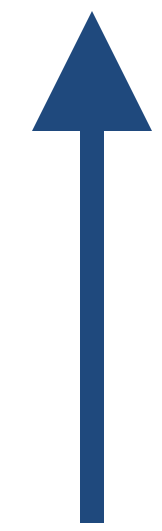


A Ping Pong Playing Robot to Demonstrate Vision and Control Systems

Our goal was to design and create a ping pong playing robot capable of playing a human opponent to showcase the capabilities of Adsys Controls' high speed vision system. Here we describe the cycle of tasks performed by the robot during a round of ping pong.

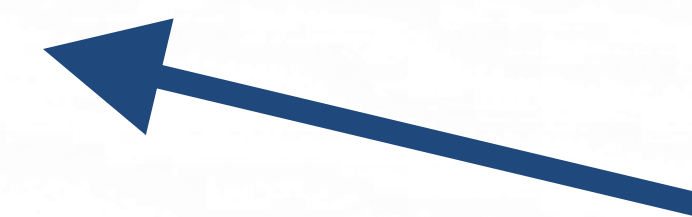
Tracking

The ProLight vision algorithms detect the ball in two camera images, and use stereo to get its 3D position. We implement an Unscented Kalman Filter to account for measurement noise and estimate complete ball state. The state is then used to predict the future trajectory of the ball.



Wait for Human

The human player hits the ball back towards the robot. The robot also enters this stage when the ball goes out of play.



Planning

We use our custom hitting decision algorithms on the predicted ball trajectory to calculate the ideal point of interception and return. This informs the desired paddle position, orientation, and velocity in four degrees of freedom.



Hitting

The mechanical system, made up of X-Y sliders manufactured by Macron Dynamics and a wrist with tilt and pan degrees of freedom, moves to hit the ball based on the decision made in the planning stage.

Returning

Once the ball has been hit, the mechanical system returns to the default position.

