Open-Source Rehabilitation Game

Next-Step

NS

NEXT - STEP

Introduction

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Problem Statement

The Biomechatronics Lab Current Workflow

- BLE-based bluetooth connection to exoskeleton
- Basic GUI to display user data as a graph.
- CSV data output for sensors and torque assistance.

Identified Limitations

- Limited user interface functionality.
- No real-time feedback for patients.
- Absence of gamification or motivational elements.
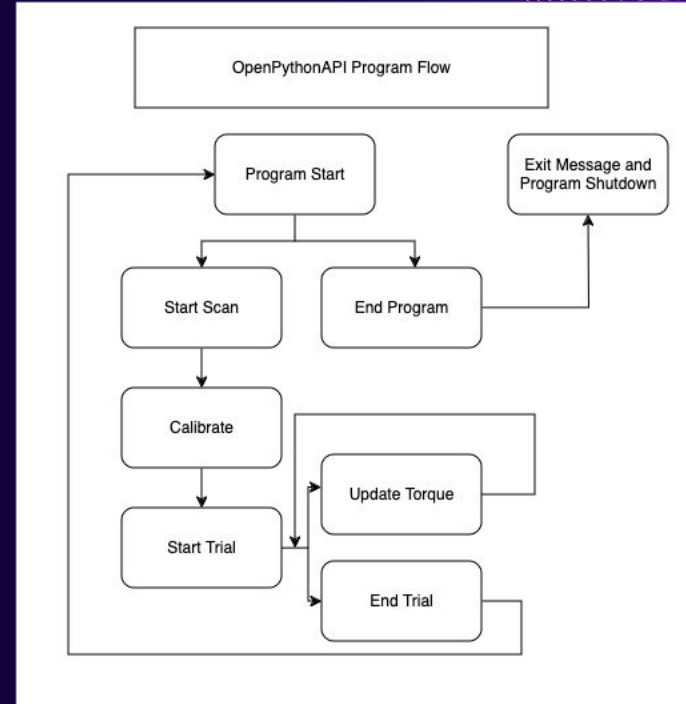
Solution Overview

Existing System:
- Modify existing GUI system.
- Implement a new GUI system that allows for game support.

Gamepad:
- Implement a virtual gamepad to interpret biofeedback from brace sensors.
- Convert biofeedback into game controller input.

Game:
- Create a small, easy to play game controlled through the collected biofeedback
- Allow researchers to collect session statistics from the game.
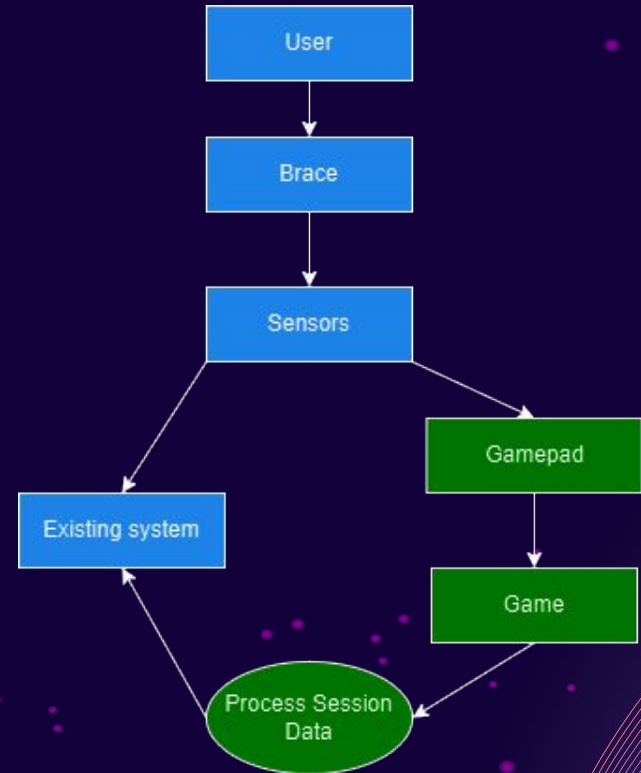
Key Requirements

- Collect exoskeleton data and output to CSV file and convert to controller data
  - Output data will include all exoskeleton data including threshold data

- Game will auto adjust game difficulty threshold to prompt for more user engagement
  - Researchers can disable this feature
  - User prompts should be simple enough to perform
  - Game will reflect user meeting the set threshold
  - Game difficulty threshold will be adjustable manually in-game

- Game Screen and python application can both be accessed at the same time
  - Any adjustments in python application should reflect data in real time

- Well defined documentation for the future of the project and for researchers (non-programmers) to comprehend
  - Will include instructions on how to use the program
  - Will include how to change sensor data

Risks and Feasibility

- **Sensor Issues:** Faulty data due to disconnections or foot sliding may lead to inaccurate feedback.

- **Bluetooth Lag:** Delays in communication affect real-time feedback and engagement.

- **Hardware Limitations:** Short battery life, overheating, and limited motor torque may disrupt sessions.

- **Usability Challenges:** Complex controls or miscalibrated difficulty could frustrate users or risk injuries.

- **Software Failures:** Crashes or logic errors could hinder rehabilitation progress.

- **Safety Risks:** Malfunctions or disconnections may pose physical safety hazards.

Schedule

Gamified Rehabilitation Tool Milestones
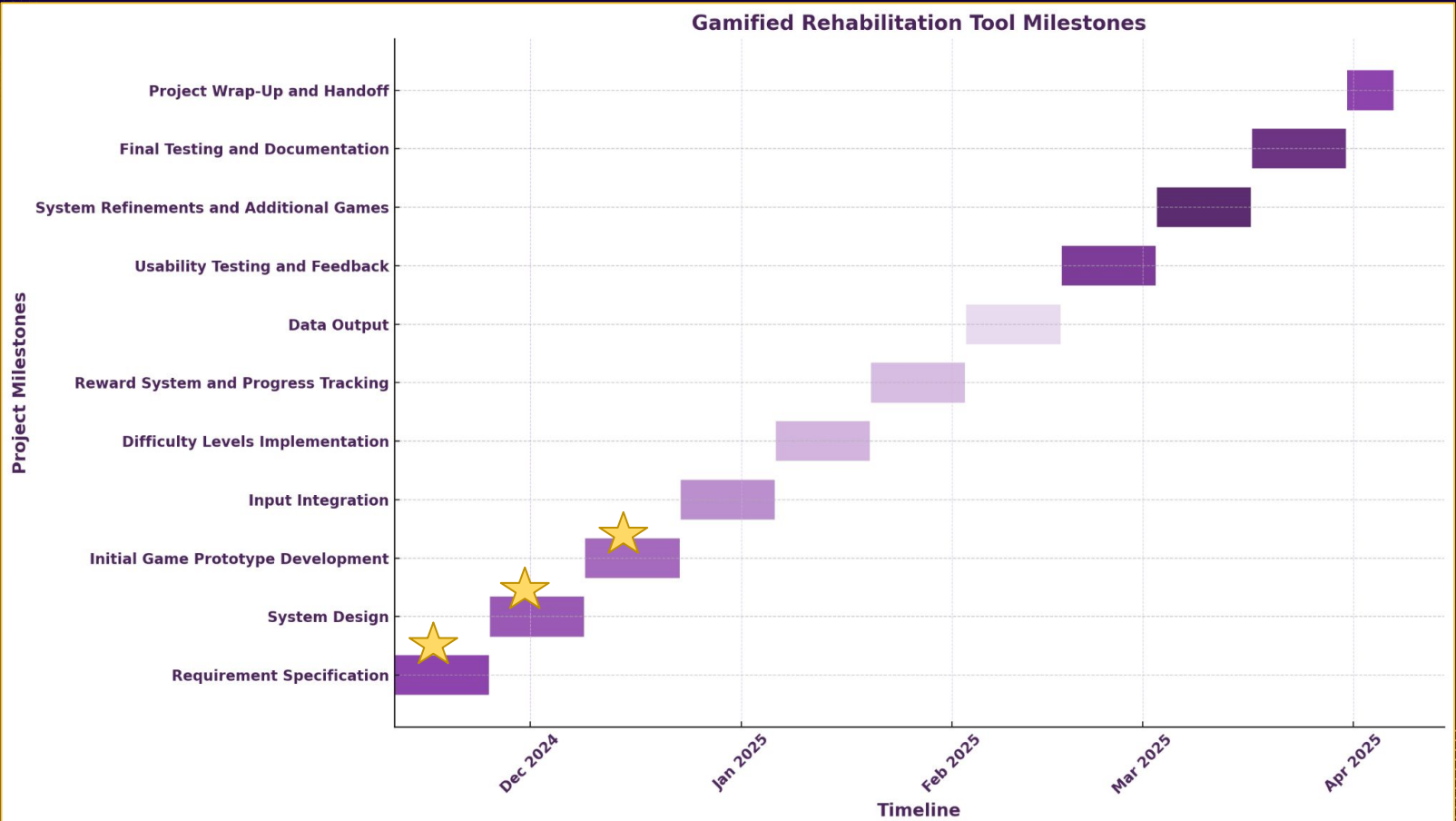
In Conclusion

- Our team's mission is to create an engaging and adaptable rehabilitation tool/experience.

- This tool must expand upon the pre-existing Biomechatronics Lab's program.

- The program must be easy to understand by both users and future developers

- In doing so, our rehabilitation games will increase motivation in patients and keep them committed to their therapy.

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Thank you!