**Verbal Chess using Computer Vision with the Baxter Research Robot**

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**Individual Report – Ryan Cook**

I was responsible for computer vision and movement when dealing with Baxter, and the code that I was responsible for is in the report appendices. The parts I was directly responsible for making happen were the initialization of Baxter in him finding the chess board, and in the process of moving a piece from one spot to the other which involved finding the piece picking it up and moving it to the next location.

The initialization of Baxter was done through running the camera control tool that would open left hand camera at a resolution of 960x600.  The next step was getting Baxter to hover above the chess board at a height of 62 cm and take a picture of the board the using computer vision and the CannyIt function to find the largest enclosed shape, which happened to be the chess board. Baxter would then approach the middle of the board and begin the process of locating the corners. Lastly a formula was derived to align the picture coordinates with Baxters’ coordinates so the middle of each square on the chess board could be turned into a pose that Baxter could pass to its InverseKinematics functions to move to.

The next step was how to pick up a piece to move from one square to the next. This was done through approaching the pose that was determined in initialization and hovering over that area. Then Baxter would take another picture and using a method called findContours find the piece. After the piece is found a moment calculation is done to find the center and then converted from pixel coordinates to Baxter’s coordinates. Baxter now has the new coordinates of the exact location of the piece the pose is updated followed by the move being performed. The last step to perfecting this method was determining the offsets and the meters per pixel of each picture to try and fine tune piece location as much as possible.

I feel that both of these processes were accomplished and helped to create a background of functionality for further use and research by other students in the areas of Kinematics and Computer Vision.