Model-based Prototyping of Real-time Systems With PapyrusRT and Unity

Michal Pasternak

Agenda

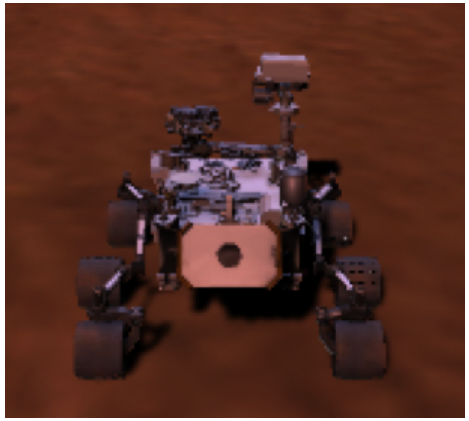
- **Completed Work**
  - Rover Simulation
  - Car Simulation
- **Motivation**
- **Vision**
- **Work in Progress**
  - Flow Chart
  - Components

Completed Work

- Simulations of both a Mars Rover and a self-driving Car.

- Communication which allows for full control of simulation through a generated papyrus model.

- Ability to hand customize the model, the environments, parameters and test conditions



Motivation

Key Motivations for a Prototyping Environment:

- Cost of hardware for testing is costly and often unavailable

- Most available simulators are not the best for the specified use case, do not allow the level of customizations required or their cost is prohibitive.

- Hand designing a specific simulation for testing a control model requires know-how and is time consuming.

- The required simulation changes frequently and requires frequent edits.

Vision

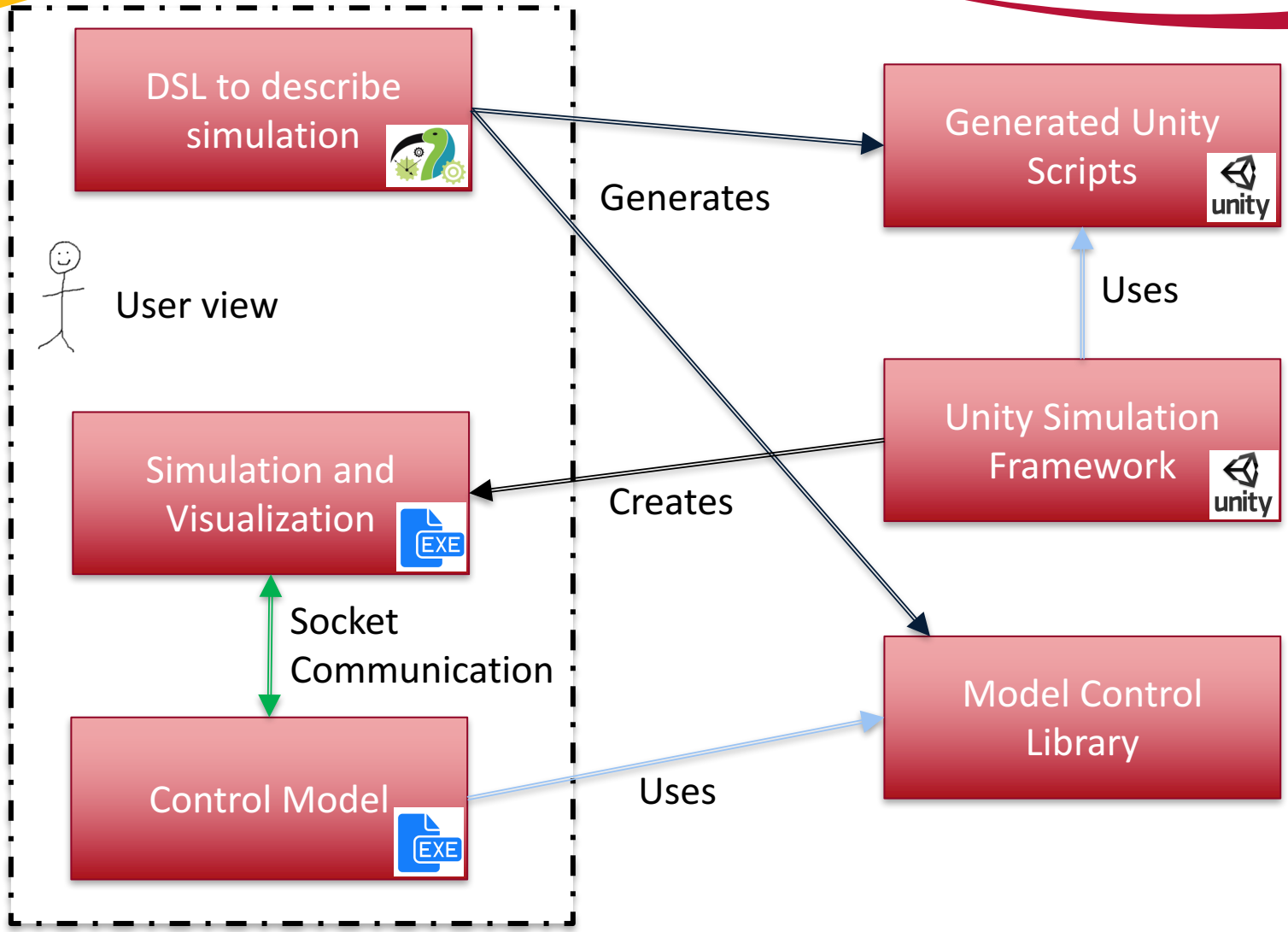
Goal:

Create a prototyping tool which will allow for the generation of a simulation environment and a control library for developing a control software using MDD.

Requirements

- Be able to customize simulation in a high level way, with out having to edit any Unity code.
- Ability to customize the environment, model and simulation to conduct varied tests.

Flow Chart


DSL to describe simulation
Generates
Generated Unity Scripts
unity
User view
Uses
Unity Simulation Framework
unity
Simulation and Visualization
EXE
Creates
Socket Communication
Model Control Library
Control Model
EXE
Uses

Components

- **Simulation Creator:** Uses a high level language to describe the environment, the controlled object, and what is to happen in the simulation.

- **Unity Simulation:** Generated based on criteria described in the Simulation Creator. Visual animation of object, environment and interactions. Produce relevant output from the simulation to the Papyrus Model.

- **Control Model:** The control model will take feedback from the simulation and provide it with inputs.