

Dextera AI

Soft Bionic Hand Manufacturing Tutorial

(redacted version)

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1 Introduction

Dextera AI is a web-based platform developed by the Laboratory of Biomechanics, Faculty of Mechanical and Aerospace Engineering, Bandung Institute of Technology to optimize the patient-specific soft bionic hand.

2 Finger Anatomy

2.1 Segments

Consists of proximal phalange, medial phalange, and distal phalange. For thumb, it only has proximal and distal phalange.

2.2 Joints

Consists of metacarpophalangeal (MCP), proximal interphalangeal (PIP), and distal interphalangeal (DIP) joint. These joints will be represented by gaps between two rigid segments that allow manipulator to bend like human finger.

3 Parts

Soft bionic hand consists of five manipulators and one palm for one hand. Each manipulator represents each of fingers: thumb, index, middle, ring, and little.

4 Manufacturing Methods

Following the design parameters generated by Dextera AI, here are the step-by-step instructions to fabricate the soft bionic manipulator.

4.1 Print Components

3D print all parts for the inner and outer molds, along with any supplementary components required for assembly.

4.2 Assemble Inner Mold

Assemble the parts of the inner mold using bolts and nuts to secure them together.

4.3 Cast the Inner Core

Carefully pour silicone into the assembled inner mold. Allow the silicone to fully cure according to the manufacturer's instructions.

4.4 Prepare the Inner Core

Once cured, carefully remove the silicone core from the inner mold. Wrap a non-extensible thread spirally around the core.

4.5 Add Reinforcement Structures

Attach the fabric layer and rigid constraint structures onto the thread-wrapped core. Position these components precisely according to the spacing specifications provided by DexterA AI.

4.6 Cast the Outer Body

Place the prepared inner core inside the outer mold assembly. Pour silicone into the cavity between the core and the outer mold. Allow it to fully cure.

4.7 Demold the Manipulator

Once the outer layer has cured, carefully remove the finished soft manipulator from the mold.

4.8 Attach Pneumatic Connection

Insert the end cap, which is pre-fitted with a silicone tube, into the base opening of the manipulator. Use a small amount of silicone to seal the connection and create an airtight bond. Allow the sealant to cure completely.

4.9 Finalize Assembly

The soft manipulator is now complete and ready for testing and integration into the bionic hand.