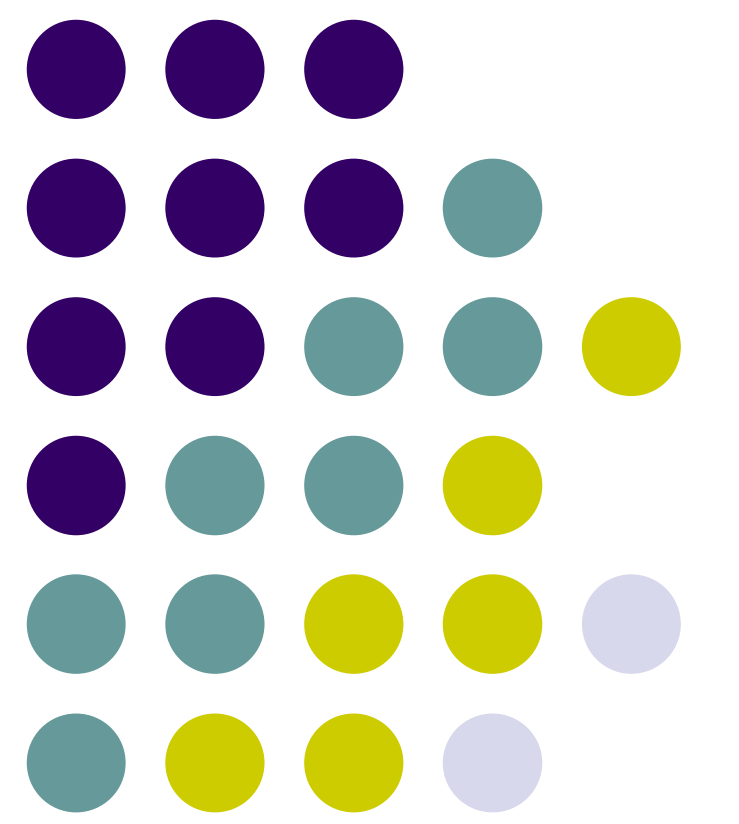


Tactile Sensing Cockroach

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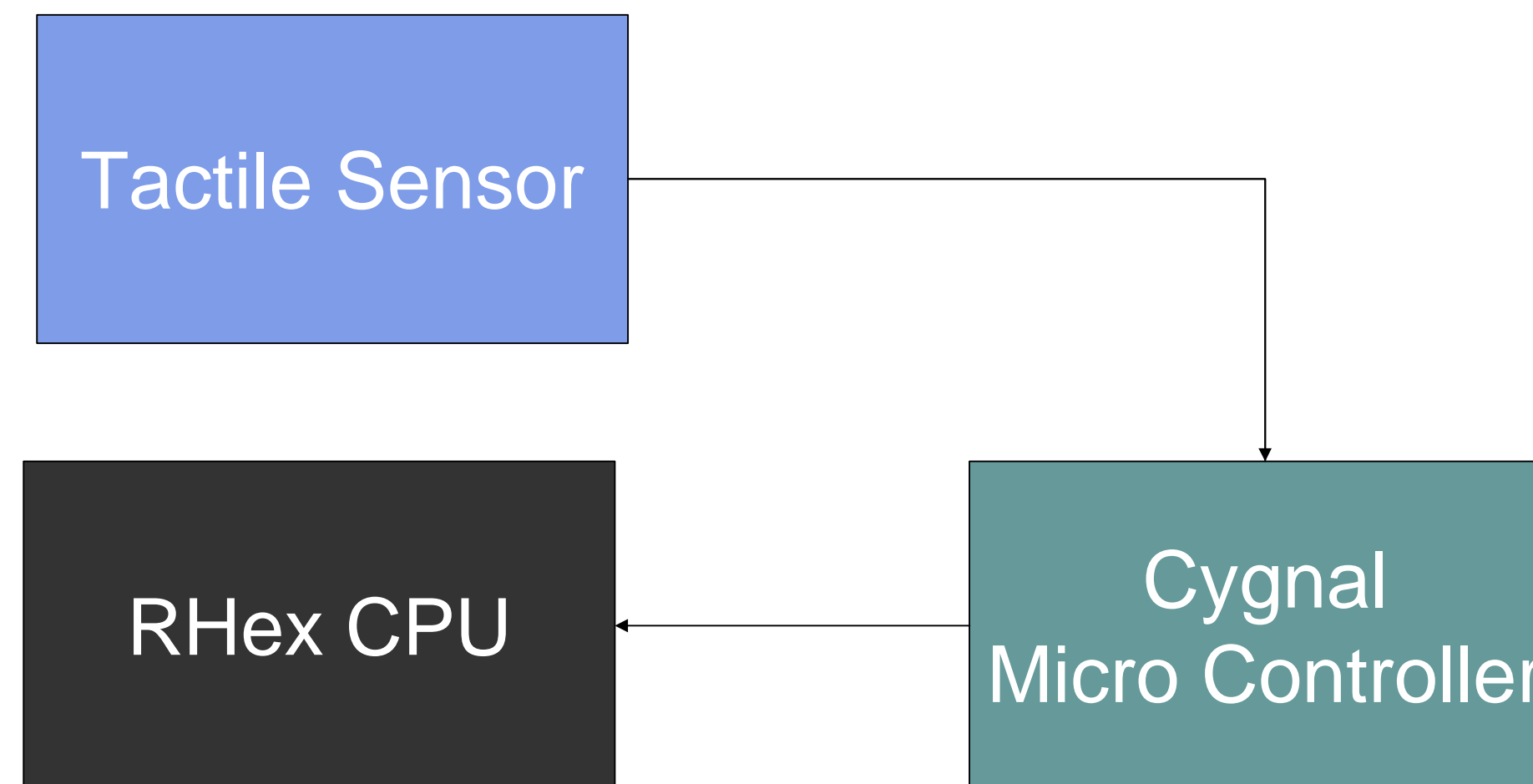
Abstract

In the field of robotics, there has been a tremendous amount of resources dedicated to solving the problems of autonomous navigation and obstacle avoidance. Traditional approaches to robotic navigation have used "vision" systems that involve gathering data using cameras and processing the data using image recognition algorithms. The problem with this approach is that it is extremely computationally intensive and ineffective in low light conditions. From a biological standpoint, consider that almost one-third of the brain capacity of higher level mammals is dedicated to image/vision processing.

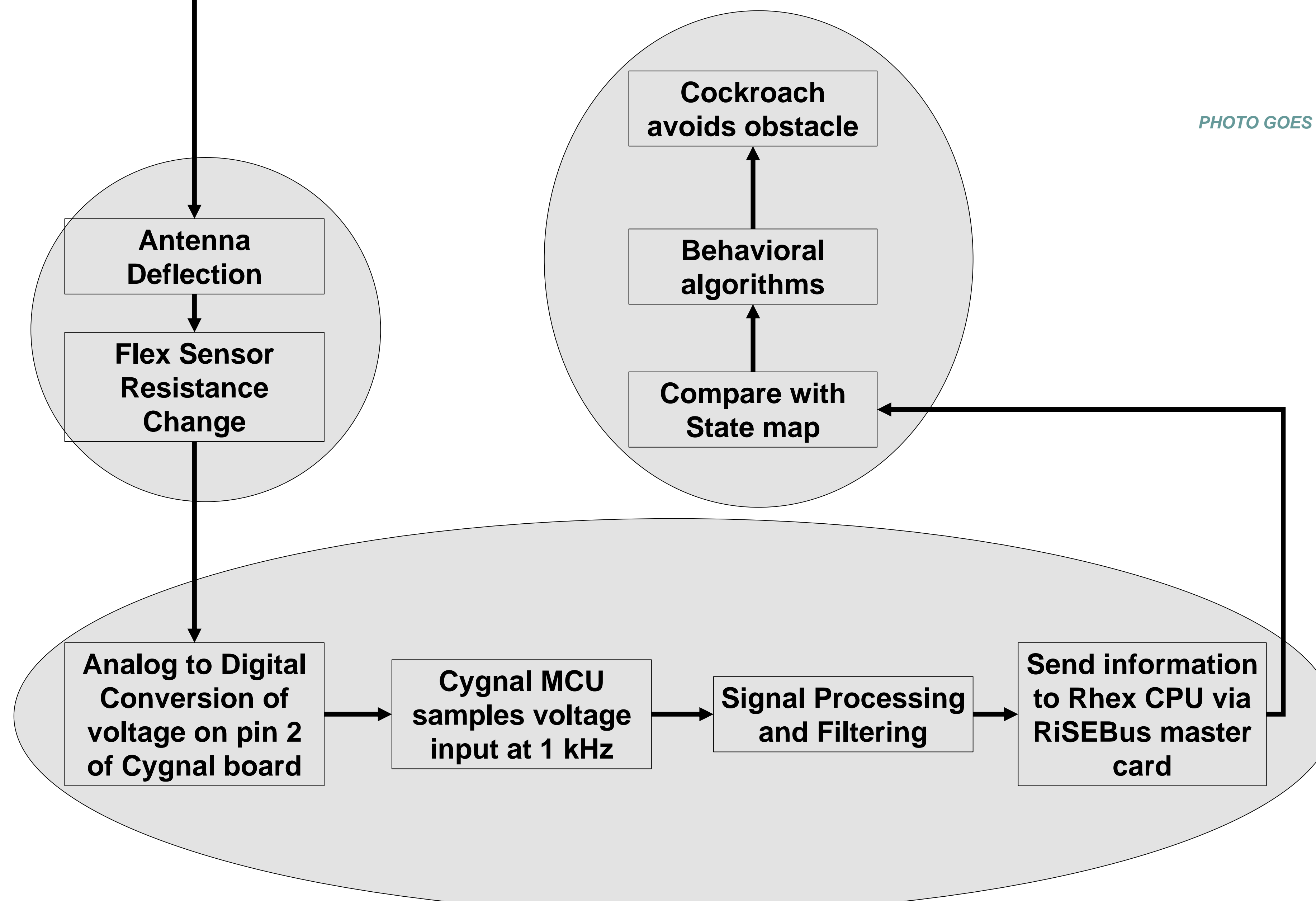
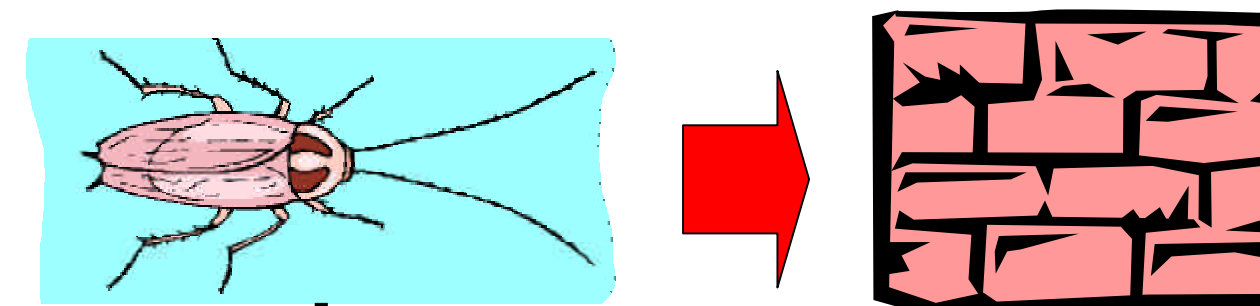
The chosen approach is inspired by nature, specifically the segmented antennae of cockroaches. Mini-Rhex, a hexapedal robot, extracts tactile information from the surrounding environment using flex sensors. When the sensors come into contact with any surface or obstacle, deformation of the flex sensors produces a corresponding voltage that is sampled by the robot and converted into digital form. This data is used in behavioral algorithms to govern the reaction of the robot to its environment.

The full implementation of this tactile-sensing system allows mini-Rhex to react dynamically to its environment while maintaining a velocity of up to 0.5 m/s. Wall following along with obstacle avoidance are implemented in mini-Rhex's behavior. This system significantly enhances the range of mini-Rhex's capabilities in both unfamiliar environments and conditions of poor lighting.

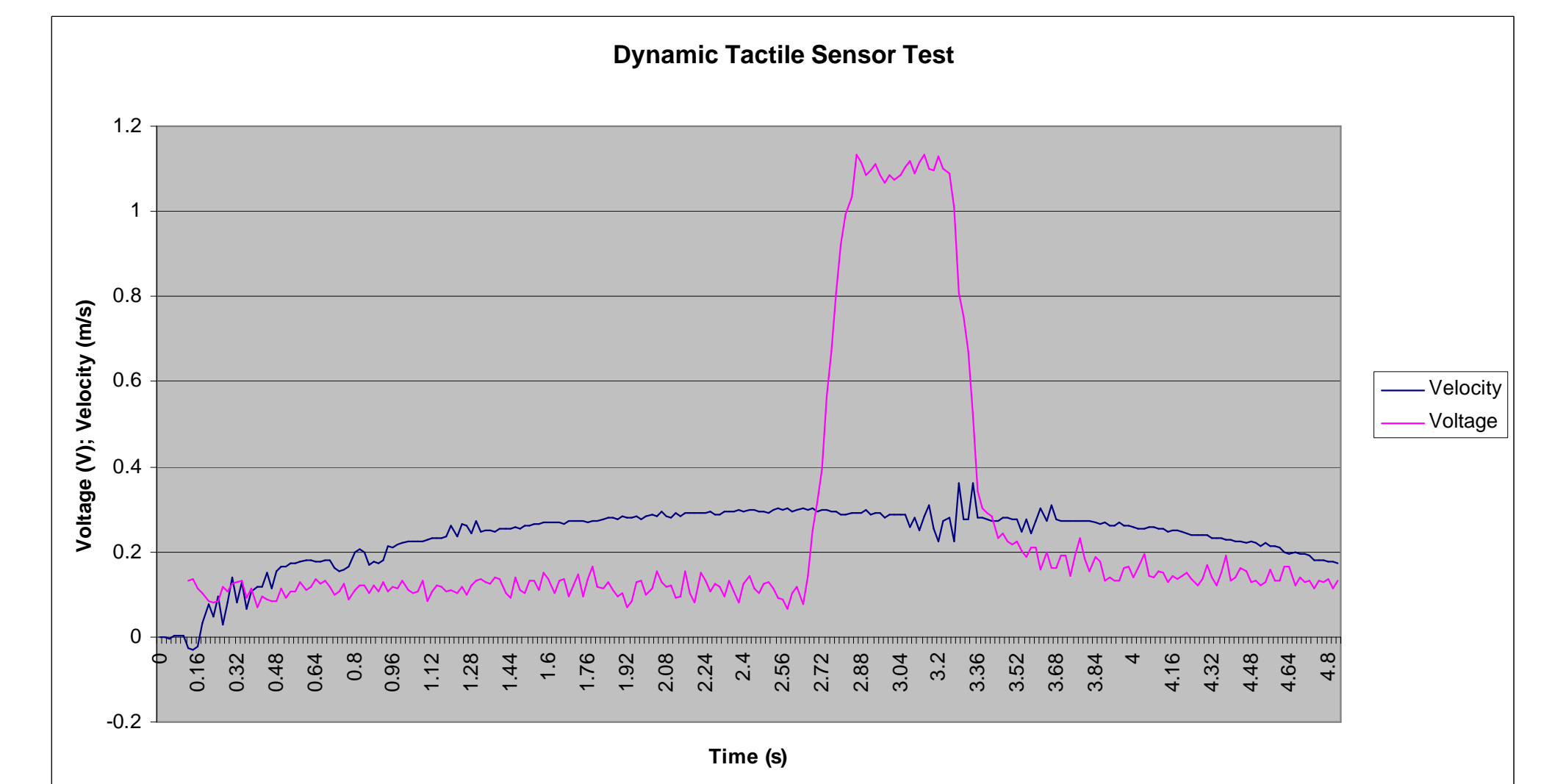
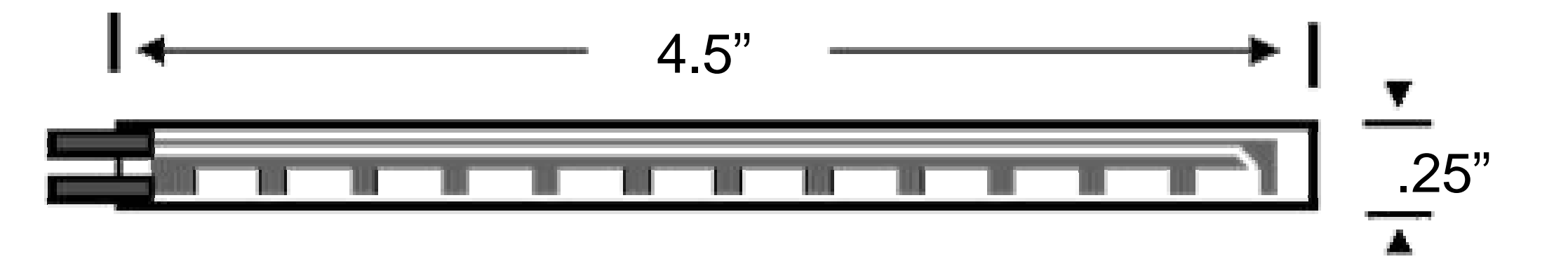
System Diagram



Operational Flow



Dynamic Flex Sensor Test



R-Hex in action

PHOTO GOES HERE. WILL PHYSICALLY ADD PHOTO.

