
Visual Shape Detection and Social Robotics Tasks

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By giving a robot the ability to detect basic shapes, such as triangles, squares or circles, we are hoping to be able to increase social interaction and teaching between the robot and one to two year-olds. RUBI06 is a small humanoid robot who interacts with toddlers. She is designed to be able to teach the children skills designated as necessary for their age group by the California Department of Education. One of these tasks is shape recognition.

The goal is for RUBI to be able to play a learning game frequently played with small children - asking a question like, "Can you show me the triangle toy?" and then indicating if the shape of toy the child holds up is correct. This task takes advantage of the physicality of a humanoid robot: RUBI may point to the correct toy, pick it up, or accept a toy from the child's hands. This task also provides quantifiable feedback, as we can track whether a child's success rate at identifying shapes is improving.

Work has currently been done with soft toys shaped like triangles and circles, in a variety of shapes and colors. Applying machine-learning boosting techniques to images including these toys has led to success identifying them. We will create a real-time shape detector to work on the RUBI's video input, allowing her to locate the toys in three-dimensional space. We will use RFID tags in the shape toys, so that when the toy is handed to the robot, it provides feedback as to whether RUBI's labeling of the toy was correct or incorrect.

Giving RUBI shape recognition abilities gives her a powerful teaching tool, and lets her interact with the children and their environment in a way similar to that of their human teachers.