

References for 16-848 for February 19, 2020

We started by talking about human benchmark tests, including these:

The Kapandji test:

https://en.wikipedia.org/wiki/Kapandji_score

<https://ars.els-cdn.com/content/image/1-s2.0-S0266768103000160-gr6.jpg>

Block and Box test:

<https://www.youtube.com/watch?v=jmpNXj5oOo0>

Purdue Pegboard test (fine dexterity):

<https://www.youtube.com/watch?v=xXT9E4OY9tw>

ARAT test (different shaped objects):

<https://www.youtube.com/watch?v=f8oiH5OA1Cw>

Jebsen Hand Function test (daily living):

<https://www.youtube.com/watch?v=ZUzSOOrtz6M>

<https://www.sralab.org/rehabilitation-measures/jebsen-hand-function-test>

Sollerman test (daily living, including bimanual actions):

<https://www.youtube.com/watch?v=adaoXVzp3ks>

<http://www.swisswuff.ch/images/adl/adl-pdf/sollermann1995handfunctiontest.pdf>

SHAP test (a more recent test):

https://www.youtube.com/watch?v=5Lby_R0EDeQ

The subject in this video is using Otto Bock's Michelangelo Prosthetic Hand, which you can read about here:

<https://www.ottobockus.com/prosthetics/upper-limb-prosthetics/solution-overview/michelangelo-prosthetic-hand/>

You can find a simulation setup for the SHAP test here (scroll down the list):

<http://www.mujo.org/forum/index.php?resources/categories/models.3/>

<https://vikashplus.github.io/Publications.html>

In robotics, benchmarks often take the form of competitions, such as the DARPA ARM challenge:

<https://www.youtube.com/watch?v=jeABMoYJGEU>

The National Institute of Standards and Technology is making a strong effort to establish a variety of benchmarks for evaluating robot hands, and their current benchmark set can be found here:

<https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.1227-draft.pdf>

This paper introduces the YCB object dataset, designed to at least standardize the object set that we use for benchmarking. I have one of these sets in my office.

<http://www.ycbbenchmarks.com/object-set/>

The benchmarks that we browsed, posted to the YCB website are here:

<http://www.ycbbenchmarks.com/protocols-and-benchmarks/>

We also looked at a few papers in a little more detail. Here are the references:

Cruciani, Silvia et al. "Benchmarking In-Hand Manipulation." IEEE Robotics and Automation Letters 5.2 (2020): 588–595.

<https://arxiv.org/abs/2001.03070>

Cruciani, Silvia, Christian Smith, Danica Kragic, and Kaiyu Hang. "Dexterous manipulation graphs." In 2018 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), pp. 2040-2047. IEEE, 2018.

<https://ieeexplore.ieee.org/abstract/document/8594303/>

Llop-Harillo, Immaculada, Antonio Pérez-González, Julia Starke, and Tamim Asfour. "The Anthropomorphic Hand Assessment Protocol (AHAP)." Robotics and Autonomous Systems 121 (2019) <https://www.sciencedirect.com/science/article/pii/S0921889019300946>

Yang, Boling, Patrick Lancaster, Siddhartha Srinivasa, and Joshua R. Smith. "Benchmarking Robot Manipulation with the Rubik's Cube." IEEE Robotics and Automation Letters (2020).

<https://ieeexplore.ieee.org/abstract/document/8972349/>

Ryan has also provided the references that he mentioned in class:

The paper which discusses the "reachable configuration manifold" (Odhner & Dollar, 2015), especially see Figure 13 <https://journals.sagepub.com/doi/pdf/10.1177/0278364914558494>

These videos <https://youtu.be/5V6FLd7KvNk> <https://youtu.be/6ry0j2YUQBc> are from different papers, but still helpful in understanding what's going on.

There's also this paper <https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=8793727> (Morgan, Bircher, Calli, Dollar, 2019) which discusses several different dexterity metrics in Section III A.