References for 16-848 for February 7, 2022

We spoke about a number of taxonomies. Here are the ones that are mentioned in the slides. It is interesting to read the papers as well.

The first was the Cutkosky taxonomy taken from machinist grasps. Notice that the goal is to develop an expert system to decide on grasp choice given needs of the grasp:

Cutkosky MR. On grasp choice, grasp models, and the design of hands for manufacturing tasks. Robotics and Automation, IEEE Transactions on. 1989 Jun;5(3):269-79. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.455.2202&rep=rep1&type=pdf

This one has the pictures showing contact (and the comment that maybe these are all the grasps we need!)

Kamakura N, Matsuo M, Ishii H, Mitsuboshi F, Miura Y. Patterns of static prehension in normal hands. American Journal of Occupational Therapy. 1980 Jul 1;34(7):437-45. http://ajot.aota.org/Article.aspx?articleid=1889836

We have seen this one before, earlier in the class. The grasping part, "Modes of Prehension" begins on page 265 of the pdf.

Kapandji IA. The physiology of the joints: upper limb, Vol 1. Elsevier Health Sciences; 1987. http://graphics.cs.cmu.edu/nsp/course/16899-s16/papers/Kapandji.pdf

Here are some additional references from today's slides:

Iberall, Thea. "Human prehension and dexterous robot hands." The International Journal of Robotics Research 16, no. 3 (1997): 285-299. https://journals.sagepub.com/doi/abs/10.1177/027836499701600302

Thomas Feix, Javier Romero, Heinz-Bodo Schmiedmayer, Aaron M. Dollar, and Danica Kragic, The GRASP Taxonomy of Human Grasp Types, IEEE TRANSACTIONS ON HUMAN-MACHINE SYSTEMS (to appear). http://grasp.xief.net/ http://ieeexplore.ieee.org/document/7243327/

You can find the I-Limb manual here. https://www.ossur.com/en-us/prosthetics/arms/i-limb-ultra-titanium

Also see this custom grip library: https://www.ossur.com/en-us/prosthetics/prosthetic-users-info/information-for-upper-limb-users/i-limb-qr-codes

Our 73 grasp taxonomy which advocates for encoding forces, motion, stiffness, and the intent of action is written up here:

Liu, Jia, Fangxiaoyu Feng, Yuzuko C. Nakamura, and Nancy S. Pollard. "Annotating everyday grasps in action." In *Dance notations and robot motion*, pp. 263-282. Springer, Cham, 2016.
https://www.ri.cmu.edu/wp-content/uploads/2017/12/LaumondBookChapter.pdf

You can find the database itself at this link. Check it out!
http://www.cs.cmu.edu/~jialiu1/database.html

The project that involved the pizza box and salad container is written up here:

Nakamura, Yuzuko C., Daniel M. Troniak, Alberto Rodriguez, Matthew T. Mason, and Nancy S. Pollard. "The complexities of grasping in the wild." In *2017 IEEE-RAS 17th International Conference on Humanoid Robotics (Humanoids)*, pp. 233-240. IEEE, 2017. https://ieeexplore.ieee.org/abstract/document/8246880

My favorite reference for in-hand manipulation is the following:

Elliott JM, Connolly KJ. A classification of manipulative hand movements. Developmental Medicine & Child Neurology. 1984 Jun 1;26(3):283-96.
http://graphics.cs.cmu.edu/nsp/course/16899-s16/papers/Elliott1984.pdf