Learning through Robot-Object Interactions (EGSR_51)

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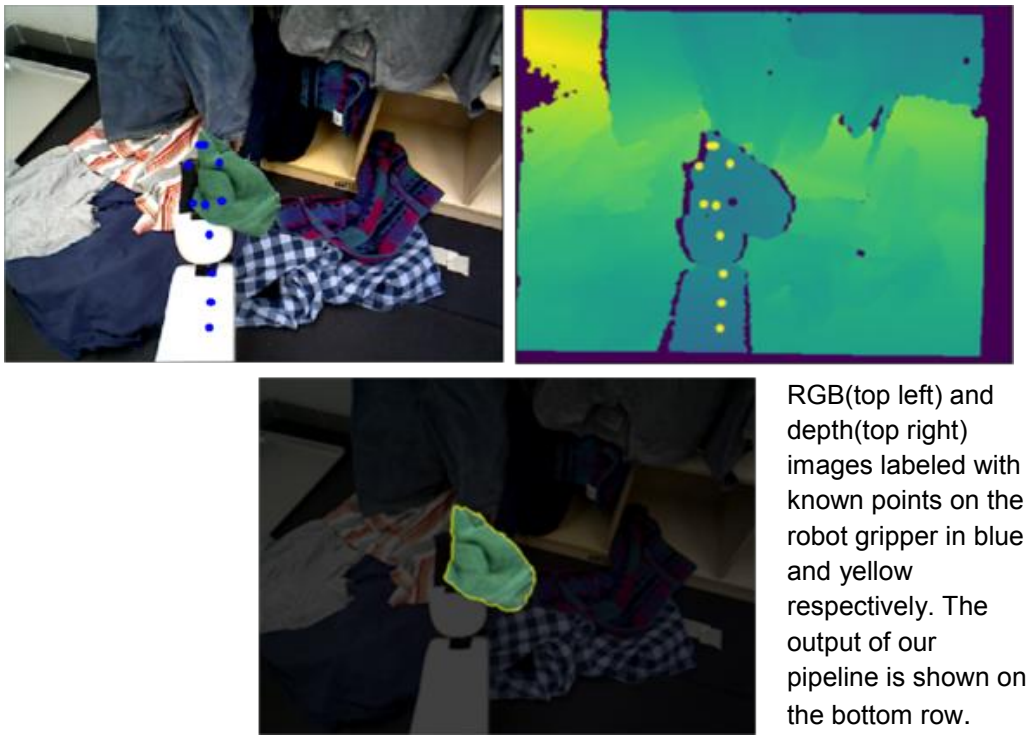
Currently, many robots are used in industrial applications in order to increase precision, productivity, and safety for humans. Additionally, there are many opportunities to extend the benefits of robotics past this set of tasks to less controlled domains where humans live their everyday lives; however, robots outside of the highly structured factory environment have to plan around the actions and movements of external agents. Since all of the moving pieces in the world would be unpractical to track, many previous works have used cameras with various image processing methods to recognize and localize objects in the environment as the robot encounters them. One bottleneck on these systems is that most require some sort of human-in-the-loop semantic description or labeling of previously saved images or video. Using this data as training data, the robot learns to describe or label new images of objects in the training data in order to perform new tasks.

In order to combat this bottleneck, we present an algorithmic pipeline that aims to perform the job of a human annotator with decreased work on the part of the human. Using the known locations of the robot gripper along with sequential depth and RGB image segmentations (see figure below), we locate pixels in the depth and RGB images which correspond to the object being gripped by the robot. In this way, we produce training data that is specific to the new object and ignores background clutter without having a human label the desired object after the fact. This method will allow robot vision systems to acquire new training data, and consequently, learn new objects in the environment, more quickly.



RGB(top left) and depth(top right) images labeled with known points on the robot gripper in blue and yellow respectively. The output of our pipeline is shown on the bottom row.