Design and Development of a Diagnostic System to Enhance Trans-Radial Prosthetic Fabrication

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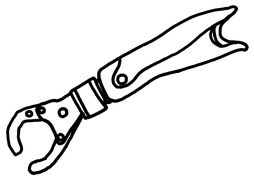
Background

Trans-radial (below-elbow) prostheses aim to replicate the form & function of the forearm + hand



Fabrication requires trial and error which results in:

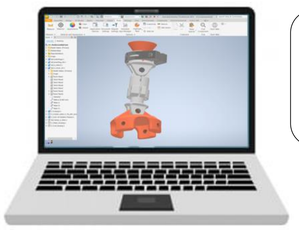
- More Client Visits
- Increased Manufacturing Time & Cost
- Higher Chance of Prosthetic Abandonment

Device Objectives

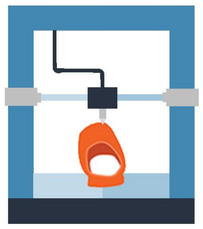
Design and develop a diagnostic prosthetic system to:

- Easily adjust forearm length & orientation
- Quantify the alignment adjustments
- Simulate weight, fit & function of the final prosthetic

Methods

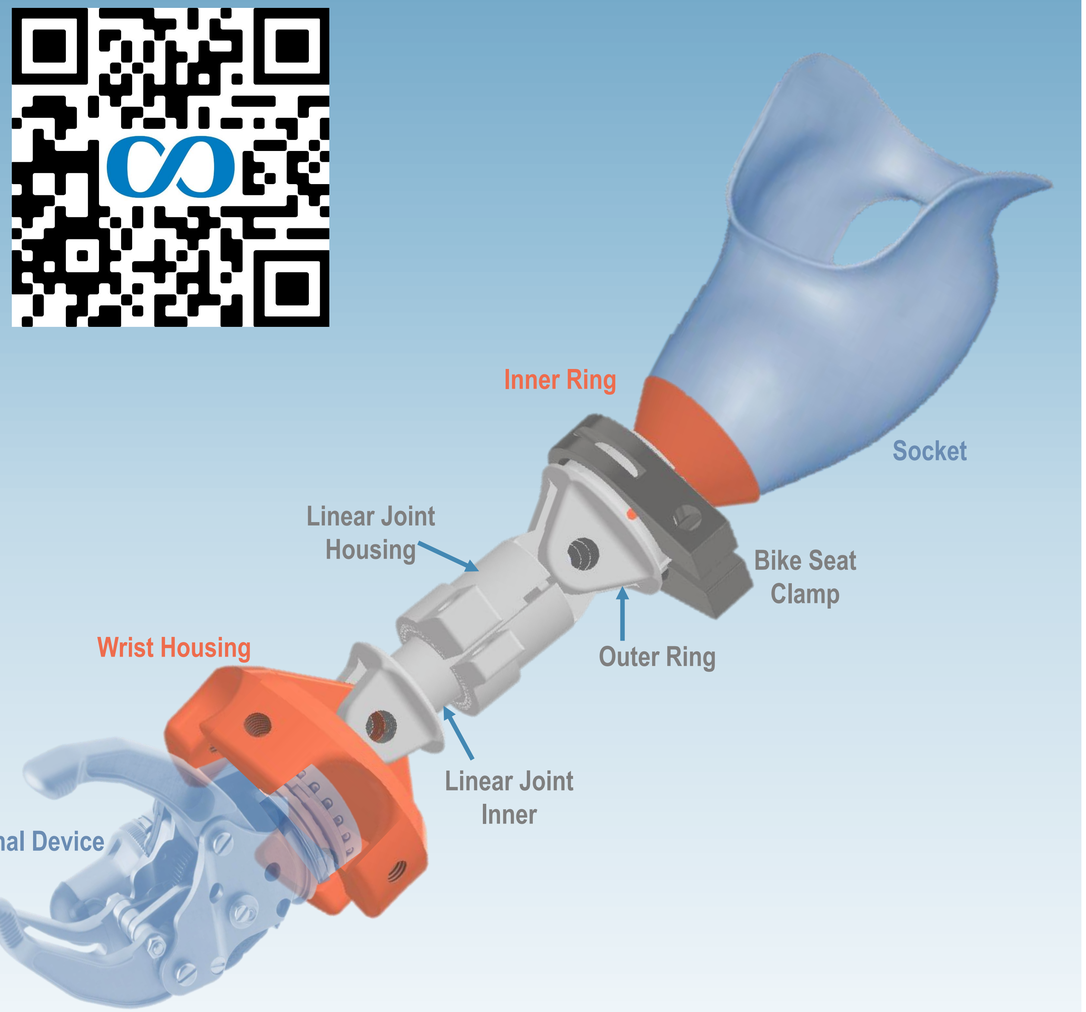


Computer-Aided Design was used to develop 12 different assembly models



3D Printing was used to fabricate prototypes and test the structural integrity of parts

An adjustable 'diagnostic' prosthesis system could be used to assess fit and function prior to fabrication of the final definitive prosthesis.



Holland Bloorview Kids Rehabilitation Hospital

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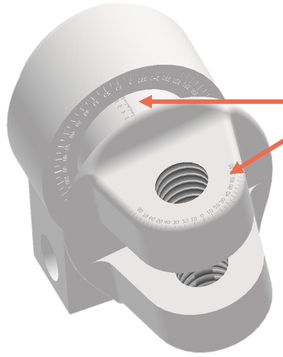
Design Considerations



Engravings to quantify length & orientation adjustments

Decoupled joint to align the device within the sagittal and frontal planes independently

This part is extendable to reach a wide range of forearm lengths

Hinge joint to increase range of motion and simulate function of the wrist

Results

Clinician feedback suggests that the final prototype is:

- **Compatible** with Existing Clinical Workflows
- Easy to Use, **Functional** & Reliable
- **Suitable** for Pediatric & Adult Clients

Impact & Future Steps

Once manufactured, the first-of-its-kind device will undergo pilot testing and clinical utilization to:

- Provide Holland Bloorview clients the opportunity to co-create their own prosthesis
- Promote the device across North America