MIDDLESEX UNIVERSITY LONDON - ADVANCED MECHATRONICS

REPORT ON MEETING -05 OCT 2018

OVERVIEW

The focus of this meeting was to review and discuss the current state of the exoskeleton and to propose a new development plan. As discussed in the meeting, please find a list of the key points highlighted below.

Shoulder Joints and Pneumatic Muscles

Upon review, it was decided that the current configuration of the joints especially the shoulder joints, posed a potential safety risk, and therefore had a limited range of motion.

In the quest to increase the safety, the overall range of motion, and the structure of the exoskeleton the following solutions were proposed.

- A complete redesign of the joint hierarchical arrangement, possibly using *Igus bearings*, electric motors (where appropriate), and relocating the position of the pneumatic muscles.
- Changing the current air muscles to appropriate industrial replacements from *Festo*, or possibly experimenting with other factors to improve the reliability and safety of the air muscles.

The other factors mentioned are:

- Varying the width and length of the air muscles,
- Changing the seal on the muscles to soft seals using silicon and or plastic clamps,
- Adding an internal tube to offset the entry point of the compressed air into the pneumatic muscle, and
- Using brake lines to actuate the various shoulder and elbow joints.

Exoskeleton Control

The exoskeleton is controlled via midi notes using *Ableton Live* with a special plugin. During the meeting, it was noted that the process of creating a play sequence was very time consuming and unreliable.

As a result, the following solutions were proposed:

- Adding a closed loop control system to the exoskeleton using potentiometers as a possible source of feedback for the joint positions.
- Building a second non-actuated exoskeleton with various feedback sensors that monitor its joints state and relays the obtained information to be used to control the main exoskeleton.

Note

It was noted that potentiometers might not be the best way to monitor the position of the joints, as they might have a lot of friction.