THE bento ARM

An Improved Robotic Arm for Myoelectric Training and Research

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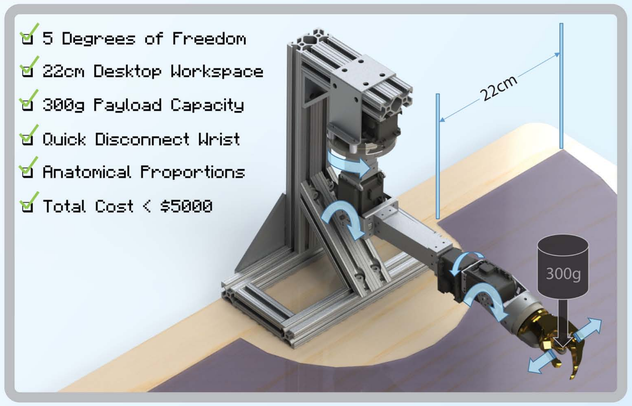
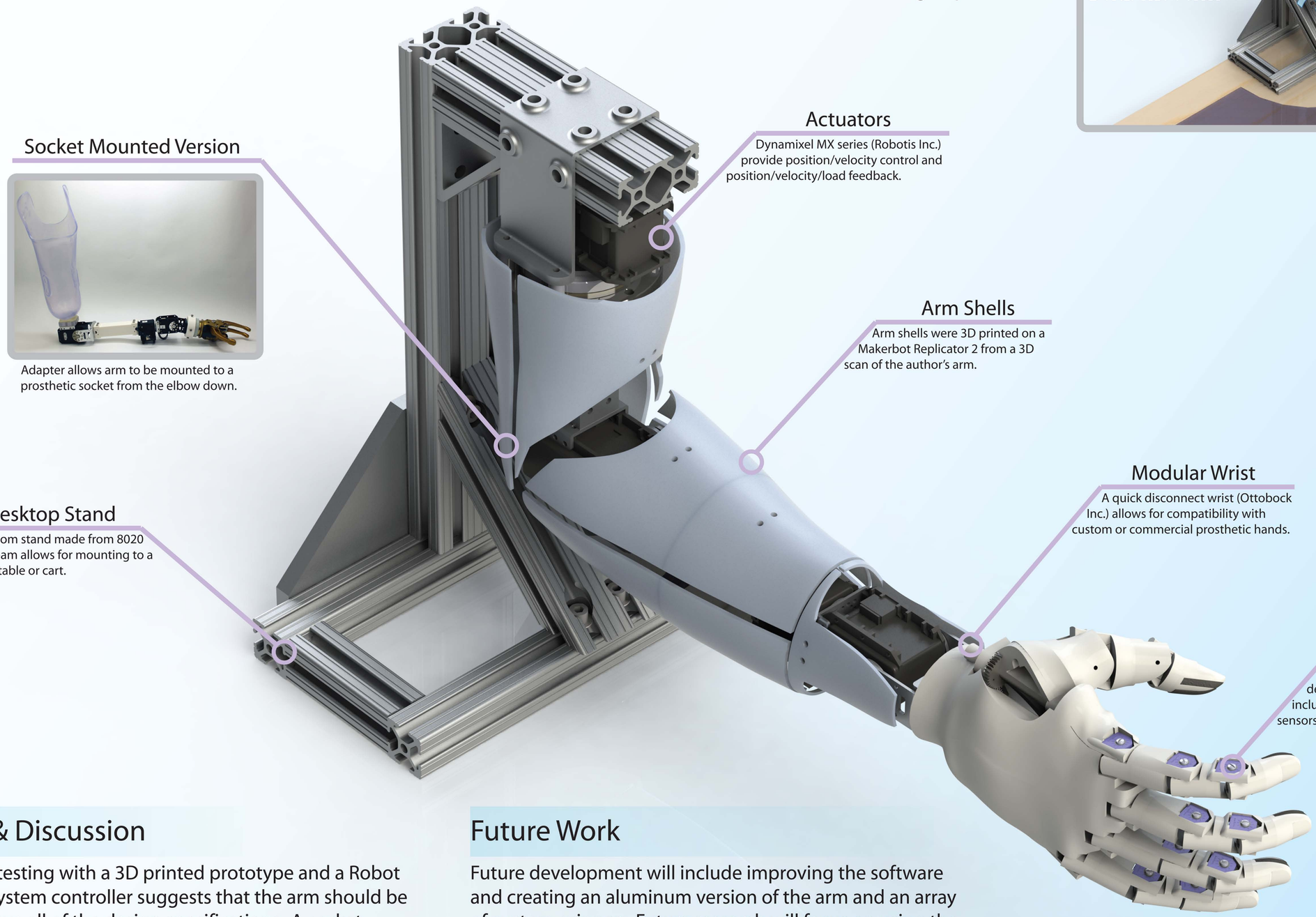
Introduction

The Myoelectric Training Tool (MTT) was developed to assess and train upper-limb amputee patients in how to use their muscle signals prior to being fit with their myoelectric prostheses. The original MTT included a desk mounted robotic arm, muscle sensors, controller, and graphical user interface and has been used in 5 different studies with able-bodied and amputee subjects. During these studies certain limitations were discovered in the MTT's off-the-shelf robotic arm.

Objective

To overcome these issues, an improved robotic arm, the Bento Arm, was designed specifically for myoelectric training and research with the following requirements:





Socket Mounted Version

Adapter allows arm to be mounted to a prosthetic socket from the elbow down.

Actuators

Dynamixel MX series (Robotis Inc.) provide position/velocity control and position/velocity/load feedback.

Arm Shells

Arm shells were 3D printed on a Makerbot Replicator 2 from a 3D scan of the author's arm.

Modular Wrist

A quick disconnect wrist (Ottobock Inc.) allows for compatibility with custom or commercial prosthetic hands.

HANDi Hand

A custom multi-articulated hand in development in our research lab that includes position, velocity, and load sensors.

Desktop Stand

Custom stand made from 8020 Beam allows for mounting to a table or cart.

Results & Discussion

Preliminary testing with a 3D printed prototype and a Robot Operating System controller suggests that the arm should be able to achieve all of the design specifications. A socket mounted version of the arm was worn by an above elbow amputee subject to successfully complete a grasping task.

Future Work

Future development will include improving the software and creating an aluminum version of the arm and an array of custom grippers. Future research will focus on using the arm to investigate clinical training protocols, machine learning controllers and sensory feedback systems.

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