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Determining Distance with Robotic Vision System

Our Robot uses simple Trigonometry to determine the distance of a basket from the robot and then throws the ball with a certain amount of force depending on the distance of the basket to the robot.

Set up: Two XBCs mounted on one robot with a rubber band powered thrower arm in between them. A claw that closes and lifts to reload the ball into the robot is in front of the thrower arm. Four wheels are each powered by their own motor. The thrower arm has a pin release system where there are two arms the upper arm and the lower arm. The upper arm is attached to the strong rubber bands, and the lower arm is attached to a weak rubber band, a winch, to move up and down, and has a pin that attaches to the upper arm.

Program: The left XBC has control of the wheels and nothing else. The Right XBC has control of the claw, the winch and the release pin. The left XBC is responsible for finding the ball and centering the robot on the basket. The right XBC is responsible for grabbing the ball, loading it into the thrower arm, calculating the distance to the basket, pulling the arm back the right amount, and releasing the pin. They communicate using servos and touch sensors.

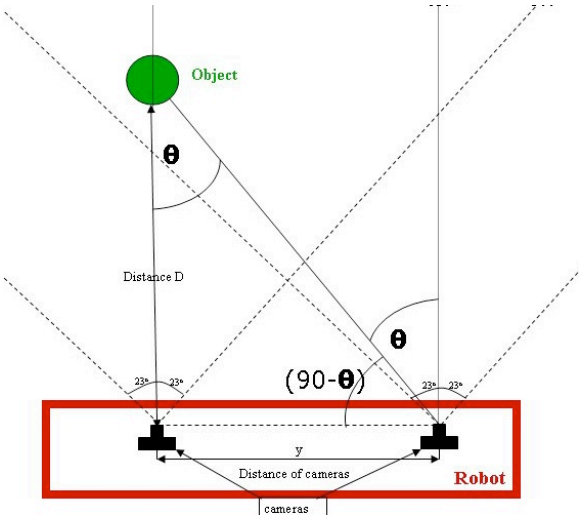
Math:

The left camera is centered so we know that that angle is 90,we know the distance between the two cameras to be 22 cm, and we know that theta is the angle the second camera sees. We also know that the other angle is 90 – theta.

Law of Sine: $\frac{\sin(90-\theta)=\cos(\theta)}{D}=\frac{\sin(\theta)}{y}$

Trig.-Identity: $y\cos(\theta)=D\sin(\theta)$

$$\Rightarrow D=y\frac{\cos(\theta)}{\sin(\theta)}=\frac{y}{\tan(\theta)}=y\cot(\theta)$$



Once it has found the distance the robot uses the equation (dist – 225.13) /-1.62 to determine how far back to pull the arm. The value is that of the potentiometer that is attached to the arm.