To: Professor Merz
From: Benjamin Nitkin
Subject: IGVC Progress Report
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This week, the software team started to get stereo vision going, despite some bizarre setbacks. On the Linux end, the cameras are both recognized, calibrated, and generating a crude depthmap. Windows (and RoboRealm) look less promising; despite 90 minutes of work, Windows still refuses to recognize both cameras.

Calibration was much more difficult than it should have been. ROS provides a node for calibration. The node searches for a checkerboard pattern, finds the intersections of the checkers, and computes distortion. Given enough samples, the program characterizes the nature of the lens distortion and provides a few matrices to correct for it. The process is called rectification. A rectified image is needed so that each camera's view matches the other. (Distortion prevents pattern matching between the left and right cameras.) The calibration node is supposed to generate data, optionally save it to disk, and commit it to the cameras. The first steps went well, but it crashed when trying to write the calibration files.

I worked through the problem in a few steps, following similar problems online. First, I ran converted the saved calibration data from .ini format to .yml format; ROS needs the latter. Next, I referenced the converted calibration file in the launchfile. When the calibration file wasn't recognized, I looked at the data and realized that the .ini calibration held data for both cameras, but the utility had only converted the left camera's data to .yml. Another pass through the converter and a few more lines in the launchfile were enough to read both camera calibration files. ROS was still throwing errors, though: for some reason, the calibrator had created calibrations for the topics *stereo_narrow/left* and *stereo_narrow/right.* Our cameras publish to */cameras/left* and */cameras/right*. After correcting the name in each calibration file, all the errors vanished.

With calibration set up, the *stereo_image_proc* node should create rectified images of the left and right cameras and generate a disparity map from the two. For some reason, neither the rectified images nor the disparity images showed in their respective viewports. Upon closer examination, I found that the viewports were subscribing to the topics */cameras/left/cameras/image_rect* and */cameras/right/cameras/image_rect*. Although I'm not sure what caused the bug, launching the *stereo_viewer* node from the commandline created the correct subscriptions. (Fixing the launchfile will wait for next week.) That gave a pair of rectified images and a sparse disparity map. Right now, the image processor only detects the most obvious patterns. A checkerboard is mapped, but more subtle textures are ignored. There are plenty of parameters to improve disparity mapping, and we'll explore those in the coming days.