



Blue Panther

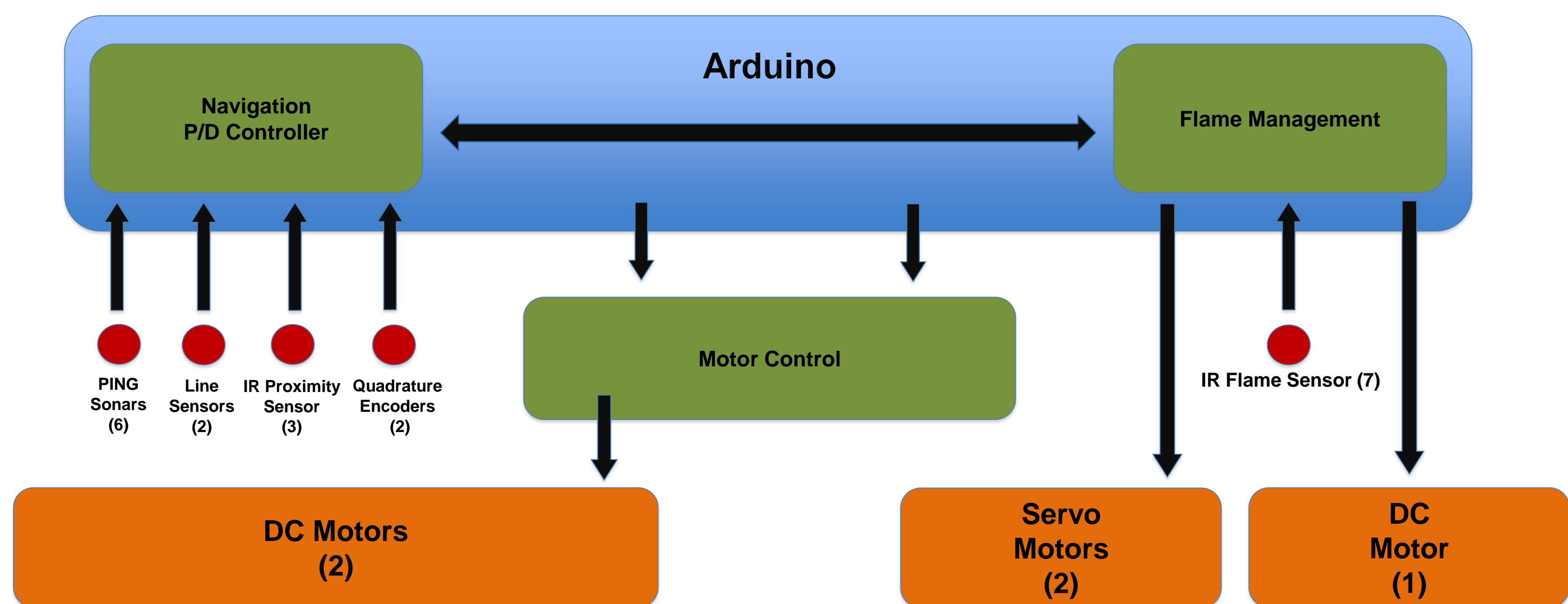
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Overview

Firefighting can seem easy as a human, but making a robot into a firefighter is no easy task! The Panther is a fully functional robot that can search a various amount of rooms with high confidence of blowing out a candle. The Blue Panther has an arsenal of tools to help with this task, ranging from the Arduino, down to the sensors. The challenge of putting a candle out requires the integration of three specific elements – navigation, searching, and extinguishing. Our navigation is run primarily off of a PD controller and our fire sensing is done mostly with a flame sensor. Bringing all of these together into a system that can move and run on its own, we have the Panther, which is capable of adapting to a multitude of situations while working to seek out a candle and extinguish it!

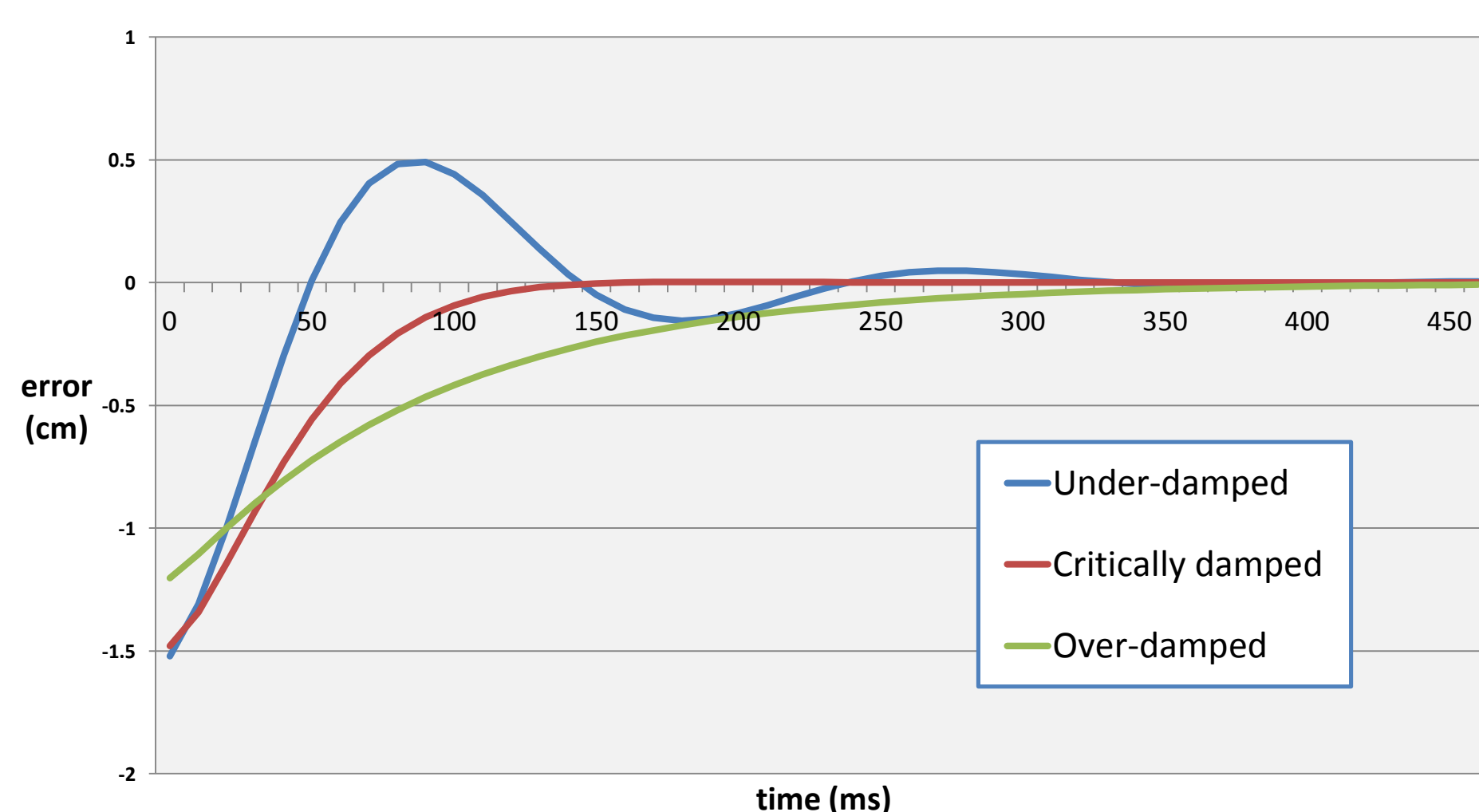
Block Diagram



PD Controller

Our Proportional Derivative controller is a simple control loop feedback mechanism. Our PD controller calculates an "error" value as the difference between our measured distance using the encoders, and a desired set point. The controller attempts to minimize the error by adjusting the new set speeds.

PD Controller: Error vs Time



Sensors

At the heart of the Panther is the sensing. PING sonar's, Infra-Red Sensors, Line Sensors, Quadrature Encoders, and finally a Flame Sensor all take a specific role in the Panther. Starting with the navigation, we are continually checking the encoders to make sure that the set distances and speeds we are aiming for are maintained, while at the same time using the sonars and IR Sensors to guide us along walls gracefully. When working with the candle sensing we are using all of the same sensors to steer clear of walls but instead of sticking close to a wall we now use our flame sensor to detect the candle while approaching it. The flame is detected using a phototransistor which measures the IR wavelength emitted by hot objects (~980nm).



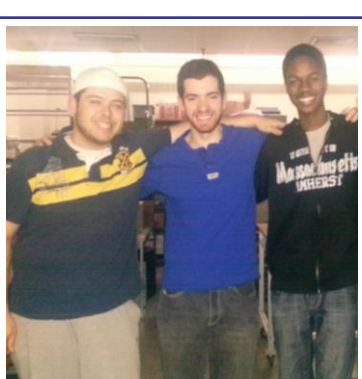
PING Sonar



Quadrature Encoder



Flame Sensor



Department of Electrical and Computer Engineering

M5 Design Project – 2014

College of Engineering - University of Massachusetts Amherst

