Simulation project

November 27, 2018

Overview

Project goals

- Goal: Creation of a simulation environment for the SwarmLab copters
- Should be easy to use and extend
- Use existing Paparazzi control loop

Why do we even need a Simulation?

- TODO: insert picture of broken copter part
- Simulation allows experiments without risking potentially expensive hardware
- Exploration of a wide range of potential environments and conditions

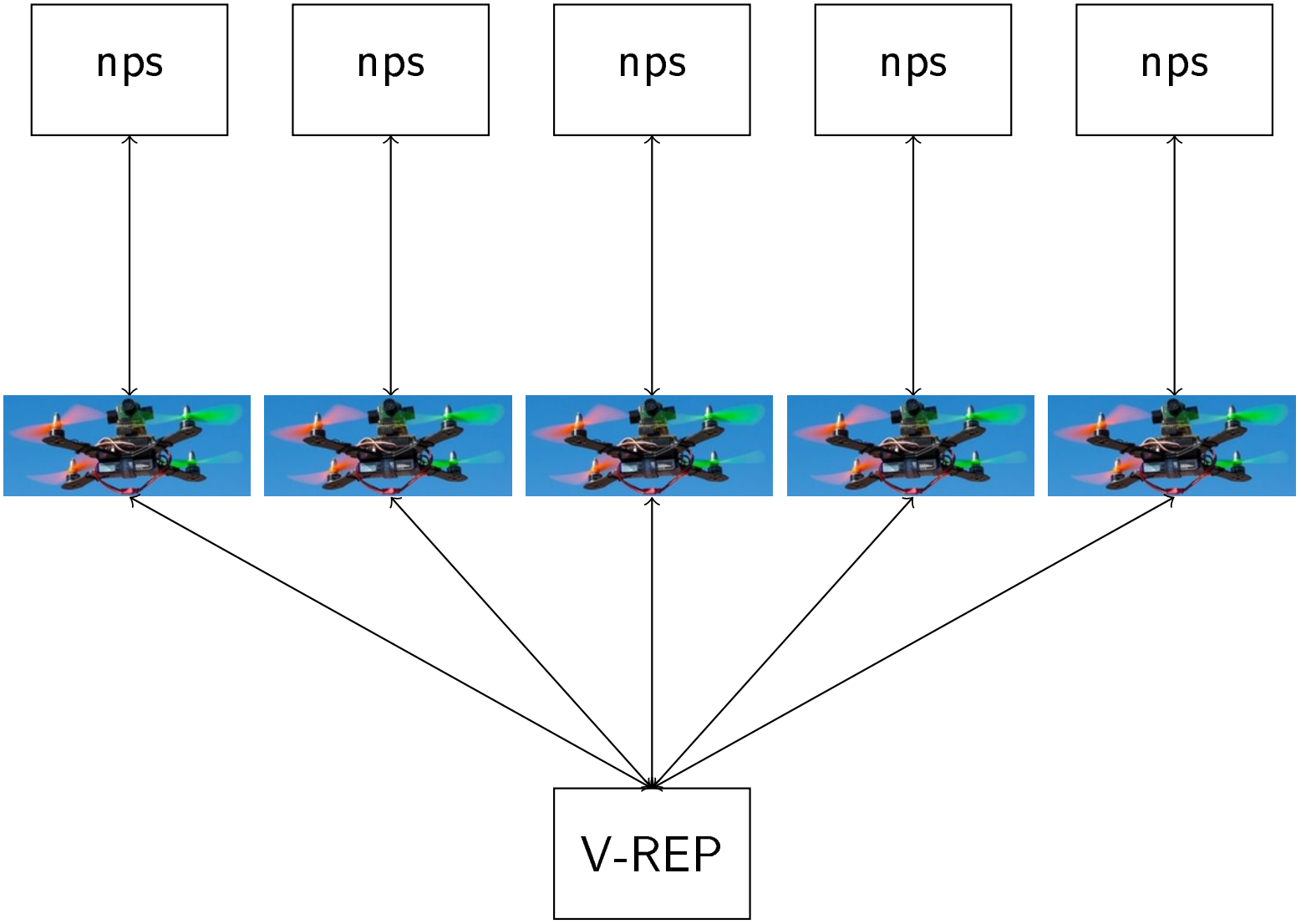
Project idea

- Idea: V-REP plugin providing communication between paparazzi and V-REP
- V-REP provides the copter state, paparazzi the corresponding commands
- Main advantage: same code and infrastructure usable on simulated and real copters

Why a new framework?

- There are other simulators for paparazzi
- None of them provide all needed functionality/convenience
  - Full 3D environment
  - Swarm capable
  - GUI, ease of use

Connection Architecture



Loop overview

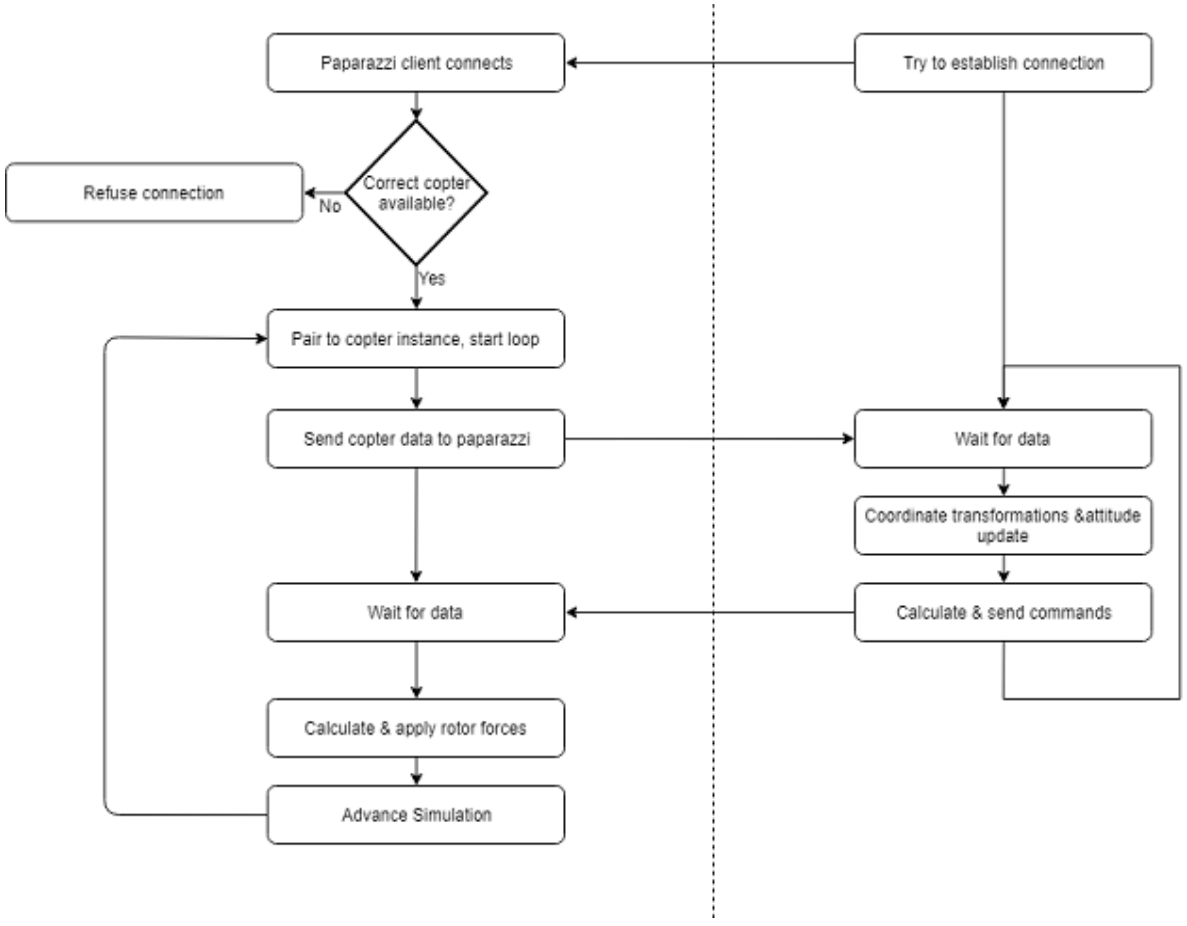


Figure 1: Simulation loop overview

Exchanged data: V-REP

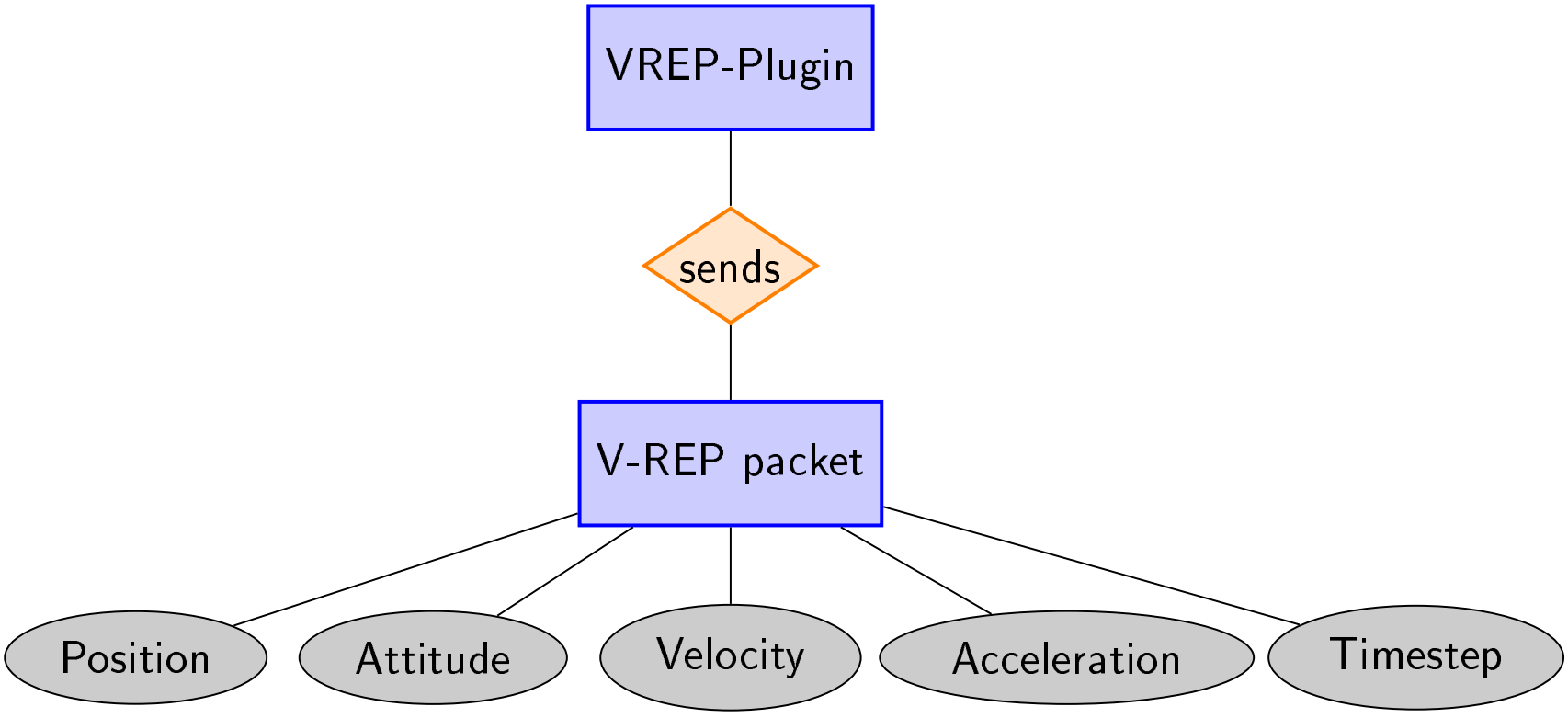


Figure 2: Data sent by V-REP to Paparazzi

Exchanged data: Paparazzi

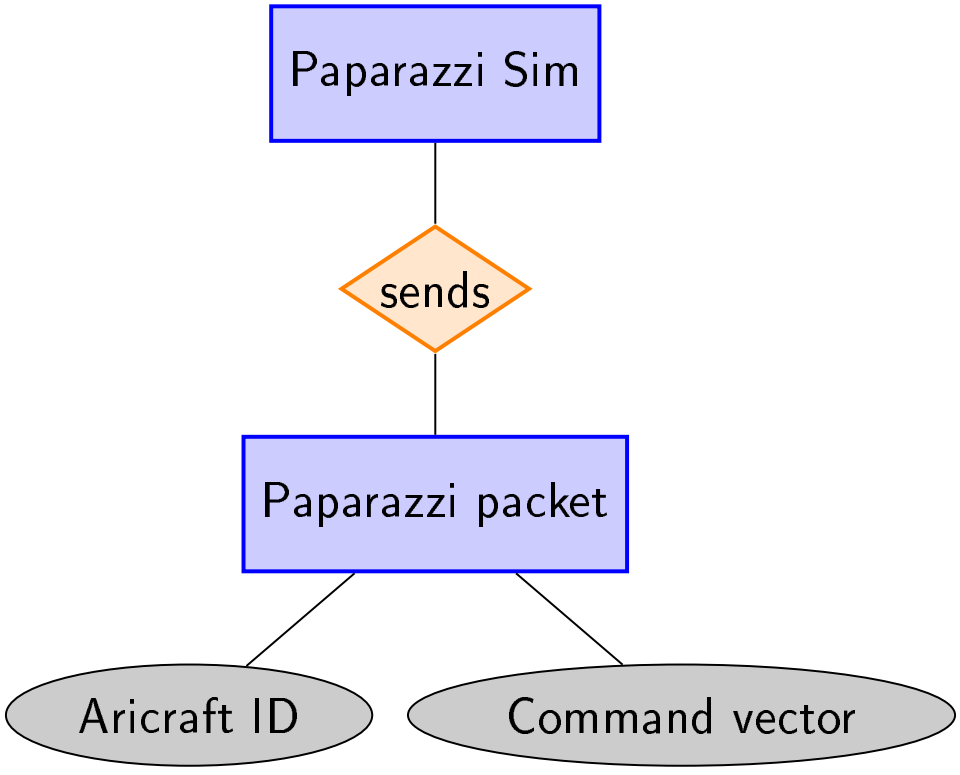


Figure 3: Data sent by Paparazzi to V-REP

Problems

- Coordinate transformations
- Connection stability

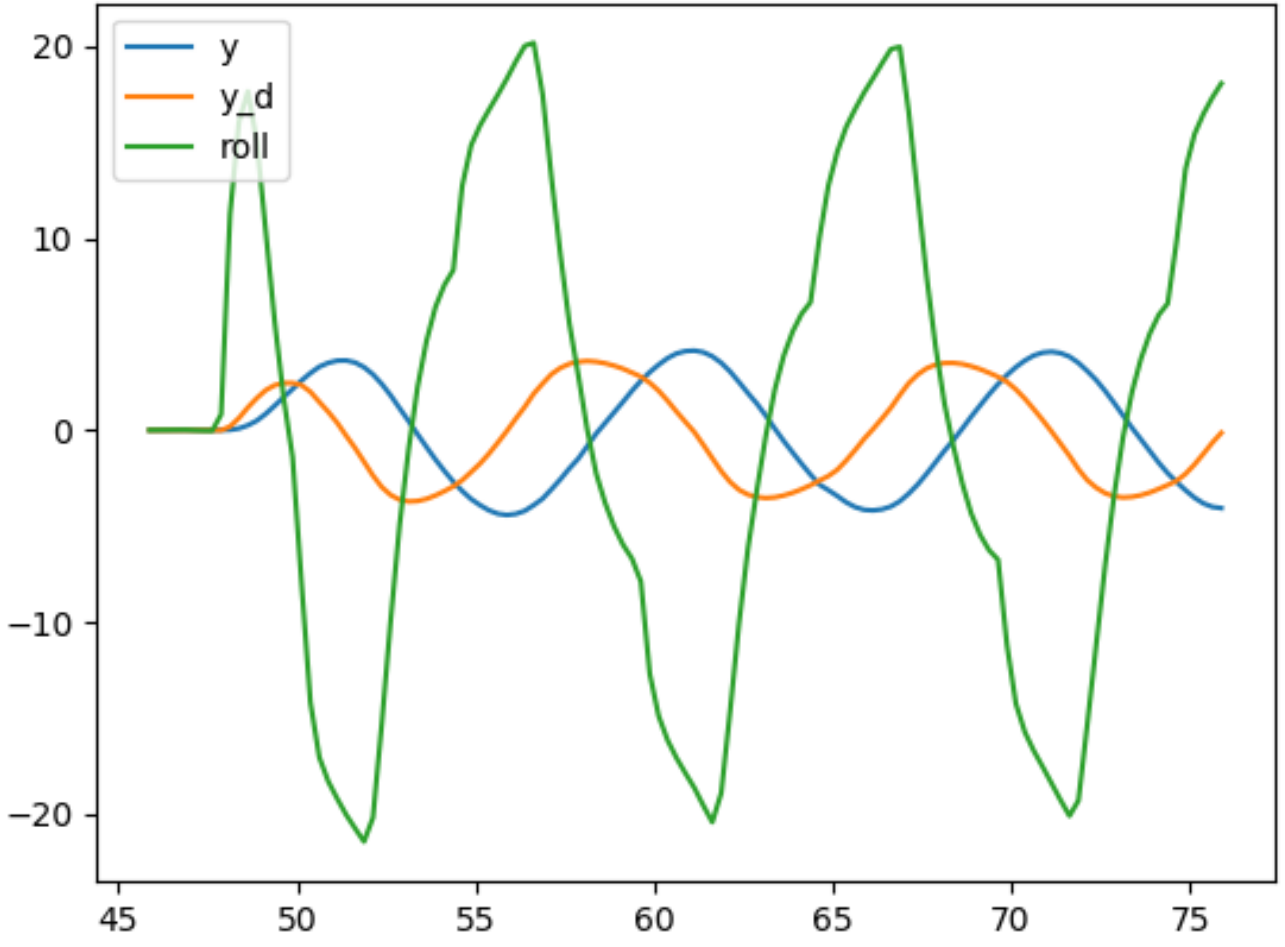
Coordinate transformations

- Paparazzi provides most functions for coordinates transformations
- But: 90 degree offset in the attitude quaternion
- Also: Rotation and acceleration values for x and y axes were switched
- $\rightarrow$ multiple interdependent sources of errors, difficult to debug

Connection stability

- Connection failure should not crash the entire simulation
- Correctly track connected and unconnected copters
- "Ghost Copters" lead to crashes

Evaluation: Simple flight plan



Satistics as well?

- insert statistic evaluation table

Demo

Thanks for your attention

- Special thanks: Christoph for always helpful advice and bug-hunting expertise

Simulation project

November 27, 2018