:** Archer Taylor, Danny Steuer
  - Uses wake word “PuppyPi” or another word such as “stop” to stop whatever action the PuppyPi is doing and clear the queue
- **Improve latency & transcription accuracy with noise reduction techniques to deal with ambient noise**
  - **Assigned:** Archer Taylor, Danny Steuer

    - Helps PuppyPi be more consistent in various environments and complete commands quicker
- **Implement compression techniques to reduce the size of the payload being sent to cloud**
    - **Assigned**: Archer Taylor, Danny Steuer
    - Helps reduce the size of the audio payload that is sent to the cloud for processing, thus reducing processing time
- **Create handling for continuous thinking commands (“follow me”)**
    - **Assigned:** Eli Weber, Olivia Monteiro, Alicia Reed
    - Get the robot to follow commands that combine functionalities such as lidar & camera
- **YOLOv8/computer vision functionality**
    - **Assigned:** Olivia Monteiro, Eli Weber
    - Using YOLOv8 or another computer vision model to use the PuppyPi’s camera to “see” its environment and interact accordingly
- **Test commands/command interpretation**
    - **Assigned:** All team members
    - Testing various ways of calling the same commands to be sure they run appropriately
- **Implement interoperability with different types of networks (WPA Enterprise / Personal / etc…)**
    - **Assigned:** Archer Taylor, Danny Steuer
    - Allows PuppyPi to connect to different types of network, for example WPA Enterprise (such as eduroam) which requires a username and a password.