

1. To people in the industry: what frustrates you about the current state of research in manipulation? What would you like to see more of? Is the Amazon Picking Challenge covering any gaps in current research areas?
  - The “tabletop approach” to manipulation, where items are separated nicely and have multiple ways of being grasped, is not realistic for future applications. This is one of the reasons why the Amazon Picking Challenge was started in the first place.
  - Economy of motion seems to be lacking in the standard manipulation solutions. It would be nice to have methods which minimize extraneous movements during manipulation.
  - “Pick and Place” manipulation solutions are overused. There should be more solutions which take pushing and sliding objects into account.
  - There needs to be more benchmarks, such as the Amazon Picking Challenge, which push the direction of research towards solving manipulation challenges. For instance, a challenge involving pushing and sliding objects.
  
2. Should academic research be focused on integration of multiple components, such as the APC, or should it be focused on developing new manipulation solutions?
  - People do not focus on the value of integration, and instead focus on being the best at a particular benchmark.
  - Integration should be viewed as a more acceptable research area, rather than immediately being shunned in academia.
  - Integration is important to consider, because the integration of the components themselves can inherently change how you are attempting to solve the problem at hand.
  - Integrating separate components can often result in new types of problems arising from the integration, and is interesting to address these problems.
  
3. Do vacuum based grasping strategies solve most manipulation challenges?
  - Vacuum solves many manipulation challenges - however, as the manipulation tasks become more complex, such simplistic grasping strategies may not be sufficient enough.
  - Vacuum should eventually be viewed as part of a larger system of various grasping strategies, all of which can be utilized by the robot to solve a manipulation task.
  - Don't give up on vacuum as a viable grasping strategy. As long as it is capable of solving manipulation tasks, we should still strive to improve and incorporate it.
  
4. What are the major roadblocks hindering robots from appearing in warehouses?
  - Utilizing robots in warehouses, especially those where humans might co-occupy the space, should be appropriately evaluated for risk. For especially dangerous operations, cages should be deployed separating the robots from the humans.

- The rate at which safety standards are accepted/adopted is low. It took years before the safety standard 15066 was adopted, and it is still at a technical paper stage. It can also take years before the AGB Mobile Manipulation standard is adopted.
  - End-users/customers often have too high of an expectation of the specifications of a robot. It is often not sufficient for customers that the robot is operational and solving the tasks it was designed for.
5. How will warehouses change as the capability of robots increase? For example, Amazon Prime Air. How will this affect the development of new technologies?
- The locations of warehouses which deliver items as fast as possible are located close to population centers. Space is extremely precious in such warehouses, and turnover of items is high. The optimization of these warehouses is important to consider: if an item does not sell well, it does not belong in these warehouses.