



HapTech

Design Review 1

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Client: Dr. Reza Razavian

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Problem Statement

Big Picture:

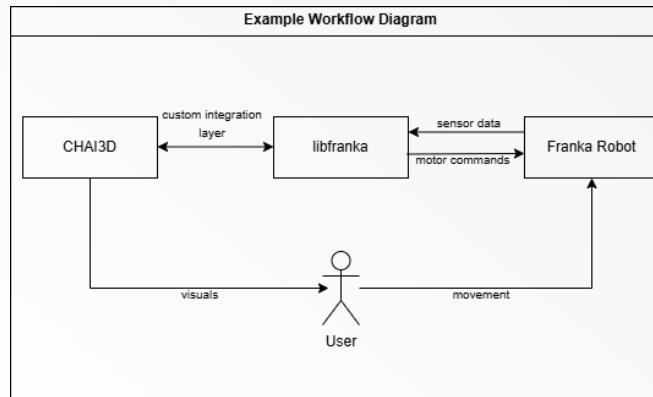
- Haptic technology lets people physically feel and control digital objects through touch.

Clients Mission:

- Dr. Reza Razavian develops rehab-focused human-robot systems at NAU.

The Problems:

- No user-friendly interface.
- No built-in data management.
- No reusable experiment templates.
- Time-consuming setup.



Solution Overview

Design a modular software system to support human-robot interaction research using the Frank 3 Robot and CHAI3D, enabling easier experiments

Key Features:

- Command Line Interface
- Data Storage
 - CSV for experiment data
 - XML for metadata + config
- Modular Design for future extension
- Improved Accessibility



Data & Process Flow

Inputs:

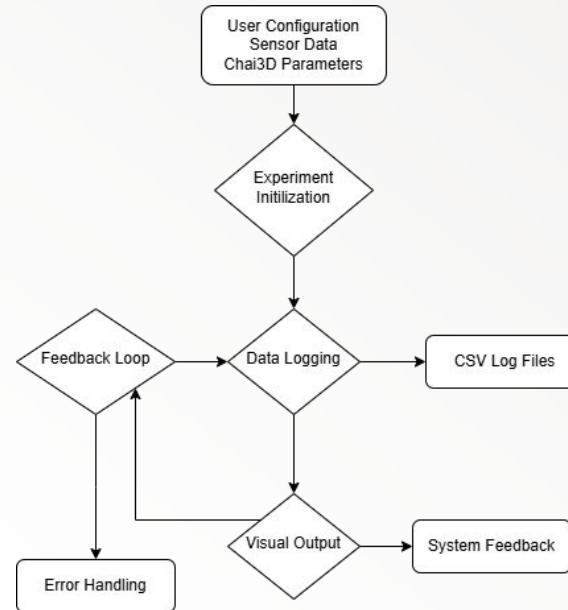
- User config file
- Franka robot sensor data
- CHAI3D parameters

Processes:

- Experiment Setup
- Terminal/Backend interaction
- Feedback loop
- Data logging

Outputs:

- CSV log Files
- Visual Feedback & System response



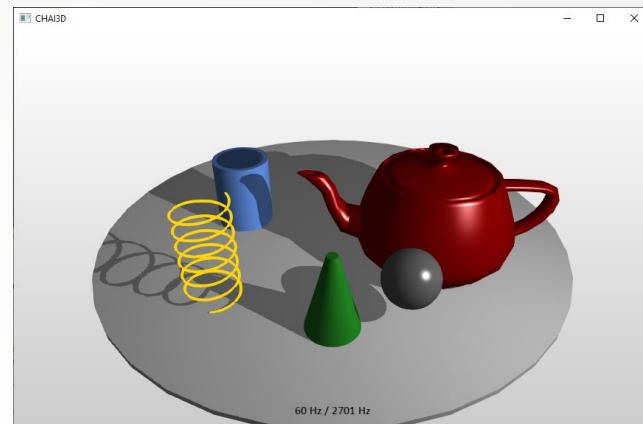
Key User Requirements

Requirements gathered through weekly meetings with Dr. Razavian:

- Learned about his needs for conducting his studies.
- Learned about the equipment & technologies involved.

Key requirements:

1. 3D Simulations with haptic feedback
2. Data collection & storage
3. Experiment design and setup
4. Operator user interface



Non-functional Requirements

Performance

- Visual integrity
- Real-time haptic feedback
- Efficient, user-friendly workflow
- Reliability



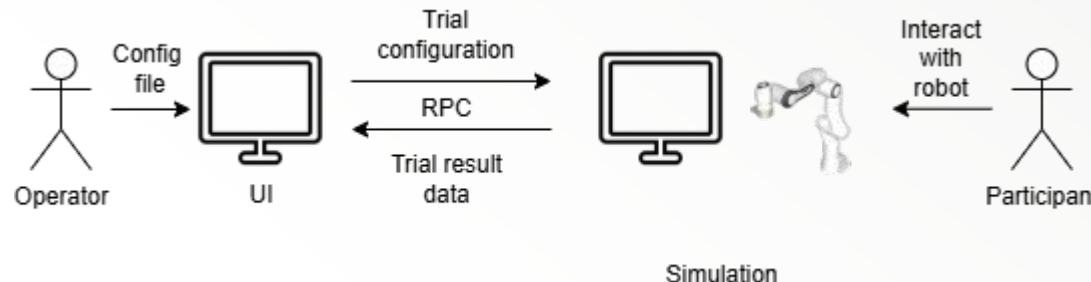
Environmental

- Franka Research 3 robot
- CHAI3D
- Linux real time kernel

Requirement Breakdown

Operator User Interface

- Terminal based UI
- Users must be able to:
 - Run experiments
 - Preview experiments
 - View experiment status
 - Manage output data files



Risks & Feasibility

Main Concerns:

- Complex integration
- Limited access
- Learning curve

Mitigation Strategies:

- Build prototypes early and test often
- Use virtual simulations
- Schedule time efficiently
- Ongoing team training

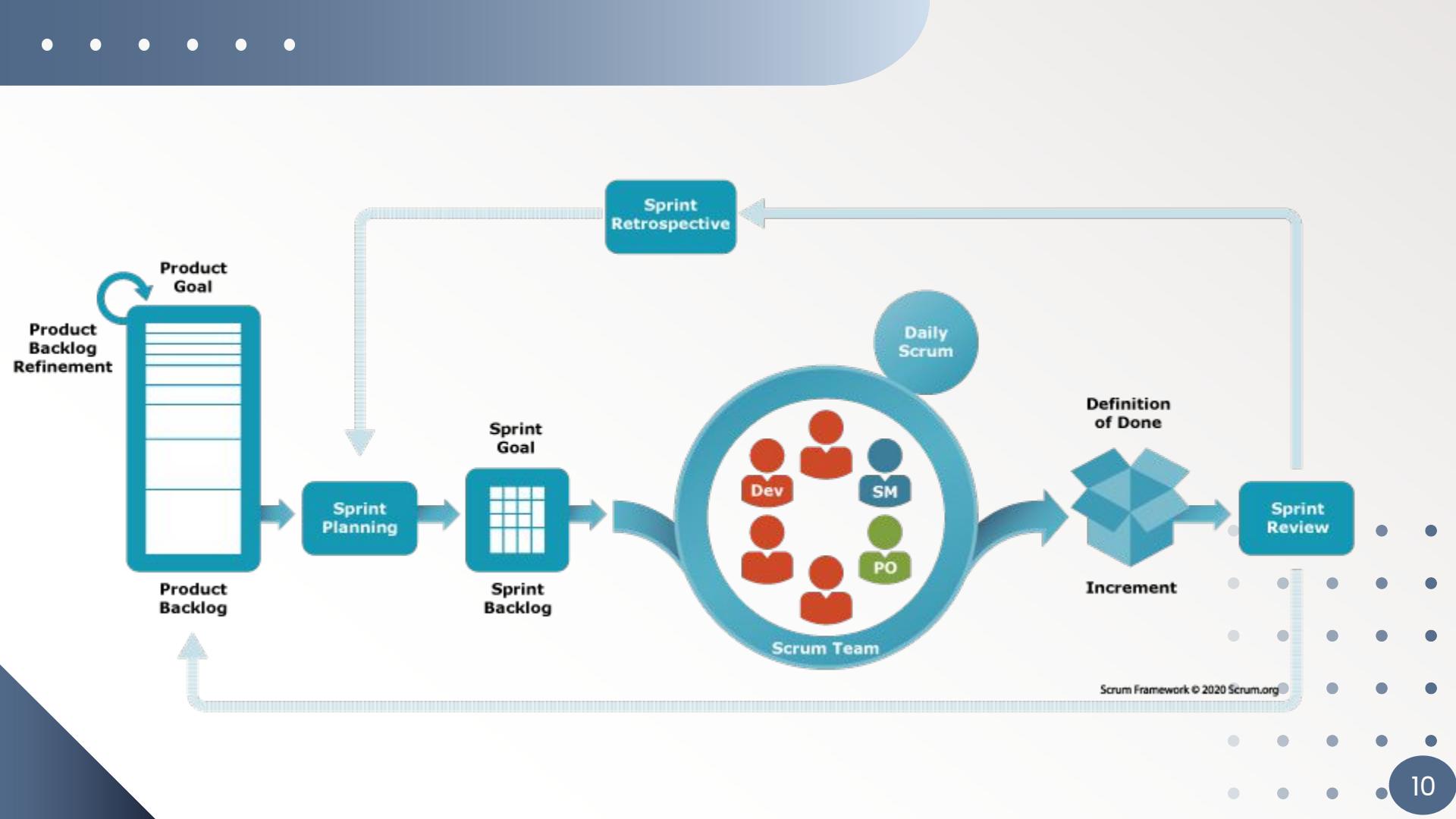


Project Plan

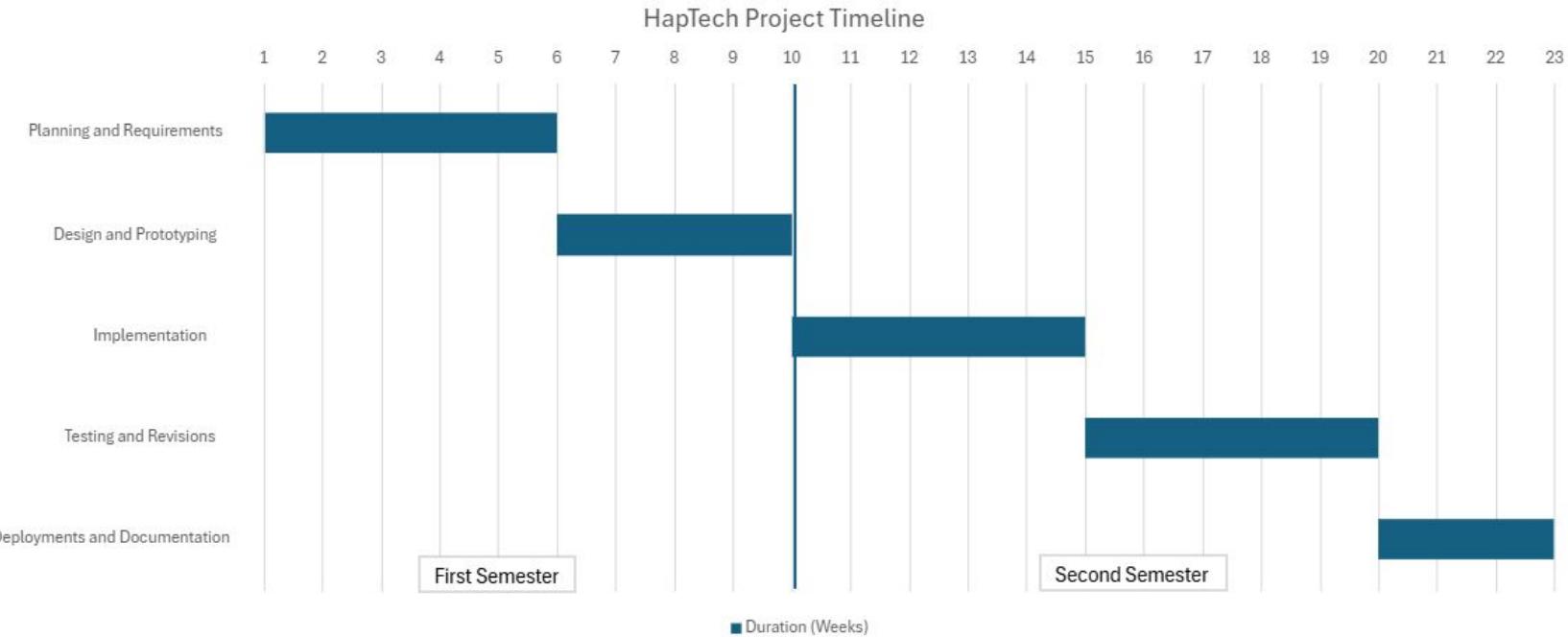
Scrum

- **Iterative Delivery:**
 - Breaks the work into sprints for fast and manageable increments.
- **Adaptive Planning:**
 - Easily re-prioritize backlog as requirements and client needs change.
- **Clear Accountability:**
 - Defined roles keeps ownership and focus.
- **Built-In Feedback Loops:**
 - Sprints reviews and daily scrums make issues easily identifiable early on in development.
- **Continuous Improvement:**
 - Retrospective drive process and allow for further refinements.





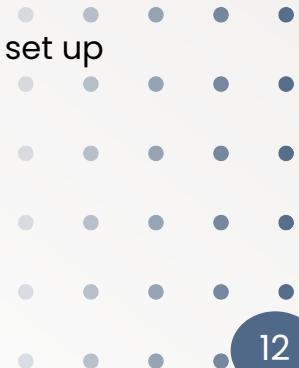
Project Schedule



Conclusion

Recap:

- Haptic technology is key part of advancing human-robot interaction, especially in rehabilitation.
- Our clients current setup is limited by lack of modularity, poor accessibility, and an inefficient workflow.
- Our proposed solution is a command line user interface with a reusable experiment set up and data management.



Next Steps:

- We will begin full development with a focus on early prototyping and integration.
- We are confident and excited to deliver a meaningful and impactful solution.

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Thank You!

Any questions?

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