Design and implementation of a research platform using the Leapmotion

Ruben Debien

Master of Electronics and ICT Engineering Technology

Jonas Vanstraelen

Master of Electronics and ICT Engineering Technology

RE p ☰ Ruben & Jonas

Objective

Data collection on a large scale is important for present-day research institutions. Tasks are currently performed locally at the home of the patient or the practice of a physiotherapist. By creating an online **platform** this data collection system could be used in many different countries and by various researchers.

Aim

- To lay the groundwork for the research platform and provide different tasks.
- Research **Leap Motion** and its research capabilities
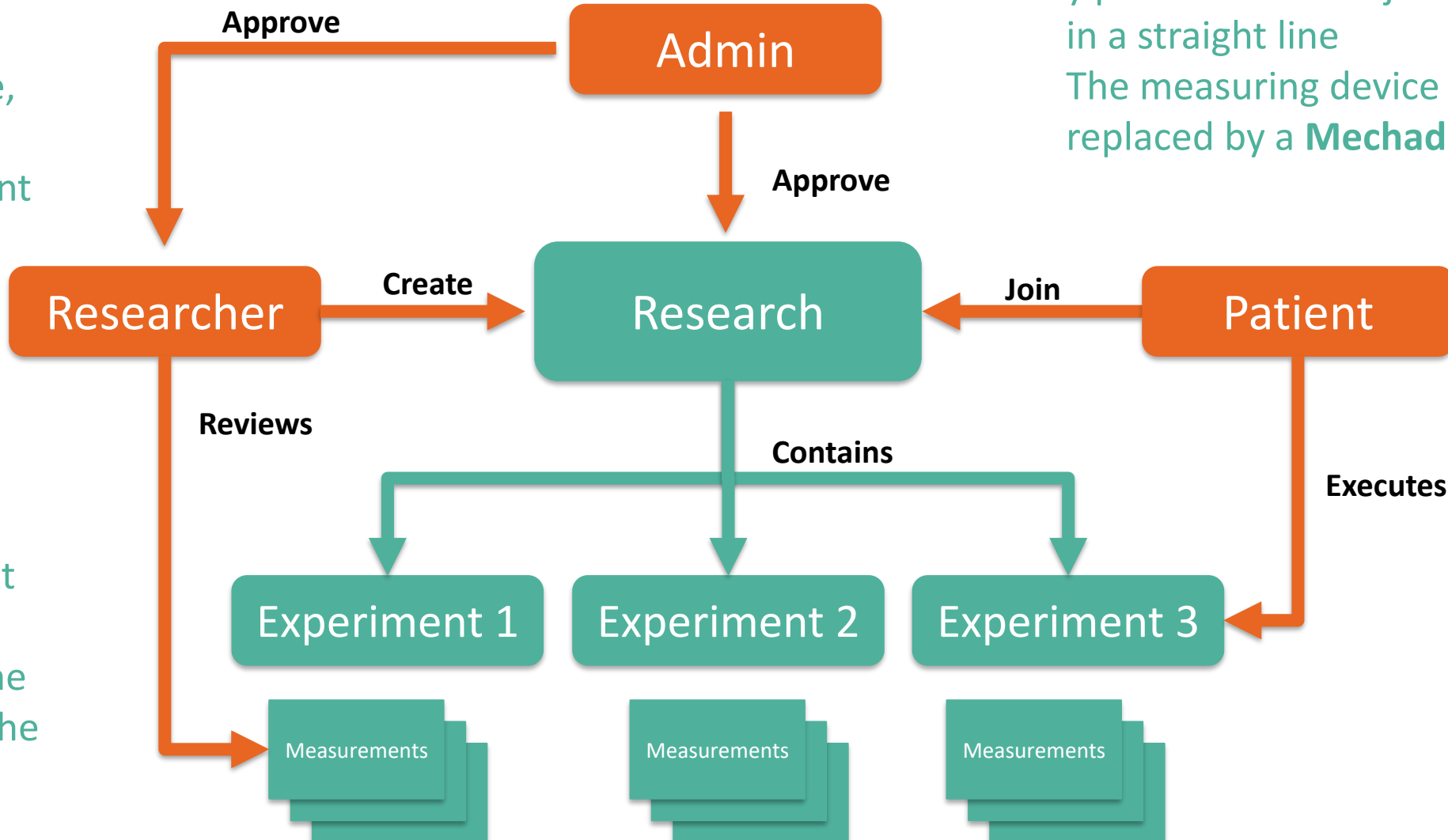- Deploy system for GLW master's theses

[1]

Method

Platform:
To implement the research platform, a website was created. This website is the central point of the platform and every task and functionality is contained within the website, only hardware devices like the **Leap Motion** and **Mechaduino** were used as measurement instruments. Different frameworks, like: **Laravel** and **Spring Boot,** were used to facilitate the different functionalities on the site.

Pursuit tasks:
Consisting of a **target** object and a **cursor** object, this task involves following that target object with the cursor. The target object moves around in a **circular trajectory** with the direction decided by the dominant hand of the patient.
Two types of pursuit tasks are implemented: the **acceleration** and the **disappearing** version. The former has an accelerating target object while the latter has a disappearing target.

Bimanual motor tracking task:
This task requires the user to rotate 2 disks which control the x and y position of an object. This object has to follow a target that moves in a straight line
The measuring device for this motor tracking task has been replaced by a **Mechaduino,** which can used to measure the angle of a stepper motor and provide motor control. This can be used to create a task where users are tested with a counter torque and make the task more difficult

Leap Motion:
Digitalization is the future and this also applies to the rehabilitation sector. The leap motion sensor is a **hand and finger tracking** sensor making it ideal for detecting **finger pinches**. Currently physiotherapists need to physically check patient's finger pinches but with the leap motion this problem could be solved. Then patients can do their tests at home and the researcher can analyze that data at work.

Approve → Admin

Approve

Researcher — Create → Research ← Join — Patient

Reviews

Contains

Executes

Experiment 1 | Experiment 2 | Experiment 3

Measurements | Measurements | Measurements

Results

Different **pursuit tasks** and a **bimanual motor tracking task** were implemented into the platform and the platform successfully functioned as a measuring platform for the two master's theses.
The **Leap Motion's** current hand tracking model was deemed too inaccurate for research purposes.

Conclusion

A research platform where researchers can collaborate and collect data was successfully developed. However, the project is still in its early stages and is therefore not finished yet, other tasks and extensive security could still be added.

[1]"Leap Motion VR Hand Sensors Will Replace all Controllers", Edgy Labs, 2018. [Online]. Available: https://edgylabs.com/leap-motion-hand-vr. [Accessed: 03- Jun- 2018]

Supervisors / Cosupervisors: Prof. dr. Raf Meesen – REVAL
Prof. dr. ir. Ronald Thoelen – IMO-IMOMEC
Ing. Thijs Vandenryt – IMO-IMOMEC

IMO-IMOMEC ▶▶UHASSELT · imec   BIOMED-REVAL REHABILITATION RESEARCH CENTER ▶▶UHASSELT   ▶▶ UHASSELT   KU LEUVEN