TEAM ORICA

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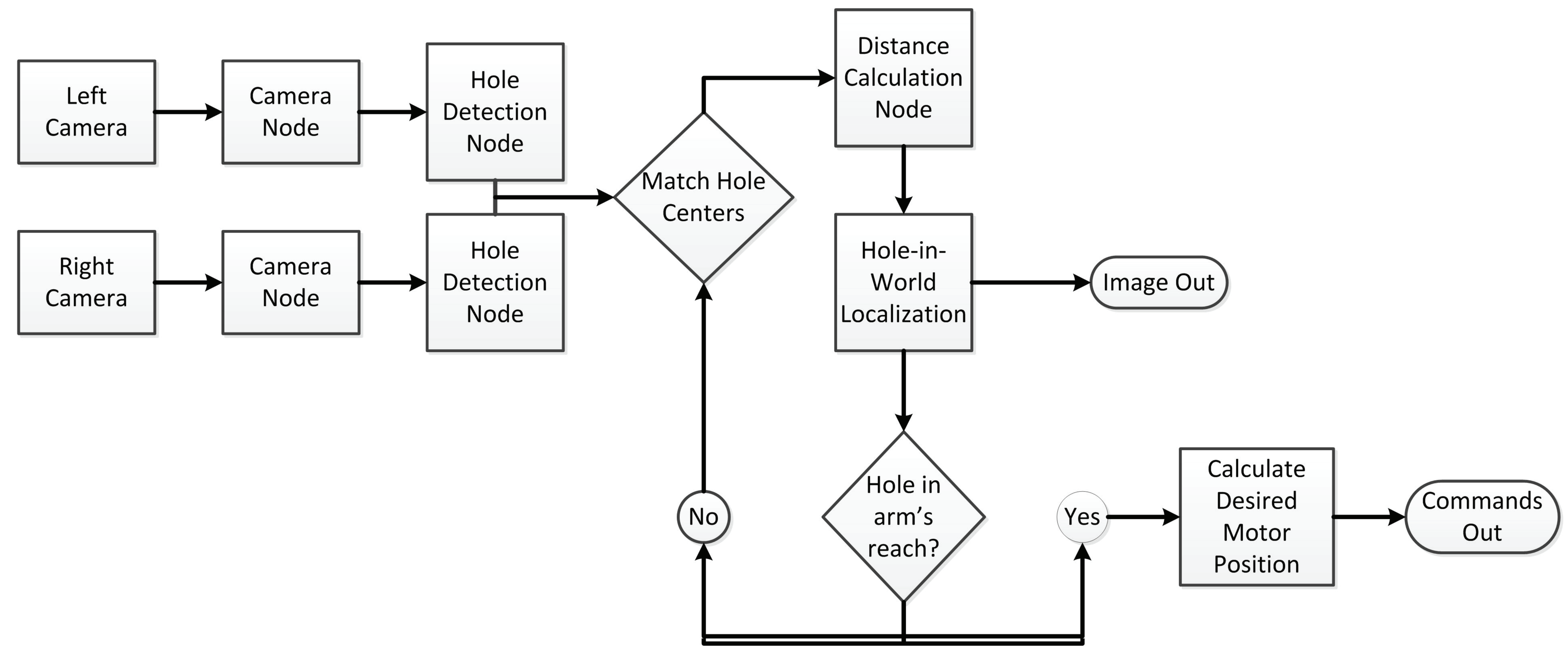
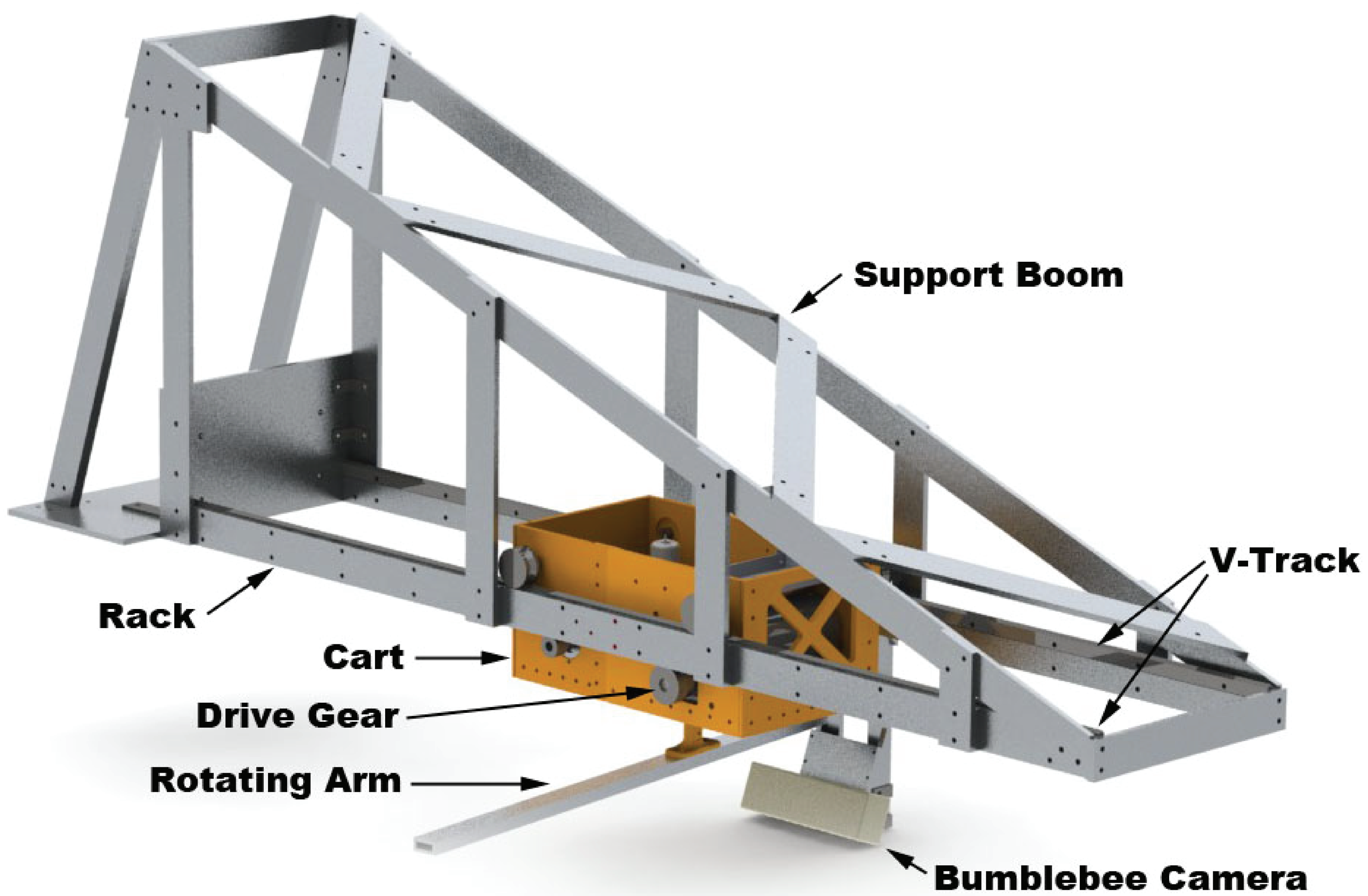
Automated Borehole Detection

Project Goals

Orica's long term goal is to automate much of the blasting process. Our project is the first step: building an automated proof-of-principle that uses stereo vision to identify holes and moves a laser pointer over the center of each hole.





The system uses a cart with a rotating arm that rides along a boom to position a laser pointer over the center of a hole. PID controls programmed on an Arduino Uno to actuate the cart and arm motors, moving the laser pointer over the detected hole center. Rotary encoders continuously update the cart and arm positions. The motors, encoders, and arduino are housed inside the cart.

The hole detection algorithm processes two images per frame, one from the left camera and one from the right camera. Each image is read in via a 'camera node' and is then fed through a blurring process, Canny edge detection algorithm and ellipse fitting algorithm, all of which happens in the 'hole detection node'. The 'match hole centers' node searches for pairs of ellipses from each image that meet certain criteria to be considered a hole. From these matches, the 'match hole centers' node also calculates a distance to the hole from the camera based on the disparity of the hole in the two images. Finally the 'hole-in-world localization' node transforms the hole's location to the boom's coordinate system which is fed to the user for confirmation and ultimately to the arduino on the boom which moves the arm.