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Team E: PLAID
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ILR10
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1. Individual progress

For this progress review, we aim to integrate all sub-systems to demonstrate the whole picking scenario with JSON update. We also demonstrate we can control electromagnet and rotary motor with Arduino. My personal progress is JSON server and point cloud fusion, and last year's JSON file is used as reference for the implementation. There are three main categories in JSON file, bin contents, tote contents and work orders respectively. Bin contents and tote contents specify items placement, and work orders indicate which item should be picked up from designated bin.

JSON file is useful in various aspects. CNN uses JSON information to zero out the probabilities of non-existent items, so the output of bounding boxes could only be one of the items specify in JSON file. It is also beneficial for the grasping. The grasping system will integrate all system information, including JSON and perception, to decide grasping order. The figure 1 shows the structure of JSON file.

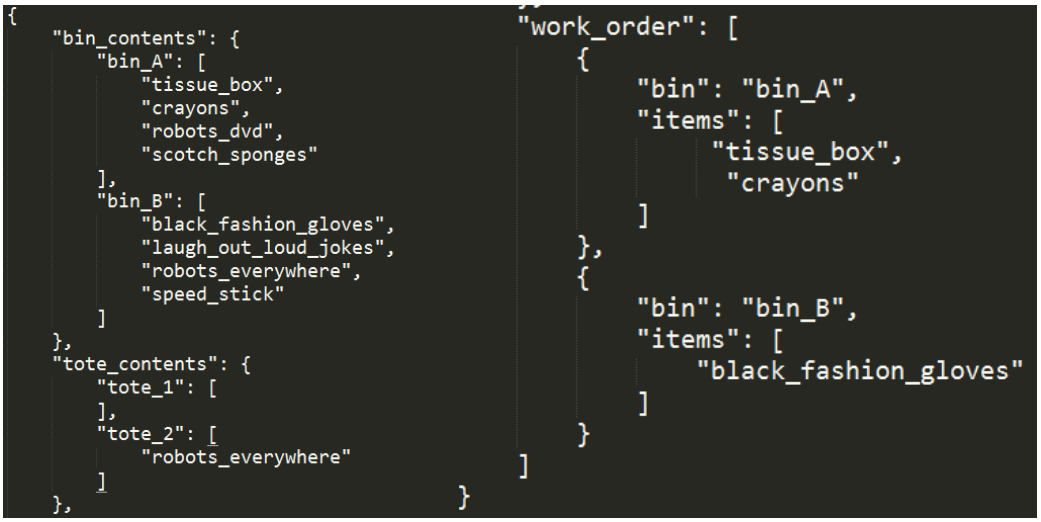

Figure 1. The structure of JSON file

2. Challenges

The biggest challenge now is the shelf and frame fabrication. We are still using wooden shelf and frame now, which could cause problems when whole system need to migrate from current shelf to final design. As we all know, CNN accuracy is strongly related to image color and intensity, so we may need to fine-tune background color and illumination after we adopt the new shelf. In terms of schedule, I highly doubt that whole system testing could be done before SVE.

Second challenge is the system robustness. Currently our system is so fragile that even a tiny failure will cause the whole system crashes, and we suffer from this for several progress reviews. Crashing gracefully or even recovering from fault is the goal we want to achieve. Otherwise, we are not competitive as other teams in competition.

3. Teamwork

For progress review ten, we focus on different domains and break down the tasks as follows:

- Michael Beck – Project manager. Michael handles project schedule and goal. He keeps helping team to break tasks down and monitor progress of sub-tasks. He also helps team to assemble shelf and electromagnet.
- Akshay Bhagat – Akshay implemented new feature for FRCNN. FRCNN now incorporates JSON file information to identify objects, which means it will zero out non-existent item possibilities. Also, He is still working on camera calibration.
- Matt Lauer – Matt is trying to fix linear actuator issue. He integrated the planner for MVP as well.
- Che-Yen Lu – I implemented JSON file service to monitor changes in bins and totes. I also developed new feature, point cloud fusion to get better point quality.
- Jin Zu – Jin helped MSCV teammate to annotate images. She also created confusion matrix of CNN for performance analysis.

4. Future Plans

For my personal plan, I still want to focus on software architecture. There are a lot of software improvement we could do in the future month. However, there are only three weeks away from SVE. Apparently, I need to compromise between ideal world and reality since software maintainability, software modularity and system robustness is not as important as fully functional system demonstration.

For competition and the project, the top priority now is to implement a decision maker for perception system. There are so many item types, and for every type system could have different perception pipeline. For example, Perch should deal with rigid unknown items since 3D model is available to identify them. CNN with SVM will be the suitable tools for unknown deformable items, and most of known items could be handled by FRCNN and FCN. Current system is only capable of identifying known items, which is my biggest concern.

Second, refactoring code before I go to California is necessary since I am the one who is familiar with system software most. Current code is hard to maintain and buggy due to negligence. I plan to do this after SVE so that I can work on this the whole day.

Third, well-documented manual should be created. We highly depend on each other to perform system demonstration, which is not efficient. If the documents are created, everyone should be able to operate any sub-systems and work independently so that we can make sure every teammate is productive.