The CHAAC Unit

By: Trevor Sherrard & Rodney Sanchez

For Robotics Systems (EEEE 485) Final Project

Sparkfun BME280 Sensor

The Sparkfun BME280 I2C sensor allows the teensy to quickly poll weather data, average it, and send it to the Raspberry Pi for classification.

Weather Data Acquisition

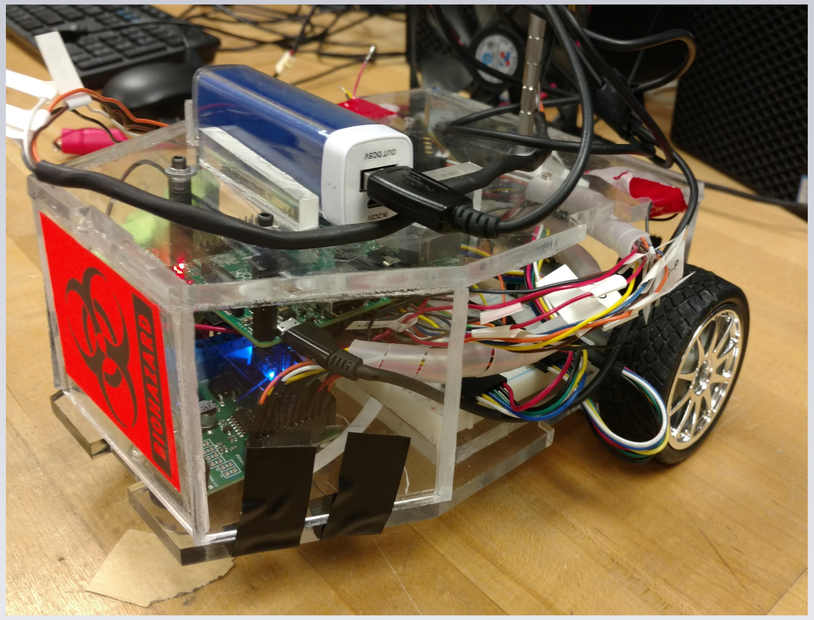
Weather data was manually scraped from Wunderground.com historical weather data for Rochester, NY into a .csv file. The dataset was an average of temperature, pressure, and humidity collected daily from 2013.

Hardware

The CHAAC unit has a Teensy 3.2 ARM based micro controller and a embedded Linux board (Raspberry Pi) that are connected over a USB connection for a control system. This allows the Raspberry Pi to power the teensy over USB in addition to serial communication. The teensy reads from quadrature encoders, the HC-SR04 Ultrasonic sensor and the Sparkfun QRE1113 line sensor to follow darks lines and avoid obstacles in its path while doing so.

Project Description

The CHAAC Unit is a differential drive robot that uses multivariable logistical regression to classify weather conditions based on data polled from a Sparkfun BME280 atmospheric sensor. The robot was also able to follows lines and avoid obstacles in its path. The robot was also able to be controlled remotely via a Microsoft Xbox controller and XBEE wireless radios.



Software

The Teensy 3.2 was programmed in C++ using the Arduino IDE and Teensy Loader. The Raspberry Pi uses a python script that runs on boot to read available serial from the teensy to classify the weather conditions. There Is also a MATLAB script that runs on an off board computer to process and transmitter commands from the Xbox controller.

See the high-level program control flow diagram below.: