

## References for 16-848 for March 23, 2020

We started by talking about some specific sensors. The first was the GelSight sensor.

Yuan, Wenzhen, Siyuan Dong, and Edward H. Adelson. "Gelsight: High-resolution robot tactile sensors for estimating geometry and force." *Sensors* 17, no. 12 (2017): 2762.

<https://www.mdpi.com/1424-8220/17/12/2762>

<https://www.youtube.com/watch?v=aKoKVA4Vcu0>

This sensor has recently been incorporated into a dexterous two-fingered gripper:

Wilson, Achu, Shaoxiong Wang, Branden Romero, and Edward Adelson. "Design of a Fully Actuated Robotic Hand With Multiple Gelsight Tactile Sensors." *arXiv preprint arXiv:2002.02474* (2020).

<https://arxiv.org/abs/2002.02474>

<https://www.youtube.com/watch?v=4hxsZ9nHJWI>

We then had a look at the FingerVision sensor:

Yamaguchi, Akihiko, and Christopher G. Atkeson. "Implementing tactile behaviors using fingervision." In *2017 IEEE-RAS 17th International Conference on Humanoid Robotics (Humanoids)*, pp. 241-248. IEEE, 2017.

<http://akihikoy.net/notes/?project%2FFingerVision>

We then turned to capacitive sensing, looking especially at the flexible sensing technology described in this paper:

Charalambides, Alexi, and Sarah Bergbreiter. "Rapid manufacturing of mechanoreceptive skins for slip detection in robotic grasping." *Advanced Materials Technologies* 2, no. 1 (2017): 1600188.

<https://onlinelibrary.wiley.com/doi/full/10.1002/admt.201600188>

We looked at magnetic sensing for soft hands, which basically uses the technology in this paper, without the whisker:

Kim, Suhan, and Camilo Velez. "A Magnetically Transduced Whisker for Angular Displacement and Moment Sensing." In *IEEE/RSJ International Conference on Robots and Systems*. 2019.

<https://ieeexplore.ieee.org/document/8968518>

Finally, we had a look at this 2015 survey, reviewing the various types of sensors and their uses with various robot hands.

Kappassov, Zhanat, Juan-Antonio Corrales, and Véronique Perdereau. "Tactile sensing in dexterous robot hands." *Robotics and Autonomous Systems* 74 (2015): 195-220.

<https://www.sciencedirect.com/science/article/abs/pii/S0921889015001621>

You may also find the following survey useful. It provides complementary information to the first one and also gives some benchmarks from human sensory capabilities.

Yousef, Hanna, Mehdi Boukallel, and Kaspar Althoefer. "Tactile sensing for dexterous in-hand manipulation in robotics—A review." *Sensors and Actuators A: physical* 167, no. 2 (2011): 171-187.

<https://www.sciencedirect.com/science/article/abs/pii/S0924424711001105>

This recent survey focuses on optical sensing. However, it also mentions in detail the commercial sensors that are currently used on various robot hands. If you can't find it online (check Akihiko's web page), ask me for a copy.

Yamaguchi, Akihiko, and Christopher G. Atkeson. "Recent progress in tactile sensing and sensors for robotic manipulation: can we turn tactile sensing into vision?." *Advanced Robotics* 33, no. 14 (2019): 661-673.