Model-driven development of software for the PolarSys Rover using Papyrus-RT

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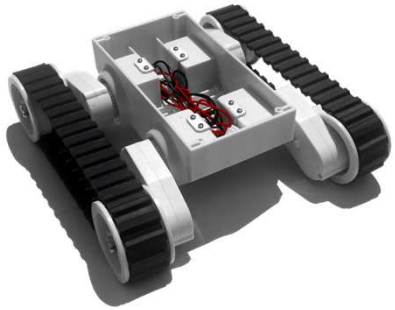
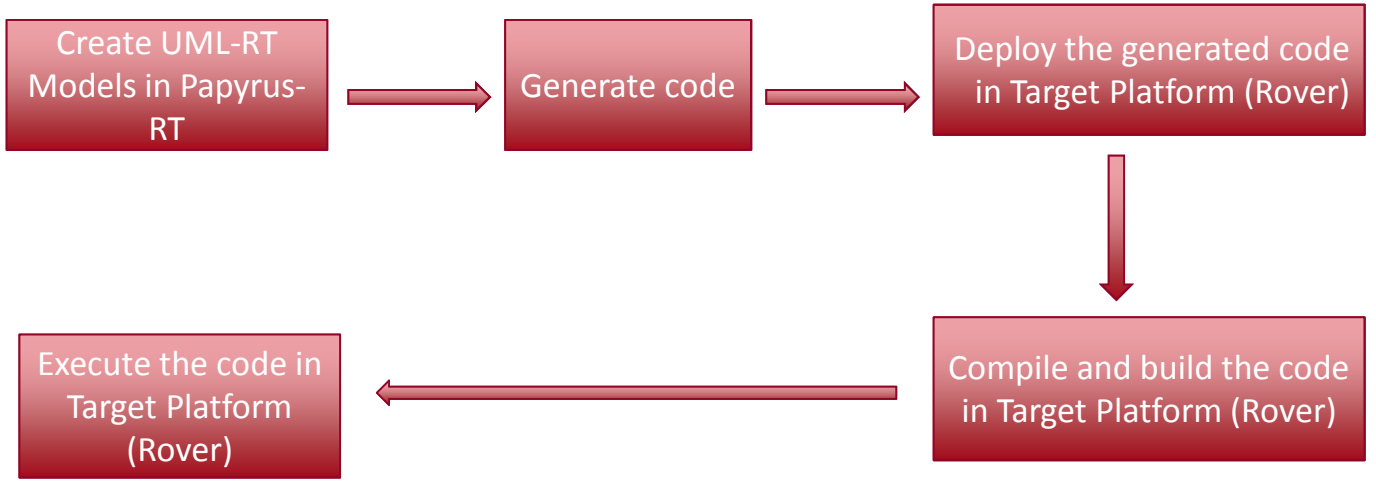
Motivation

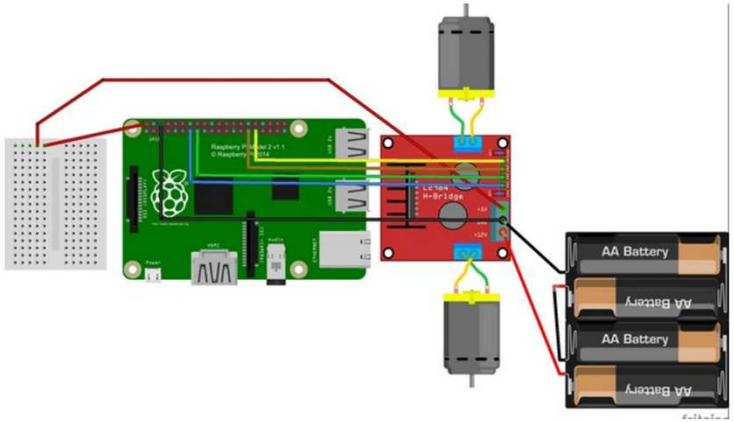
- As part of PolarSys Rover Project, the intension is to perform model-driven development of software for the Pololu rover.
- To get a hands-on on all the phases of the development of an embedded system.



High-Level Design Flow



Hardware Specs



- Pololu Dagu Rover 5 Chasis
- Raspberry Pi 3 Model B
- MC33926 Motor Driver
- HC-SR04 Ultrasonic Range sensor
- LSS05 Line Sensor
- PiCamera

Rover Architecture

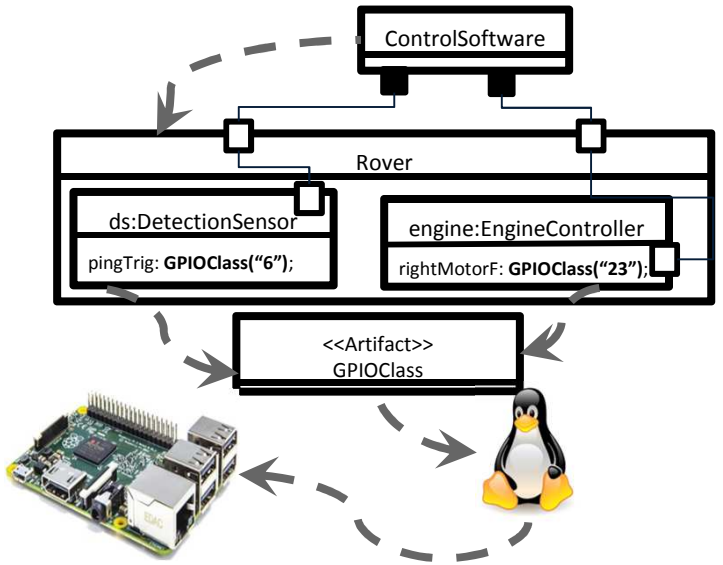
Application

Rover Library

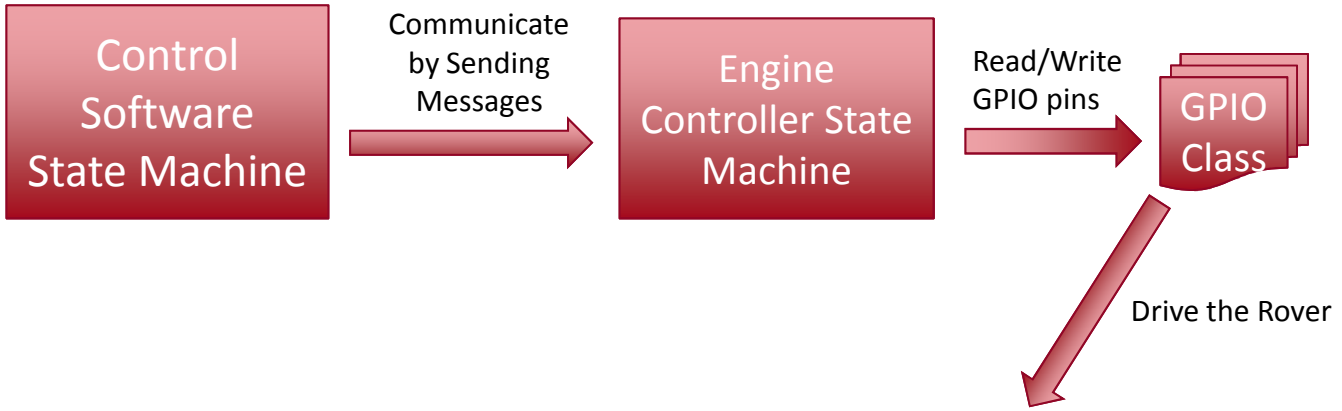
GPIO Class

Mapped File System

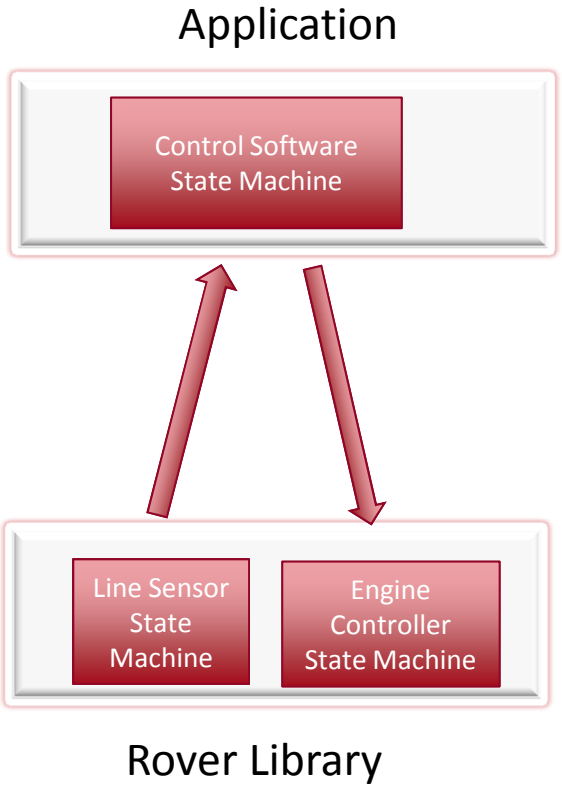
Hardware

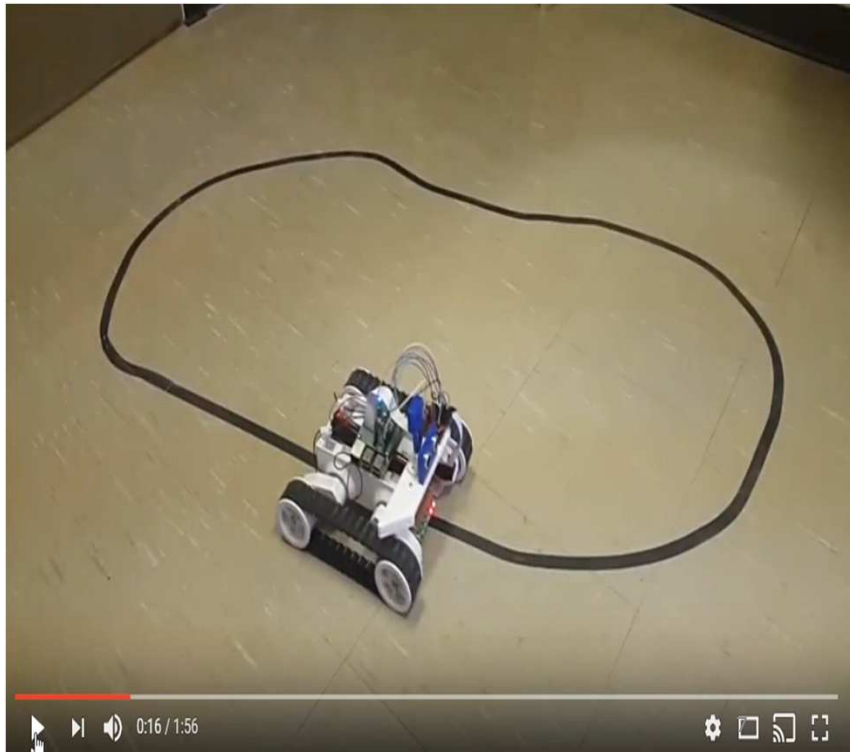


Work Flow

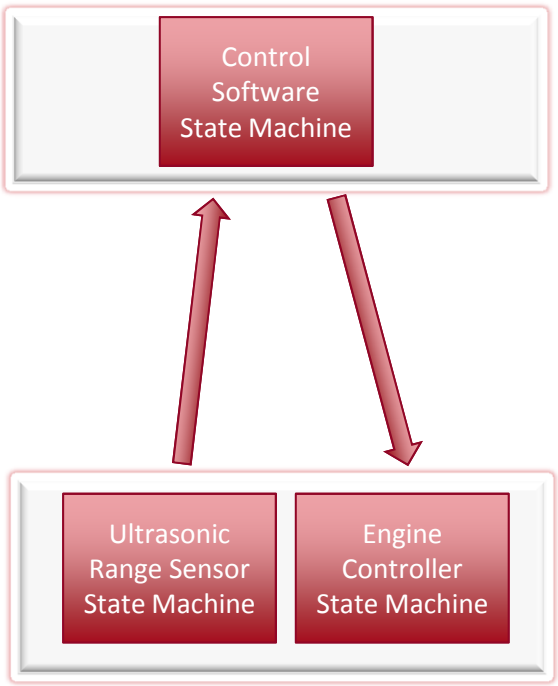

Control Software State Machine
Communicate by Sending Messages
Engine Controller State Machine
Read/Write GPIO pins
GPIO Class
Drive the Rover

Use Case 1: Line Following



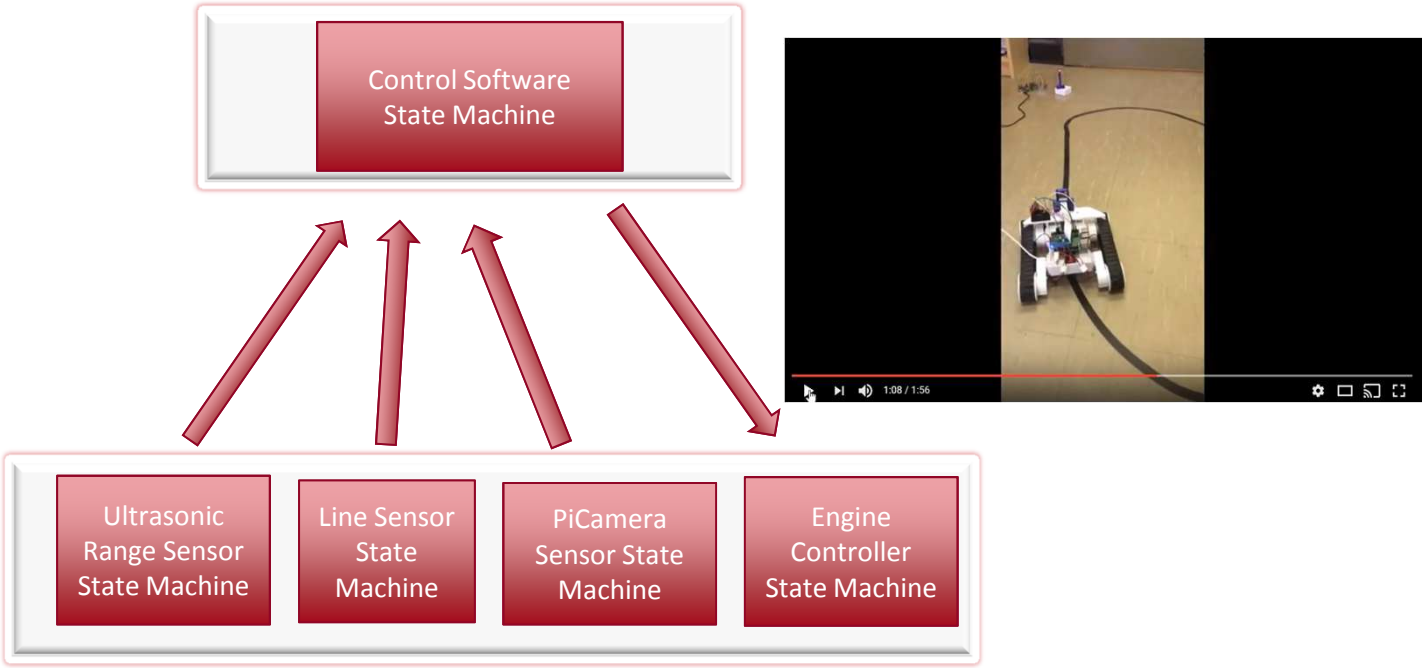


Use Case 2: Obstacle Detection



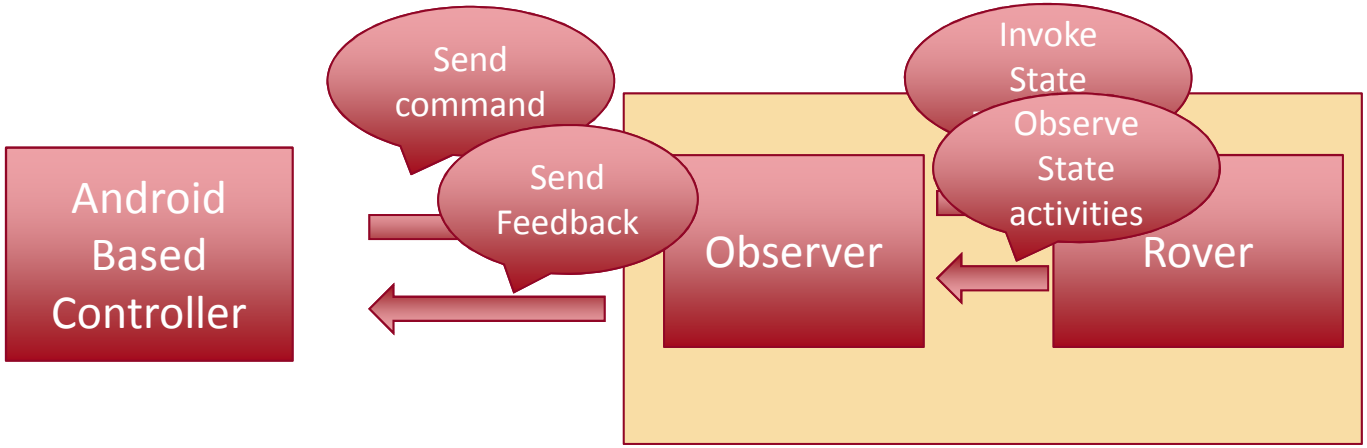
Use Case 3: Image Recognition

Application



Rover Library

Communication with External Environment

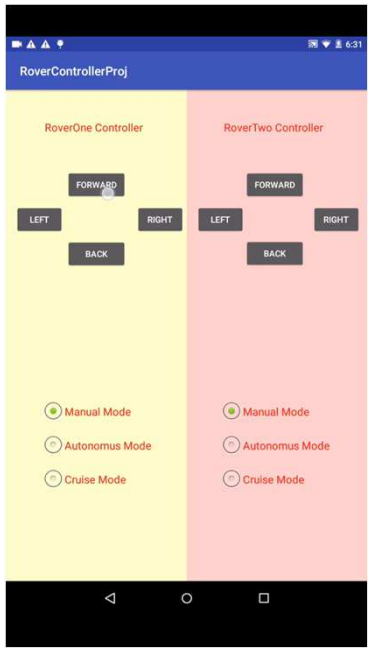


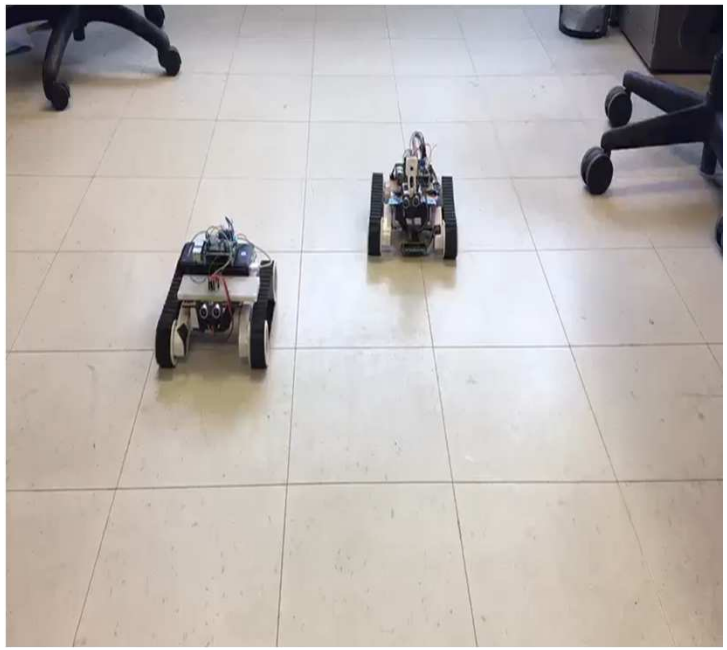
Use Cases

Android Controller

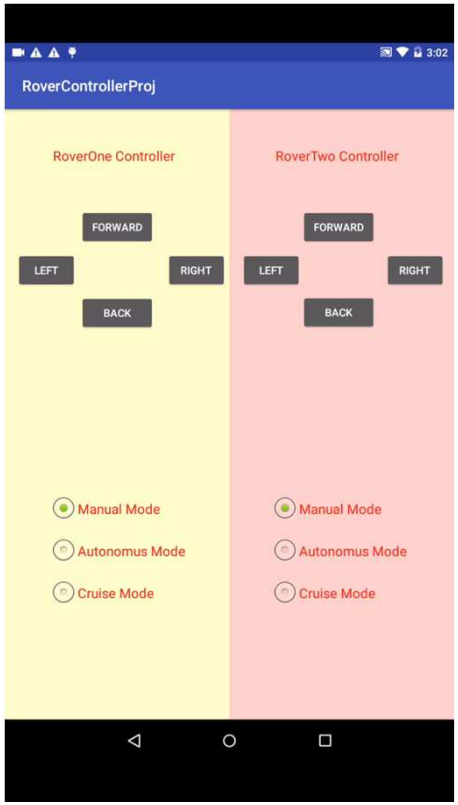
- Manual Mode
- Autonomous Mode
- Cruise Mode

Use Case 1: Manual Mode





Use Case 2: Autonomous/Cruise Mode



Future Work

- Creating complex control software use case scenarios:
  - Establishing communication among a group of rovers for autonomous exploration.
  - Autonomous Rover with camera and GPS for navigation.