

Soft Robotics: 3D-printing an orthotic for a partly paralyzed client

In this project the new technology of 3D printed, one-piece, pneumatic products will be used to research the possibility to apply this technology in the field of orthotics. Orthotics is used to support, align, prevent or correct moveable parts of the human body. The project is set up with a partly paralyzed client who is looking for (soft robotic) solutions to improve the grasping capabilities of his hands.

A lot of braces that exist nowadays are made from rigid and heavy materials. One of the problems with these braces is that they often prevent or impede other functions than the intended one. This is mostly due to their weight and incapability of following complex movements of the human body. There are a few projects with 3D printers that have made braces for people with some kind of impairment but these braces are also rigid.

Another part of the orthosis might be measuring the movement or detecting movement which has to be corrected. This data can be saved to the device and help doctors to correct the therapy for example. Soft robotics might be a good step towards a solution of these problems.

There is already an air pressure driven silicone bellow developed by Polygerinos et al.. Rob Scharff realized a device using 3D printing, which can be regarded as a proof of principle for the design of dynamic orthoses.



Figure 1 Glove of Polygerinos



Figure 2 Hand of Rob Scharff

This design research project will be in collaboration with Sophia Revalidatie in Delft. They are able to provide the required knowledge about the human body and orthotics. The Sophia knowledge Centre will help set up the tests which are being done during the project as there are several guidelines for medical products and testing to be followed.

It will be an interesting project for the faculty to create a new application of a trending technology, namely 3D printing, to create products that can help people recover.

Activities to be carried out during the project:

- Literature study 3D-printed soft robotics
- Explore portable pneumatic power supplies
- Analyze client's needs
- Analyze existing orthoses at Sophia Revalidatie
- Develop a new and improved orthosis for the client using the technology described above
- Test and evaluate a prototype of the orthosis with the client at Sophia Revalidatie