05:33:48 Shan Luo: https://www.youtube.com/channel/UCc8Ro4QD0URX2jNqfs8pbbA?view_as=subscriber
05:34:46 Shan Luo: This is the YouTube Channel of the workshop, we will upload the videos there, so please subscribe the channel!
05:35:03 Nathan Lepora: Please subscribe - then we get a nice web address once we reach 100 subscribers :-)
05:39:16 Juan Antonio Corrales Ramón: Subscription done! Thank you! By the way, the workshop webpage seems to be down now: wordpress.csc.liv.ac.uk/smartlab/vitac-2020/
05:48:46 Nathan Lepora: @Robert Haschke: (global vs local pose) - yes we perceive the local pose of an object feature. We place the fingertip on part of the object, and the servoing starts from there. You could infer the global pose of an object by having an object model and using this with the local pose information
06:05:23 Nathan Lepora: @Gordon - what is the latency in your control loop from the tactile sensing computations? how fast/slow does it need to be for common interactions?
06:10:50 Shan Luo: @Gordon, how about the implementation of the sensors at the joints or other corners of the robot?
06:11:29 Kaspar Althoefer: @Gordon: What is the price of your sensor, e.g., for one robot arm?
06:22:49 Robert Haschke: @Prof. Allen: Completion requires prior segmentation, right? How is that done in cluttered scenes?
06:25:30 Robert Haschke: How many training data a required for learning?
06:32:49 Yitao Ding: With known objects completion and segmentation can be realized from the known dataset. But how can segmentation be applied for unknown objects?
06:40:41 Brayan Impata: @Prof. Allen: How much of that human grasp adaptation when blindfolded could be due to previous knowledge of the object? If I touch something I know, then I could already know whether the grasp I am about to execute is good for the given object.
06:40:57 jiaqi jiang: @Prof. Allen: how to get reliable tactile information when robots touch a non-fixed object ? This is the question I got when I was reading the paper Multi-Modal Geometric Learning for Grasping and Manipulation
06:50:46 Xiaogang Hu: Can you use the tactile sensor to learn other object features besides geometry? like stiffness
07:06:26 Nathan Lepora: @Daniel, @Shan - the variable focal length lens sounds interesting... how do these work?
07:12:30 Daniel Fernandes Gomes: @Xiaogang Hu: Yes. The obtained tactile image is similar to traditional GelSight, so the same kind of methods can be applied, or instance CNNs. With the addition of the markers, methods that exploit the tracking the markers' position, should be possible as well.
07:15:23 Arpit agarwal: @Daniel can you post the link or name of the variable focal length camera you are talking about?
07:18:39 heba: @wenzhen are you able to share the texture database?
07:20:01 Shan Luo: Ah, probably…
07:21:40 Daniel Fernandes Gomes: @arpit agarwal - Microsoft LifeCam Cinema/Studio

07:25:12 Arpit agarwal: @heba I believe http://people.csail.mit.edu/yuan_wz/clothing-perception.htm contains the texture gaslight data.
07:25:56 heba: thanks @arpit! great!
07:35:14 Brayan Impata: How can we be sure that the visual features learned are not dependant of the colour of the pieces of fabric? Could you detect any confusions between fabrics with similar colours?
07:39:57 Wenzhen Yuan: @Brayan: We augmented the visual dataset by changing the colors. So by expectation color won't affect the perception.
07:40:43 Brayan Impata: Ok, thanks!
07:56:40 Robert Haschke: @Roberto: Where can we order the DIGIT sensor for $15 ?
07:57:45 Lorenzo Natale: @Roberto: which interface does DIGIT provide?
08:02:33 Lorenzo Natale: electrical interface usb?
08:03:02 Lorenzo Natale: thanks
08:03:04 Rui Ouyang: What is the programming process / interface for flashing the firmware?
08:05:08 Roberto Calandra: It is detailed in the github repo. I believe that the version release make use of some software from the producer of the camera.
08:05:34 Roberto Calandra: *chip, not camera
08:08:12 Rui Ouyang: Ah, right, the FT900 mcu is listed on the BOM. I am not familiar with it. Maybe I can organize to do a batch pcb and component order, and someone else in the community can contribute firmware expertise, and we can add build process documentation. Thank you!
08:10:04 Roberto Calandra: If the instructions for flashing the firmware are not clear, we are happy to improve the documentation. Also if you have any question/feedback feel free to open a ticket on github and we will look at it
08:15:55 Rui Ouyang: Wow, thank you!
08:39:31 Lorenzo Natale: Do you have an estimation of the precision with which you can reconstruct forces on the biotact? (in terms of Newton or Pascal)
08:41:59 Yashraj Narang: Median errors of approximately 0.5-0.6 N, with respect to maximum force ranges of 5-20 N during the experiments
08:43:51 Zihan Ding: What software did you use for building the soft-body deformation with finite element method?
08:43:52 Jakub Tomasek: @Prof Fox I would be interested how the performance would deteriorate in Dexpilot if latency was introduced. Have you tested that?
08:44:30 Yashraj Narang: @Zihan, we used ANSYS. We have a commercial license, but I believe there is a free license for students. We are also aiming to port the model into open-source FEM software
08:44:44 Zihan Ding: Cool, thanks.
08:45:23 Arpit agarwal: Can you share the paper reference for FEM modeling of BioTac and indenter?
08:46:00 Arpit agarwal: Did you try out some experiments with soft indenter and BioTac?

08:47:58 Yashraj Narang: @Arpit, absolutely. We will be submitting camera-ready for RSS on Wed, after which we'll post on ArXiv. Paper is titled "Interpreting and Predicting Tactile Signals via a Physics-Based and Data-Driven Framework." We haven't tried soft indenter. I have faith that the FEM model will still work well due to the strong physics constraints on the simulations, but I suspect PointNet++-based NN predictions may become less reliable.
08:48:33 Arpit agarwal: Thanks. I will be on the look out.
08:57:37 Juan Antonio Corrales Ramón: @ Yashraj, thank you for the reference to ArXiv. I will take a look when you publish it. It is a very interesting work!
09:00:38 Yashraj Narang: Thank you! If anyone has any follow-up questions, please feel free to email me at ynarang@nvidia.com.
09:17:06 Wenzhen Yuan: Questions from audience?
09:18:20 Shan Luo: @Alberto, how was the ground truth of the cable trajectory obtained?
09:29:13 Arpit agarwal: What have panelists heard from people who are not using tactile sensing and doing manipulation?
09:30:22 Arpit agarwal: Is it unavailability, clarity or laziness?
09:33:59 SIAO WANG: Thanks for the brilliant talks! I would like to ask about your insights about large scale tactile skins. What do you think is the optimal representation of tactile signals catering the limitation of embedded systems and for reactive control considering essentially now the raw tactile data are mostly 2D?
09:38:27 Arpit agarwal: Should the community focus on manipulation tasks or abilities of tactile sensing(like precision, dynamic range) while working on tactile perception?
09:39:22 Kshitij Minhas: What are some of the integrated tactile sensors do researchers here use? Only off-the-shelf reliable sensor I have found is the SingleTact sensors from Pressure Profile.
09:39:24 Stefan Escaida Navarro: Many thanks to the organizers and the speakers for this excellent workshop! (I have to leave)
09:40:46 Alberto Rodriguez: I need to leave. This was a great workshop!! Thanks to the organizers!!
09:46:52 Dieter Fox: Sorry, I have to leave as well. Thanks for organizing this excellent workshop!
09:48:47 Shan Luo: Thank you very much for joining us Dieter and Alberto. It is our great honour to have you here!
09:49:24 Rafael Fierro: Great workshop. Have a great week. Thank you!!
09:50:04 Vincent Hayward: hi all, sorry, for some reason, my connection is very bad; i get about 30% of what is being said. Thank you for a great workshop and amazing progress.
09:51:58 Arpit agarwal: What have people heard from industrial sector especially manipulation?
09:52:00 Robert Wilbrandt: What do you think will be the applications potentially driving the comercialization of tactile sensors?
09:52:27 Brayan Impata: Don't we need a task lime Computer Vision had with ImageNet for pushing the field?
09:52:40 Brayan Impata: like*
09:53:28 Saber Sheybani: @Brayan: we sort of have that, right? "Pick and Place" and "Peg-in-hole" I guess.
09:58:03 Brayan Impata: Occupational Therapist have standard ways

to measure human dexterity
09:58:16 Brayan Impata: We could copy that on our robots
09:59:02 JUNLI GAO: thank you every one!!
09:59:48 Juan Antonio Corrales Ramón: Thank you very much for this so interesting workshop!