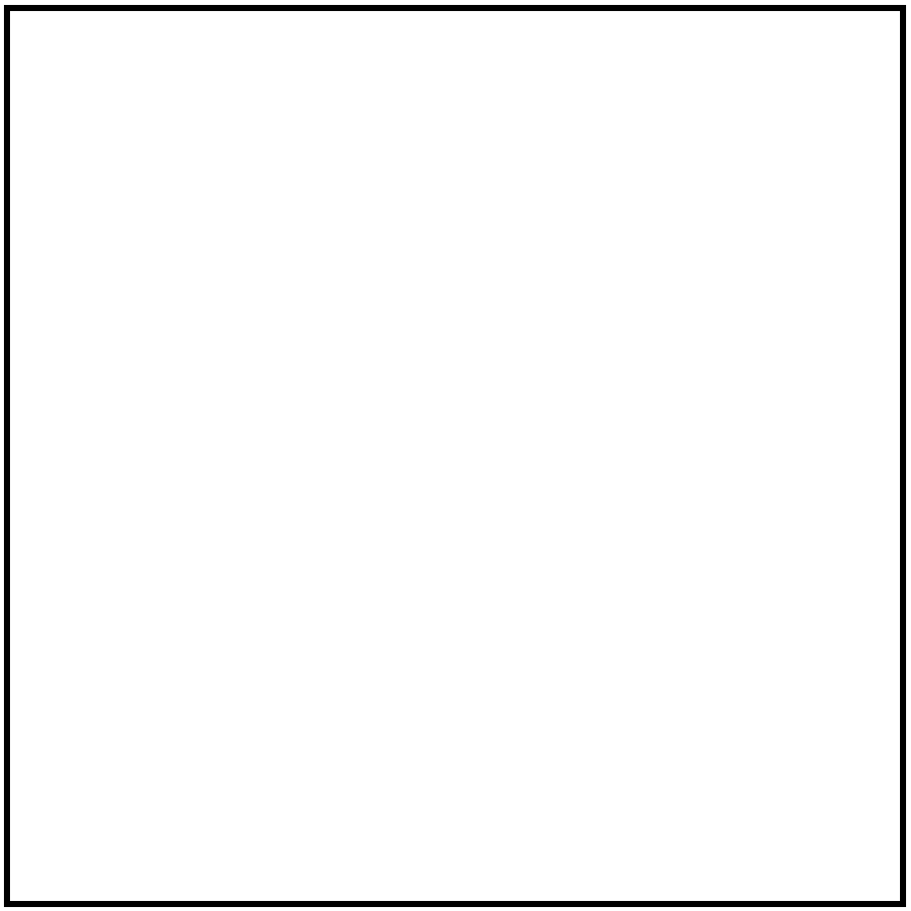
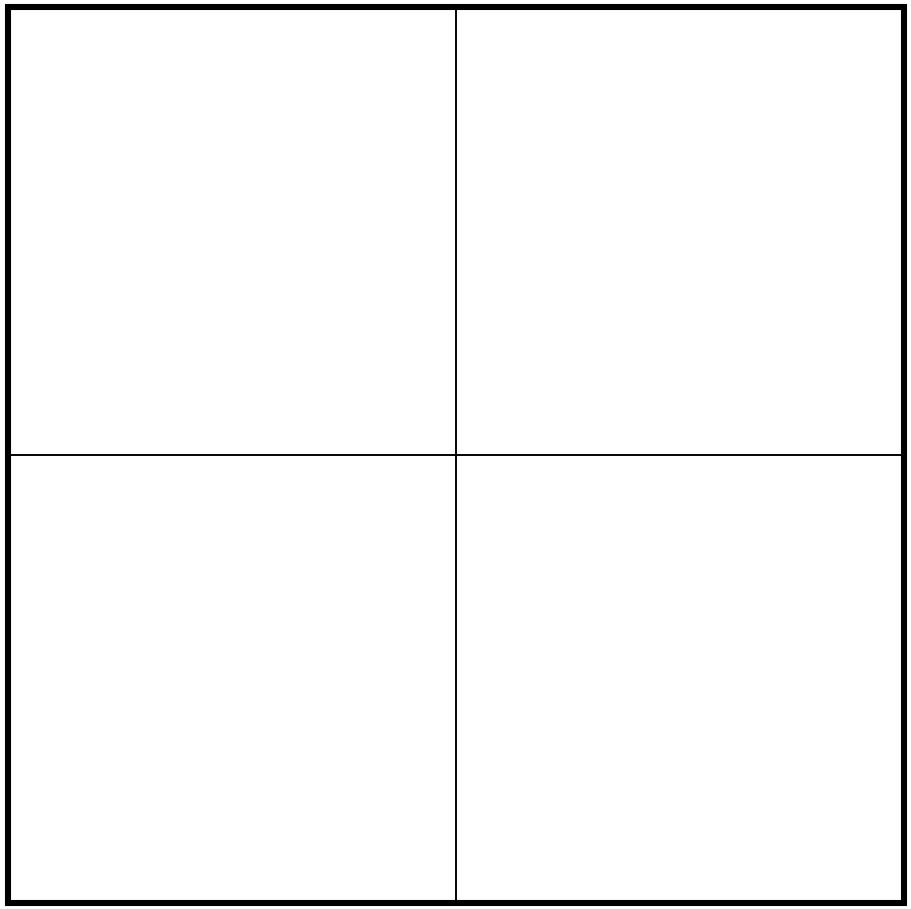
Draw a box. This represents the joystick range of motion.



Divide into quadrants



Put the desired Left, Right wheel speeds around the box perimeter.

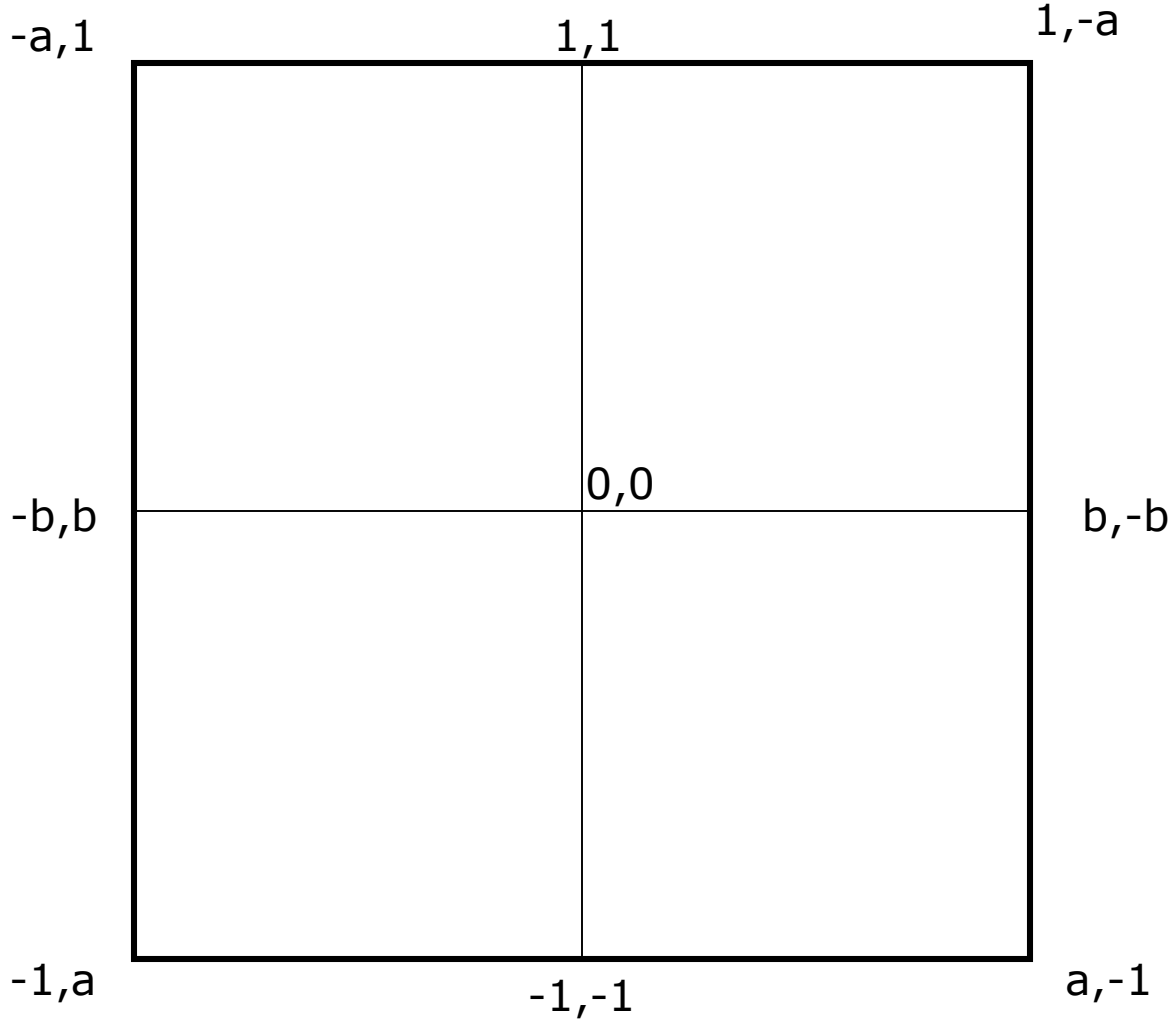
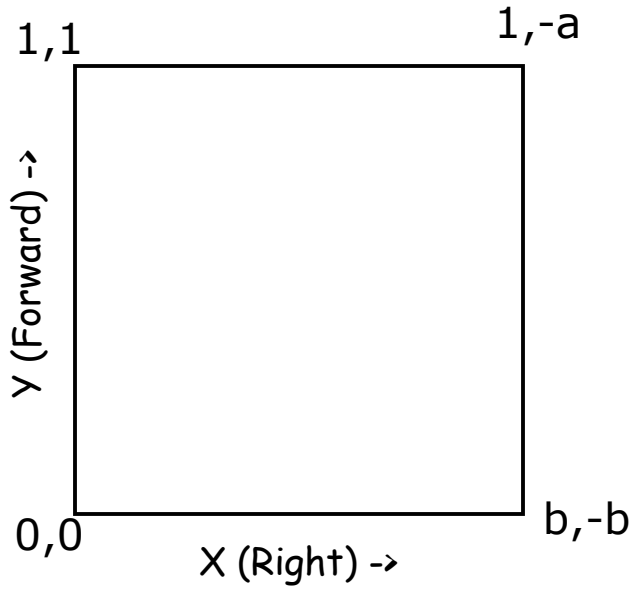
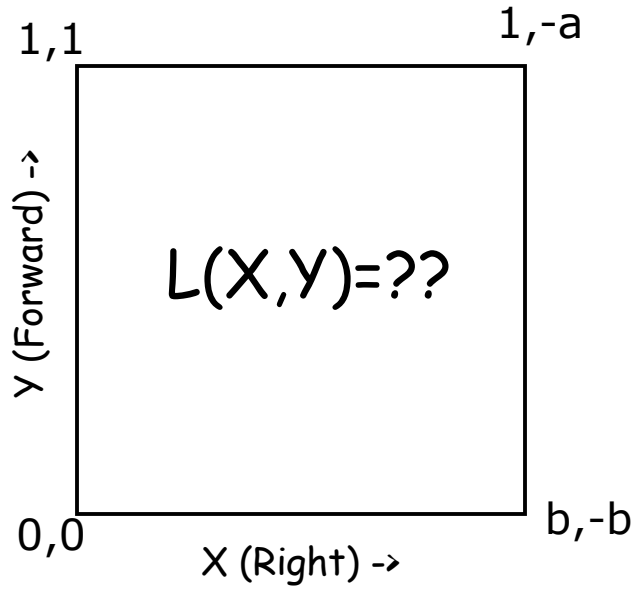


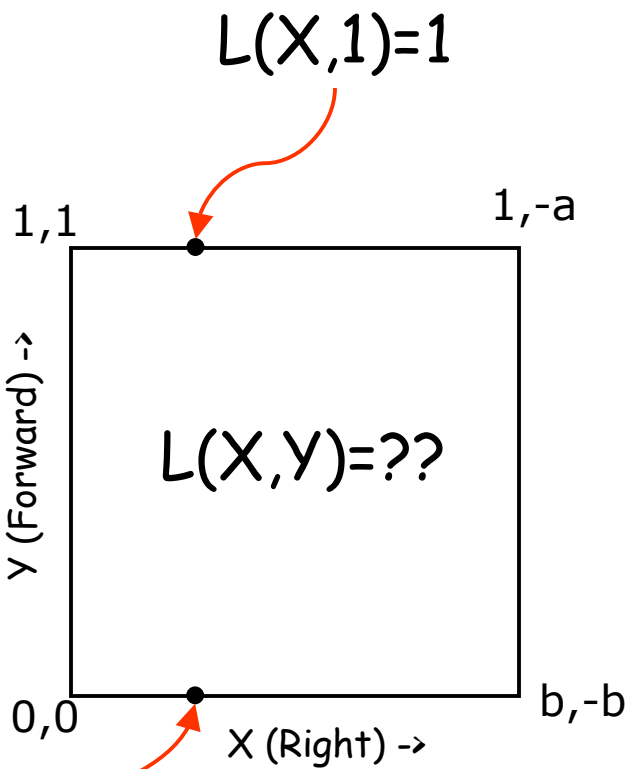
Figure out how to linearly interpolate
Left,Right wheel speeds for all locations
(Joystick X,Y values) inside the box.

Start with the first Quadrant.



Let's figure out the Left wheel speed first



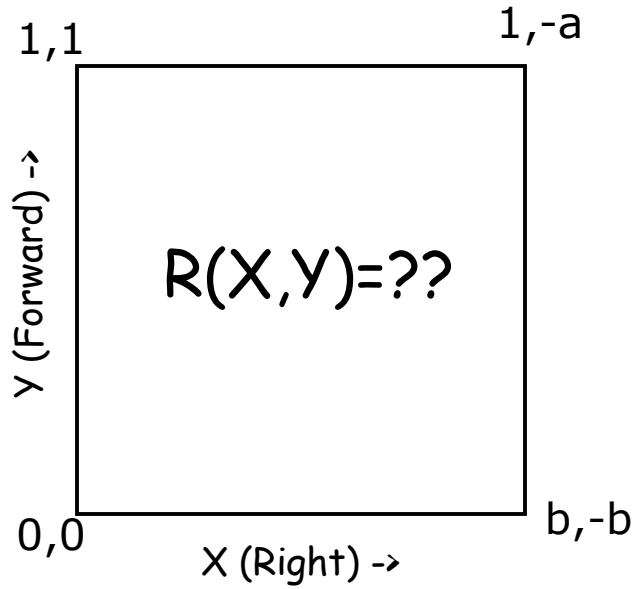


Linear Interpolation:

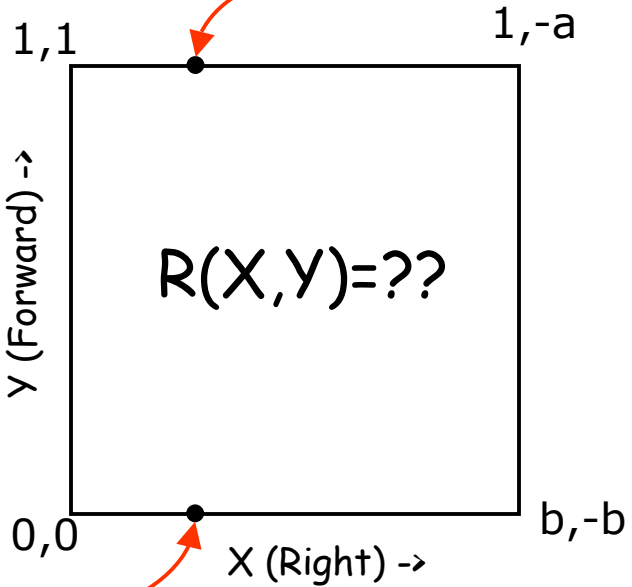
$$L(X,Y) = L(X,0) + Y*(L(X,1)-L(X,0))$$

$$\Rightarrow\ L(X,Y) = X*b + Y*(1-X*b)$$

Now figure out the Right wheel speed



$$R(X,1) = 1 + X*(-a-1)$$



$$R(X,0) = -X*b$$

Linear Interpolation:

$$R(X,Y) = R(X,0) + Y*(R(X,1)-R(X,0))$$

$$\Rightarrow\ R(X,Y) = -X*b + Y*((1 - X*(a+1))+X*b)$$

Repeat for Quadrants 2, 3, & 4.