

# 1 Autonomous Landing System

**Draven** software enables it to land to specified spot autonomously through the utilization of advanced image processing techniques and ROV control. Using the **Motion Decision Block** processes input frames from the camera to identify the designated landing spot. The resulting processed frame is then forwarded to the Decision Making Algorithm, which estimates the relative distance from the camera's position to the identified spot. Subsequently, the Decision Making Algorithm generates  $(X, Y, Z)$  coordinates, indicating the direction of movement based on the estimated distance. These coordinates serve as input for a closed-loop control system. The Control Block, equipped with a PID Controller, computes and guides the ROV's movements, stabilizing and smoothing its motion to navigate effectively within the surrounding environment as it overcome the effect of it on the motion.

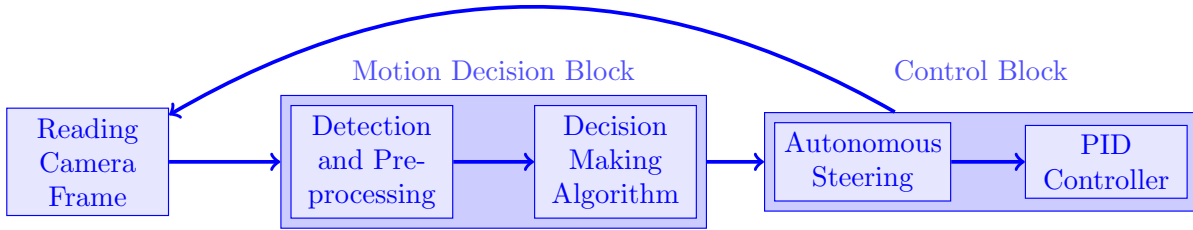


Figure 1: Autonomous system flow chart

## 1.1 Motion Decision Block

The Motion Decision Block software consists of multiple sequential stages. The first stage involves processing the input frame through a Color Detection and Noise Reduction Algorithm, which serves to isolate the Region Of Interest (in this case, the landing spot) from the surrounding environment. Following this, the ROI is thresholded to be further processed by the Bounding Box Coordinates node, which allocates the ROI in the frame using the  $(X1, Y1, X2, Y2)$  coordinates. These coordinates are then fed to the Decision Making Algorithm, which estimates the relative distance from the ROV to the Landing Spot and further produces the ROV motion presented in  $(X, Y, Z)$  coordinates, as shown in Figure 2

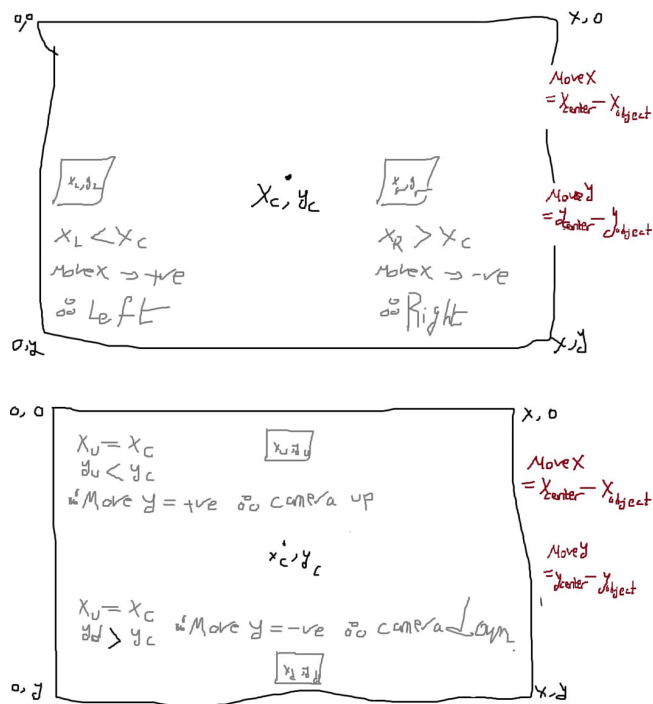


Figure 2: Figure illustrates how the Decision Making Algorithm works with respect to the presence of the ROI in the frame.

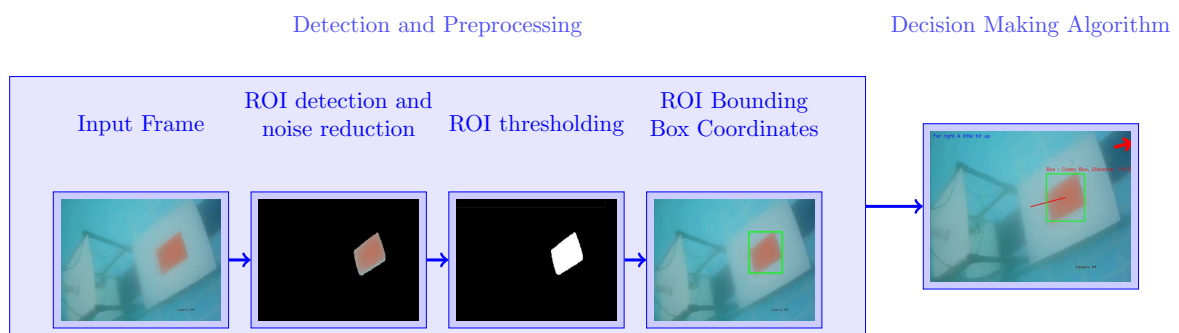


Figure 3: Motion Decision Block