

## **RBE 500 Group Assignment #3**

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## Preliminary Work for Controller

The process of creating a controller for this application stems from the previous position controller as well as other controllers created throughout the course. The goal velocity of each joint,  $V_r$  is received through a service response. The name of the service is `velocity_inv_kin_service`. Suppose our current velocity is given as  $V$ . The error for each joint is then calculated as follows:

$$E = V_r - V$$

When paired with the proportional gain value, we now have one of the terms of the controller. In order to get the other term, the derivative of the error is also needed, and is calculated as shown:

$$\dot{E} = \frac{V - V_{prev}}{\Delta time}$$

This derivative of the error is paired with the derivate gain and now completes the controller. Our controller takers on the form:

$$F = K_p E + K_d \dot{E}$$

Where F is the effort that will be applied in Gazebo and will cause the joints to move.