REXOS

Progress Report for a

Rehabilitation Exoskeleton Hand Device

Project Team: Anton Khomutskiy
Joshua Law
Tony Lee
Seungjun Lee
Doug Tao

Contact Person: Tony Lee
leetonyl@sfu.ca

Submitted to: Dr. Andrew Rawicz–ENSC 440W
Steve Whitmore–ENSC 305W
School of Engineering Science
Simon Fraser University

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Introduction

Rexos is aiming to develop an active exoskeleton device, the RexoGrip, which will provide power assistance to user's who have difficulty with hand mobility. This document will provide information regarding the current status of our product and the scheduled plans till completion. The RexoGrip will actuate the index, middle, ring, and pinky finger, using two push switch sensors on each finger to control the upwards and downwards movement. The device will use an Arduino Uno R3 as the microcontroller. Our project is currently running on two streams for the hardware aspect, with two different designs being implemented.

Schedule

In comparison to our original schedule (shown below in Figure 1), we have broken the hardware assembly into sub-stages for each finger, seeded throughout the implementation period. We are currently 30% through integration, and one week behind our projected timeline.

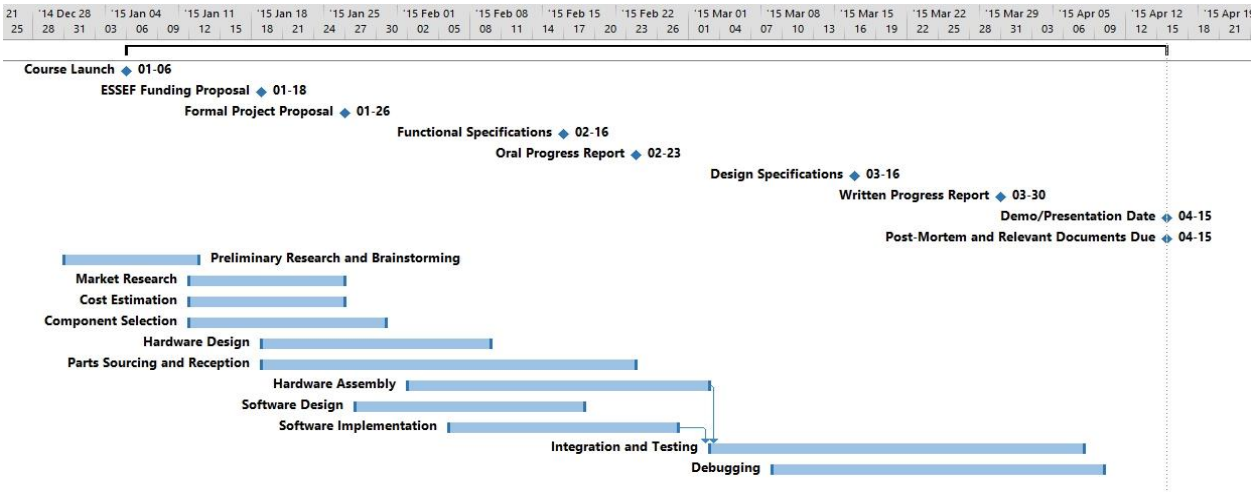

Figure 1 - Original Gantt Chart

Financial

We are currently under budget, and our expenses to date have been less than the funding that we've received. We have received $750 from the Engineering Student Society Endowment Fund and have spent $730, with the cost breakdown as shown in Table 1. We do not know the final cost for 3D printing but are quoted by Gary to cost $6/cubic inch which will come to approximately $50 - $100, however, we will receive additional money via the Wighton Fund to cover the 3D printing costs.

Table 1 - Approximate Expenses

	Budget	Expenditure
Motors	$425	$430 (+$5)
Microcontroller Unit	$85	$80 (-$5)
Materials	$100	$175 (+$75)
Miscellaneous	$150	$45 (-$105)

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Progress

Throughout the development of the RexoGrip, our team has been meeting three times every week to touch base and also as work sessions. One formal meeting was to be held each week to meet the meeting minutes documentation requirement, but in the last two weeks we have forgone the formal meetings for more work time. To date, all other documentation have been submitted on time, and the only document remaining is the post-mortem.

Hardware

We currently have two hardware designs in motions for the exoskeleton frame, dubbed "Plan A" and "Plan B".

Plan A is to have our design be fabricated via 3D printing. The 3D computer model has been designed and will be printed on March 30, 2015 by Gary using the SFU 3D printer. The model will then need to assembled and validated for functionality.

Plan B is to fabricate a different design using Plexiglas and miscellaneous materials. For this stream, the design has been validated and finalized. Completion of the index finger mechanism has been achieved with push switches implemented, allowing motor assisted actuation of the index finger. The fabrication of the hardware mechanisms for the middle, ring, and pinky finger will be done this week, along with push switch implementation.

Software

The software has been completed and is functional, interacting with the push switches and motors that we are using. The code has been uploaded to the Arduino Uno and have been tested to be working with 8 push switches and 4 servo motors. Two push switches are assigned to a specific motor, controlling the left or right rotation of the motor. The software will need to be fine-tuned for each finger's default position and range of motion, which will be completed after the specific motor has been mounted.

Electrical

The electrical diagram for the device has been defined and tested via breadboard. Long stranded wire has been obtained from the Lab 1 resource office. Further soldering to finalize the wiring will be done in the last week when the project is near completion.

Enclosure

An enclosure to hold our device's two power supplies and the microcontroller is being constructed out of Plexiglas. The layout of the enclosure has been defined and the pieces of the enclosure has been cut out. The next step for this will be to assemble the enclosure.

Remediation

The project was planned to be completed by April 9th, with the assumption that our demo would be held mid-April. We are currently a little under one week behind schedule in terms of hardware, however our demo is on April 17th and we are confident that we can complete our project by then. Our timeline for the next 3 weeks are as follows:

March 30 – April 3

- 3D print Plan A, begin assembly and testing
- Fabricate and mount middle, ring, and pinky finger parts for Plan B
- Assemble enclosure
- Solder wiring

April 5 – April 10

- Test finalized system
- Project completion by April 10

April 13 – April 17

- Prepare documentation and practice for presentation

Conclusion

In summary, the development of a rehabilitation exoskeleton hand device is going according to plan and our team members are confident in being able to showcase a functioning prototype by the demonstration date, April 17th.

