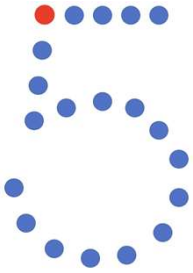
SEMTRON

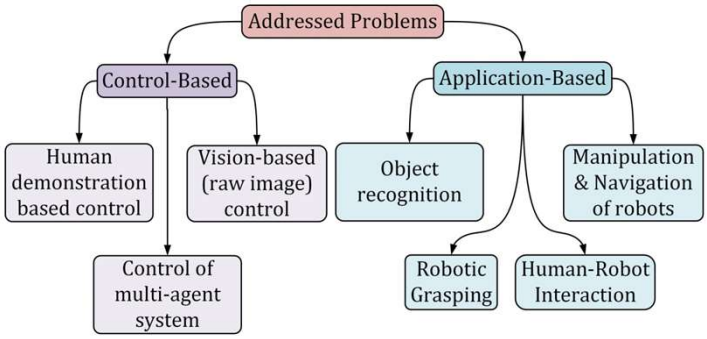
FIVE

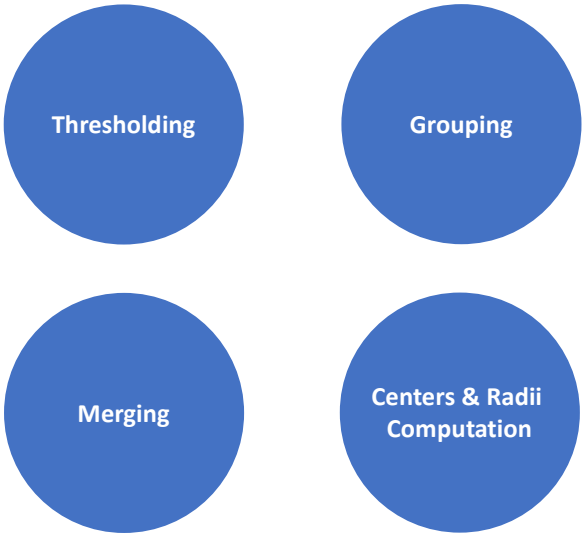
Visual Object Tracking



SEMTRON

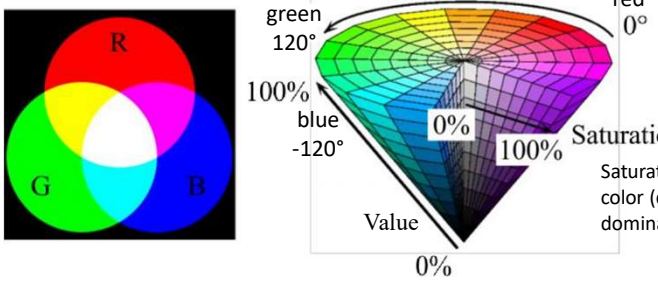
Robotic Vision



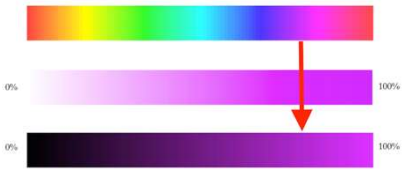


Blob detection algorithms / processes

Hue corresponds to the color components (base pigment), hence just by selecting a range of Hue you can select any color (0-360 °)

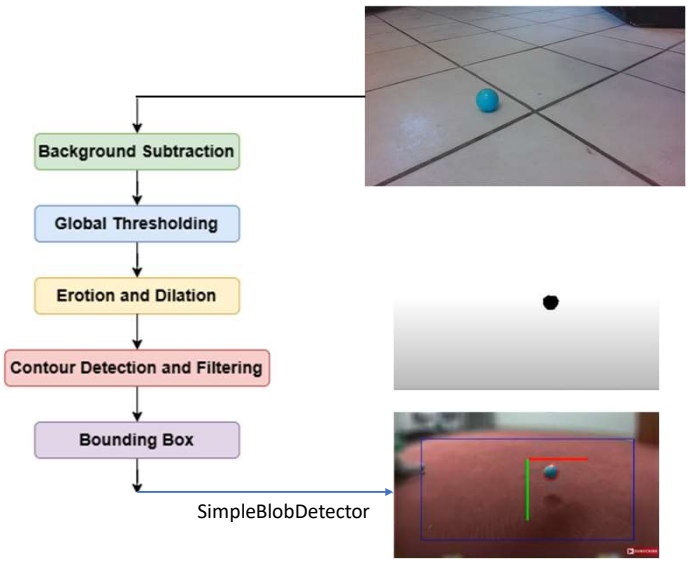


Saturation is the amount of color (depth of the pigment), dominance of Hue

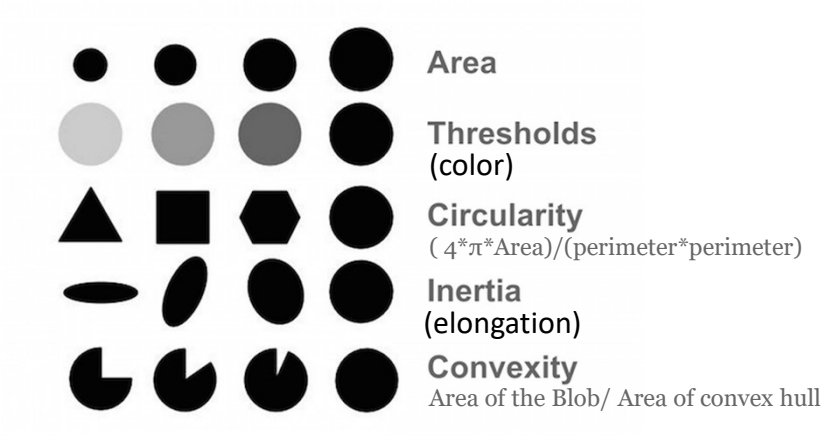


Value is basically the brightness of the color

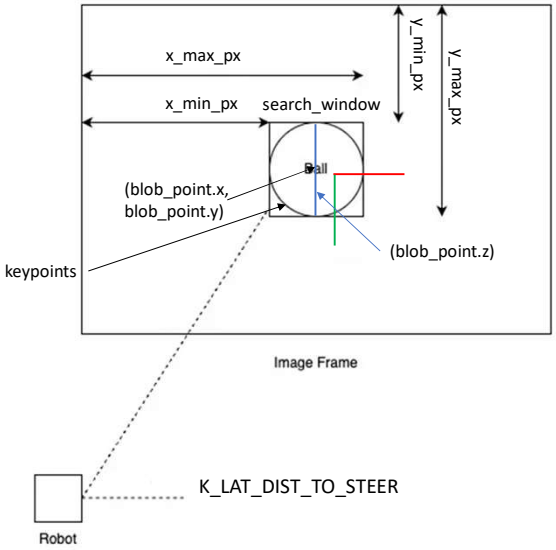
OpenCV range filters



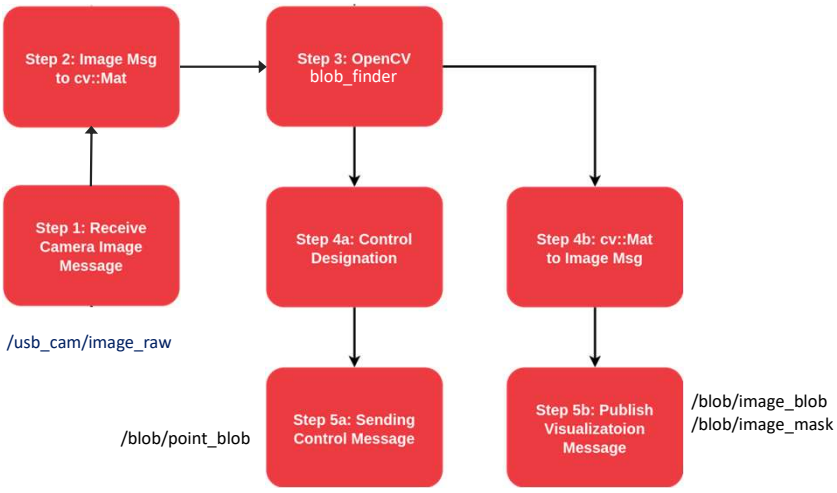
Blob detection pipeline



OpenCV SimpleBlobDetector filters

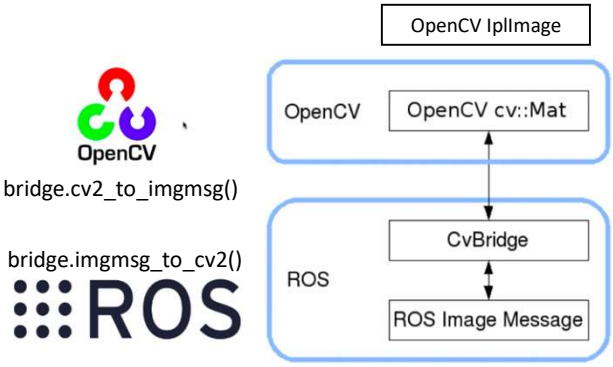


OpenCV blob detection



OpenCV blob finder

cv_bridge package to convert between ROS Image Message and OpenCV frames

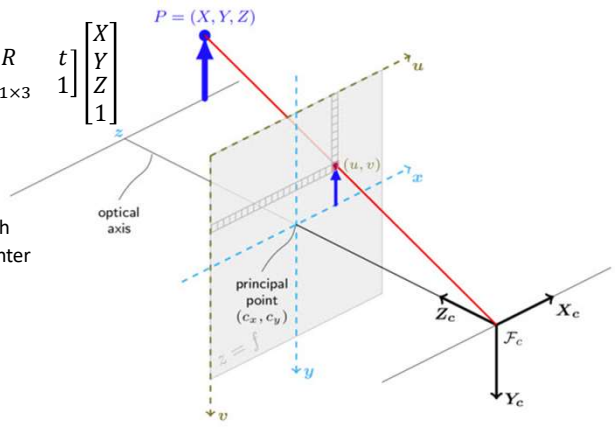


OpenCV blob finder

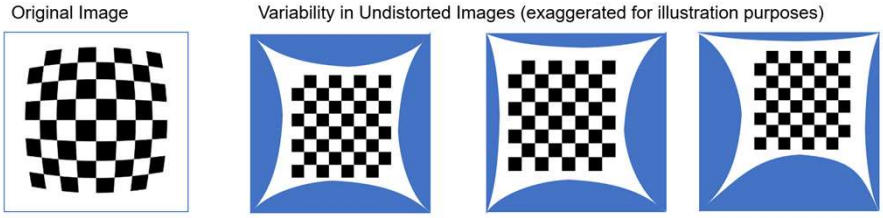
$$\begin{bmatrix} u \\ v \\ 1 \end{bmatrix} = \begin{bmatrix} f_u & 0 & c_x \\ 0 & f_v & c_y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} r_{11} & r_{21} & r_{31} & t_x \\ r_{21} & r_{22} & r_{23} & t_y \\ r_{31} & r_{32} & r_{33} & t_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \\ 1 \end{bmatrix}$$

$$= \begin{bmatrix} f_u & 0 & c_x \\ 0 & f_v & c_y \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} R & t \\ 0_{1\times3} & 1 \end{bmatrix} \begin{bmatrix} X \\ Y \\ Z \\ 1 \end{bmatrix}$$

(f_x, f_y) camera focal length
(c_x, c_y) camera optical center



Camera calibrations

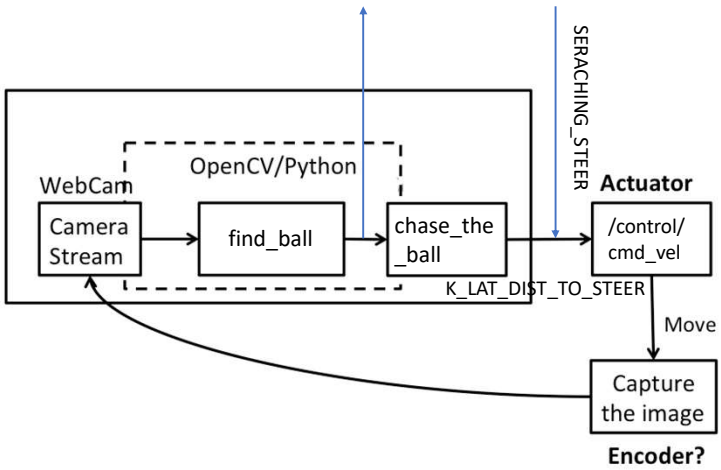


$$\begin{bmatrix} f_x & 0 & c_x \\ 0 & f_y & c_y \\ 0 & 0 & 1 \end{bmatrix} =$$

```
New Camera Matrix
[[  1.16392310e+03   0.00000000e+00   6.28041958e+02]
 [  0.00000000e+00   1.12263977e+03   3.42072773e+02]
 [  0.00000000e+00   0.00000000e+00   1.00000000e+00]]
```

Camera calibrations

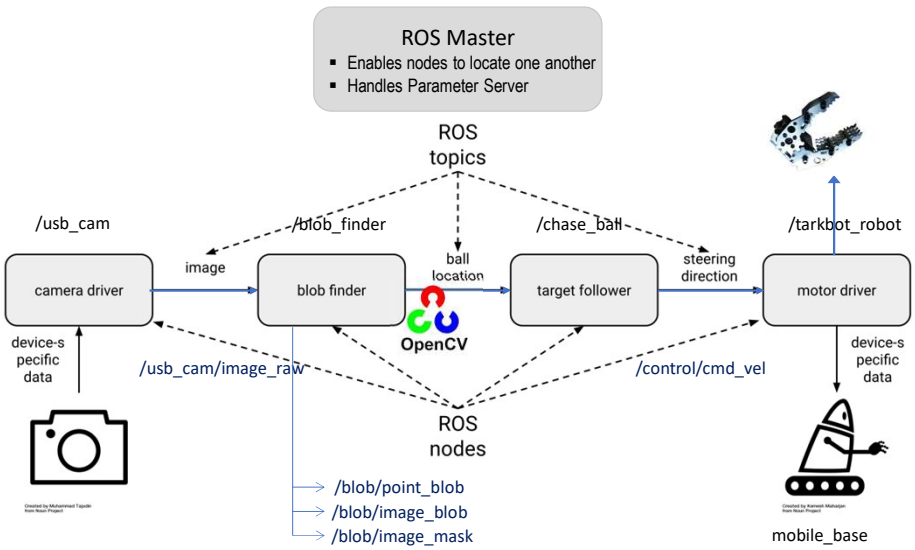
keypoint.x outside search_window
keypoint.size 30 <= s <= 80

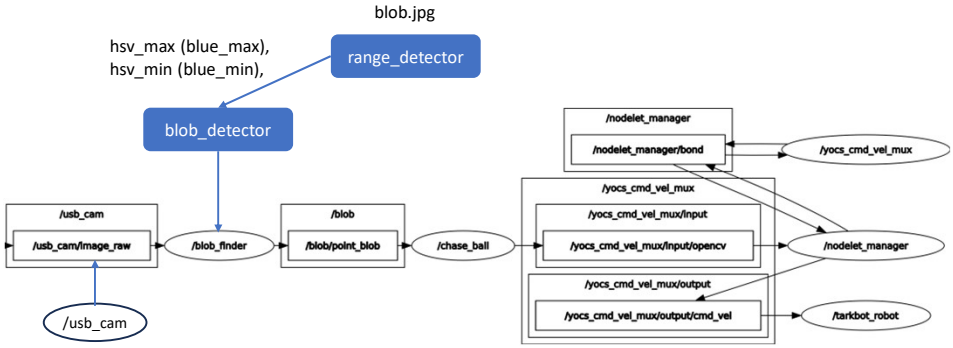


OpenCV KeyPoint steering

$ roslaunch yocs_cmd_vel_mux test_actions.launch

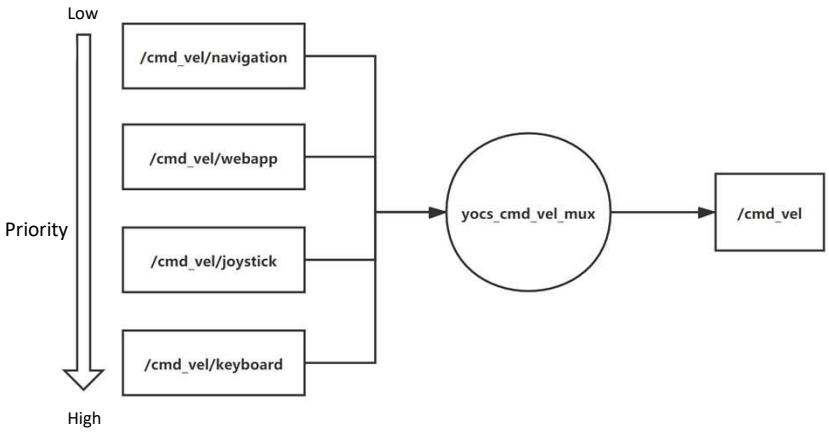
https://github.com/joshnewans/ball_tracker/
https://www.youtube.com/watch?v=We6CQHhhOFo

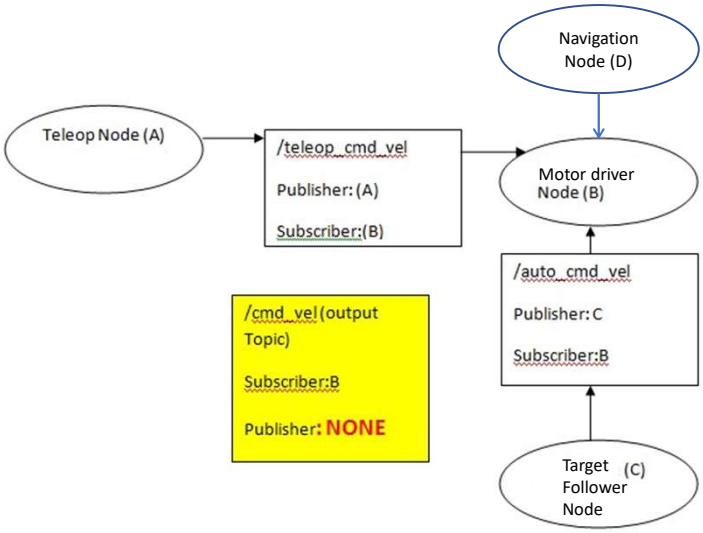




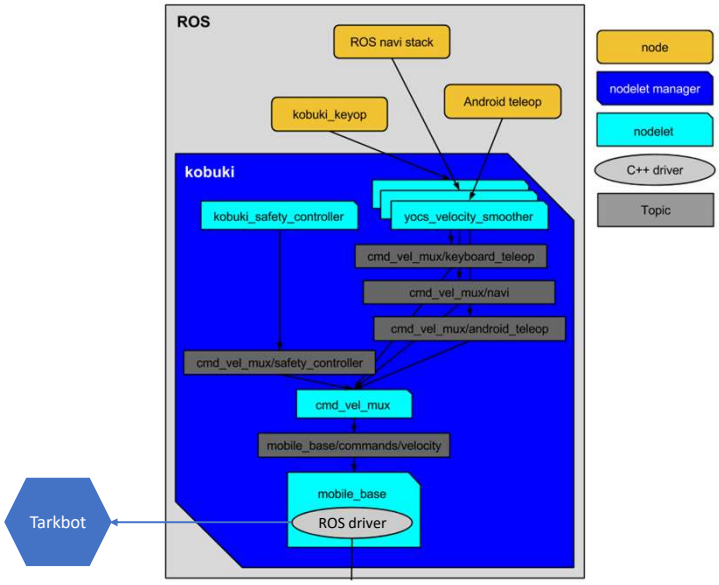
SEMTRON

Velocity Multiplexing

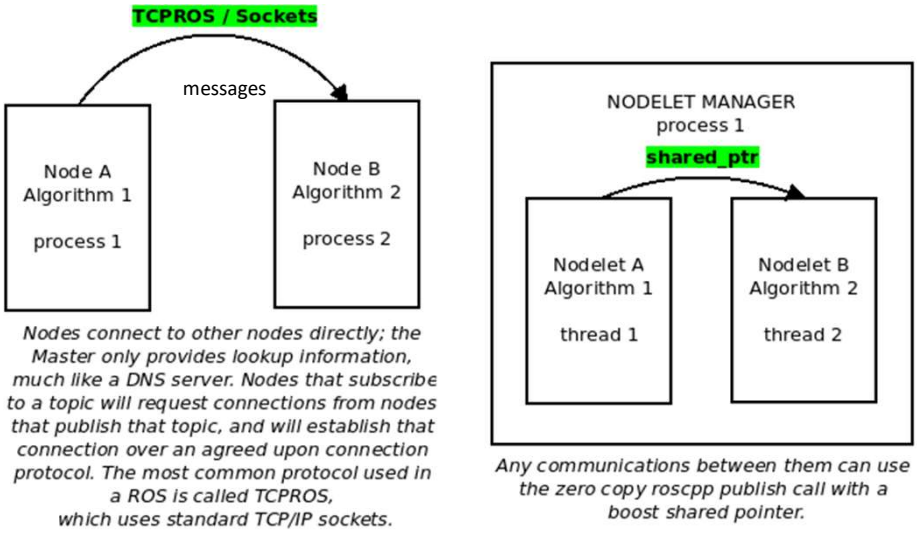




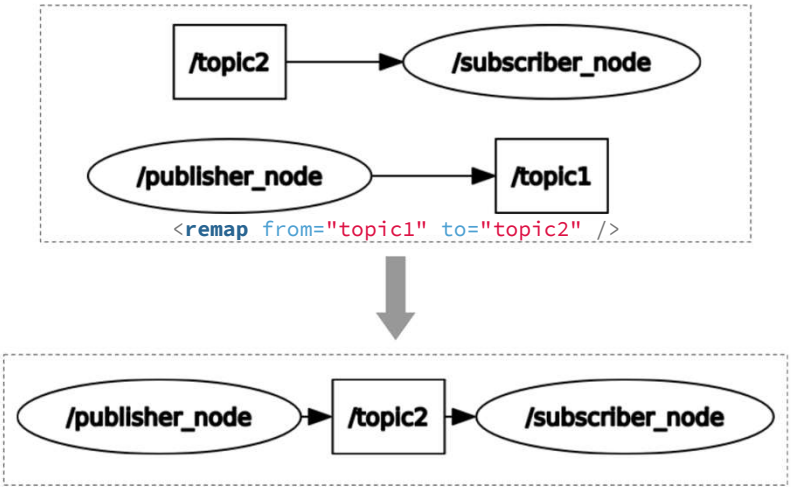
Problem of cmd_vel from multiple tasks



ROS mux package



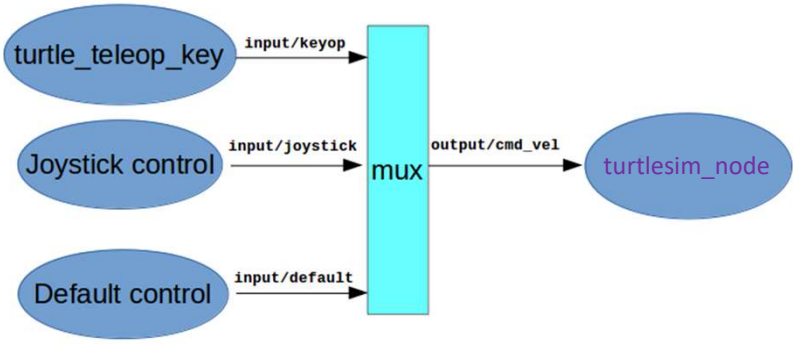
ROS nodelet



ROS remap

<remap from="/turtle1/cmd_vel" to="/yocs_cmd_vel_mux/output/cmd_vel" />

<remap from="/turtle1/cmd_vel" to="/yocs_cmd_vel_mux/input/keyop" />



ROS remap