

Introduction

- The Leap Motion Controller (LMC) is a low cost portable device used to assess hand kinematics during object manipulation in an virtual environment
- A virtual take on the standard peg-test (NHPT)[1] running on Unity3D
- The focus of this study was the analysis of the LMC's closed source pinch strength and its comparison to force sensors
- Leap's pinch strength was compared against iBox based force analysis [2]

Materials and Methods

- Ten healthy, able bodied participants, age: 22,3 (\pm 2) participated in this study
- Portable Linux setup (estimated latency of less than 100ms)
- Trials were timed giving a Time Score which can be used as an secondary assessment

	Trial 1	Trial 2	Trial 3
Time(s)	74.16 \pm 39.69	57.25 \pm 36.17	38.66 \pm 11.68

Table 1 : Mean time scores \pm standard deviation

Results and Discussion

- Pinch strength shows an inverse correlation with the distance of index finger and thumb tip (Figure 1).
- LMC pinch strength shows similar traits to the force sensor data [2] (Figure 2)
- Pinch strength shows an overshoot (up to 30%), similar to the force peak observed in [2]
- Adaption phases using the LMC are slower or sometimes missing most likely due to absent tactile feedback

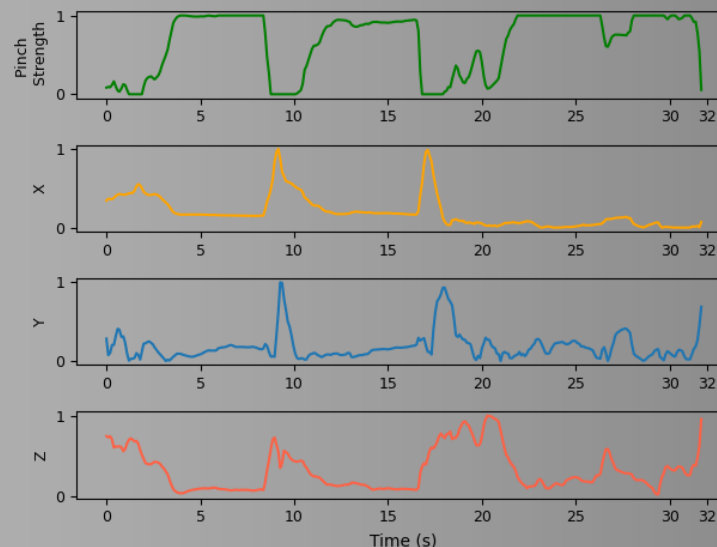


Figure 1: Pinch strength compared against the distance of the index and thumb distal phalanx along the axes of LMC's coordinate system.

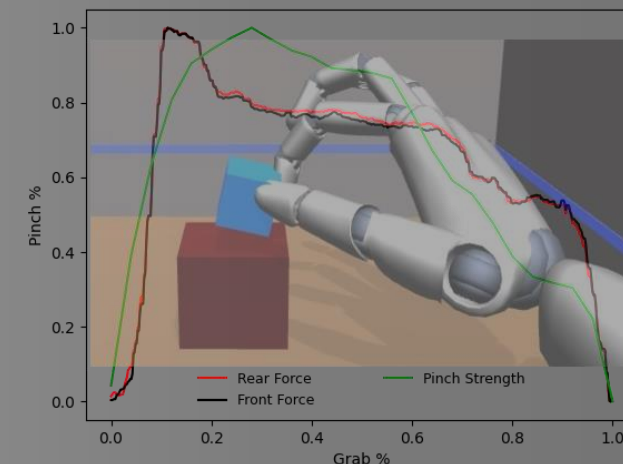


Figure 2: Pinch strength compared against normalised force measurement of the iBox faces

Conclusion

- Participants on average, decreased their overall task performance time
- Pinch strength is not an actual measurement of force but rather an indicator of the current pinch pose
- Visual feedback given by the game may replace the missing tactile feedback to some extent [1]

References

1. Dominik Buchmann (2020). *Interactive Visualisation to assess hand Kinematics*, Bachelor Thesis, University of Heidelberg https://github.com/dombmann/Bachelor_Game
2. Martin-Brevet, S. et al. (2017). PloS one, 12: e0178185
3. Grice et al. (2003). Amr. Occp. Ther.Ass., 57: 570-3.