Finding the Target from the Key

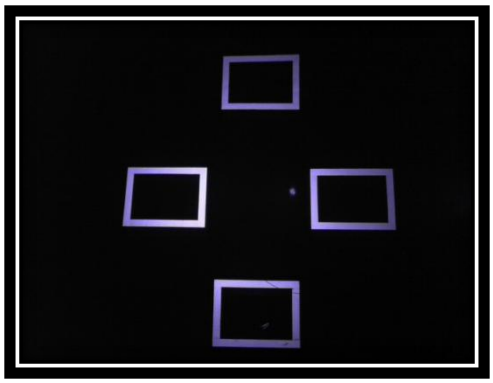
Overall Process for Locating the Targets from the Key:

Camera
The image is acquired by a webcam.

BeagleBoard
The image is sent to a processor on the BeagleBoard, and the image is processed to get information about the location of the targets.

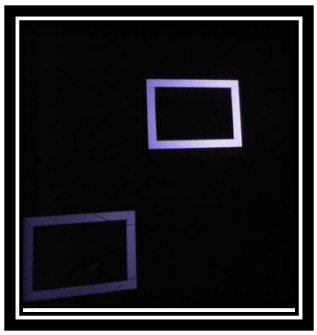
cRIO
The processed data is sent to the cRIO, so that the driver can position the robot to face the target correctly.

Establishing the Main Target:



Because the camera is infrared (IR), not much false positive is expected to be in the image. Using a preset threshold all images acquired from the webcam are converted into black and white, with white being the reflective tape and black being everything else.

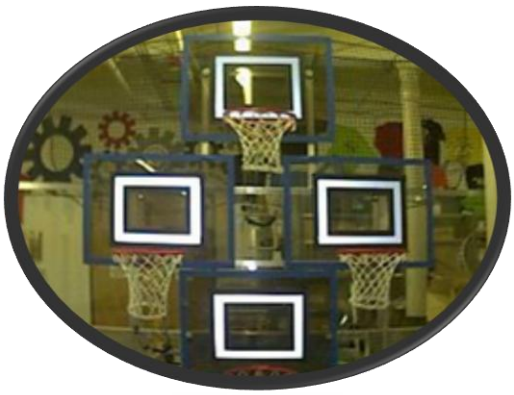
First, the program creates an array of all shapes found in the image. It eliminates those that are too far from being rectangular or too small and then sorts the array by the y-axis.



Second the program finds the distance from the center of the square to the center of the screen. Rectangle closest to the screen center becomes the main target. The offset of the main target from the center is sent to the cRIO, as the slop, in pixels.

Lastly, the program figures out if the main target square is the top target or the middle target, 1 or 0 respectively. It does this by seeing where on the screen the target is on the y-axis. This is possible because when the program is run, the robot is already in position at the key.

If there are no squares visible, the program sends an error message, a value of -128 for slop and a value of 1 for top.



Lighting and Positioning:

The camera is positioned near the shooter (on the top) on the robot.

In order to see the reflective tape, IR LEDs were attached around the camera shining out, towards the target. The IR blocking filter in the camera was removed and a new IR-only filter was attached to the camera.