VIDEO GAME ENVIRONMENT FOR ARM ASSESSMENT THROUGH A ROBOTIC EXOSKELETON

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EXPO 2022 engineering ▲ design

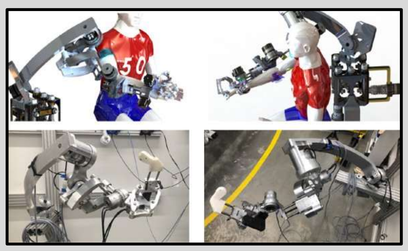
PROJECT OBJECTIVE

Create a three-dimensional configurable task environment for the BLUE SABINO where subjects can be presented with consistent and repeatable task guidance and feedback for arm assessment.

PROJECT BACKGROUND

The **BLUE SABINO** (**B**i-**L**ateral **U**pper-limb **E**xoskeleton for **S**imultaneous **A**ssessment of **B**iomechanics and **N**euromuscular **O**utput) is a robotic exoskeleton being developed by the University of Idaho Assistive Robotics Lab.

- Built in Series of Phases (from 2 to 30 Joints, 15 per arm)
- Measures Arm and Hand Function in Individuals with Neurological Impairment, Such as Those Who Suffer From Stroke
- Records Joint Position Information to Report on Things Such as Range of Motion, Control of Motion, Range of Force, and Control of Force



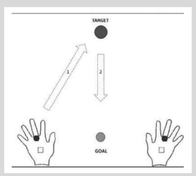
VALUE PROPOSITION

- Research and Educational Purposes
- Providing Clear and Repeatable Tasks Is a Current Challenge
- Insufficient Auditory Cues or Visual Demonstrations
- Utilizing a Game Engine To Make a Capable Task Environment

MADE WITH Unity

PROJECT REQUIREMENTS

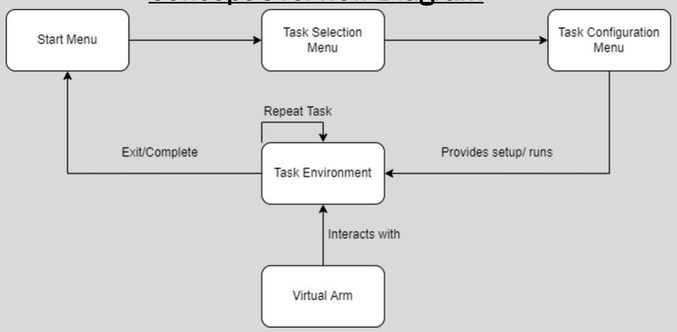
- Consistent and Repeatable Tasks
- Configurable Task Settings
- Point-to-Point Reach Task
- Clear Communication of On-Screen Objects
- Virtual Arm can Modularly use Multiple Joints



CONCEPT DEVELOPMENT

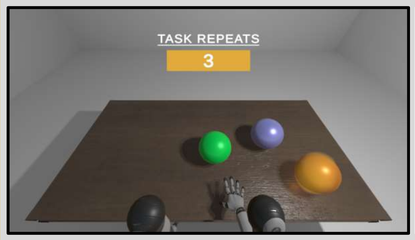
- Eventual Shift from Hardware Focused to Software Focused
- Originally Developed for Testing, our Virtual Arms Have Now Become Representative of the BLUE SABINO
- Heavy Research into the Best Way to Implement our Task System, which Involved Passing and Storing Data; all While Keeping our Environment Intuitive and Modular

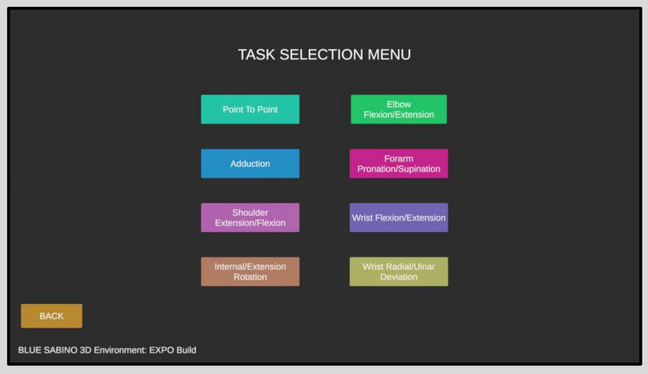
Concept Overview Diagram



FINAL DESIGN

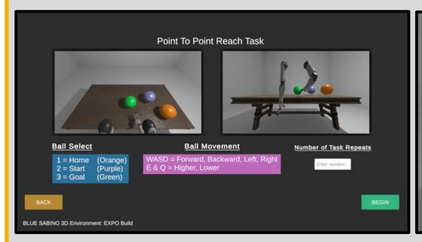
- Main Point-to-Point Reach Task (Involves Multiple Joints)
- 7 Other Tasks Showcasing Individual Joint Movements
- Assessment Results Screen
- Implemented with Possible Future Development in Mind

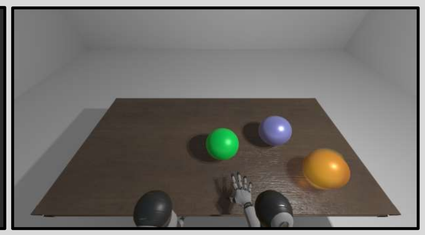




VALIDATION

- Tasks Repeat for a Specified Number of Times and Maintain Their State Until The Assessment is Over
- Home, Start, and Goal Positions are Moveable which Expands the Variation and Configurability of Tasks
- One Main Task and 7 Individual Joint Movement Tasks
- Use of Shadows and Lighting for Depth Perception
- Each Virtual Arm Can Utilize Up to 9 Joints Which Surpasses Current Builds of the Physical BLUE SABINO





SUMMARY AND CONCLUSIONS

Our project requirements have been fulfilled and we hope the Assistive Robotics Lab can utilize our environment for arm assessment in the future. Additionally, we believe their work on capturing the output from the BLUE SABINO would be easy to add into the project as per the modularity of our design.

RECOMMENDATIONS

- If the Project Advances into a Marketable Product, the Addition of Quality-of-Life Settings would be good (e.g., screen resolution)
- Adding BLUE SABINO Information to the Assessment Results

ACKNOWLEDGEMENTS

- NSF Award #1532239, *Funding*
- The Dean and Cindy Haagenson Endowment, *Funding*
- Dr. Joel Perry, *Client*
- Bruce Bolden, *Lead Instructor*

University of Idaho
College of Engineering