CS491/691: Introduction to Aerial Robotics

Aerial Robot Swarming Subject to Communication Constraints

Nirmit Patel, Luan Nguyen, Garrett Winkelmaier

Team 5

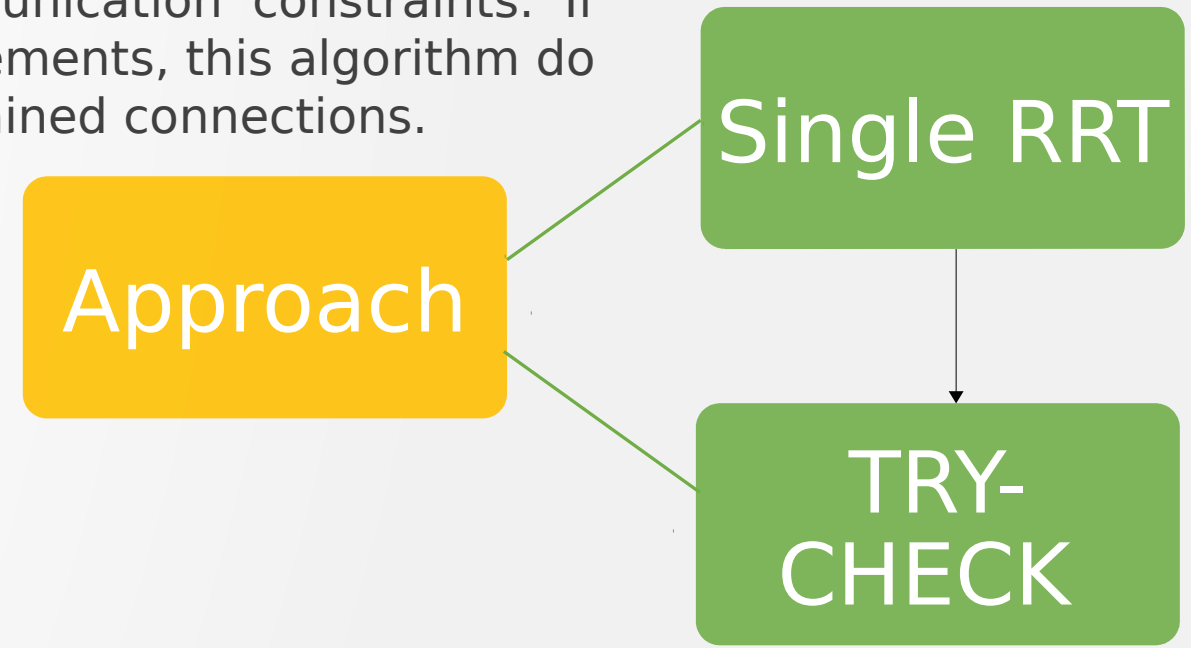
Motivation and Problem Description

- Facebook is using drone swarms to increase internet coverage in remote areas. We wanted to create a control algorithm for maintaining connectivity of a swarm in an urban environment.

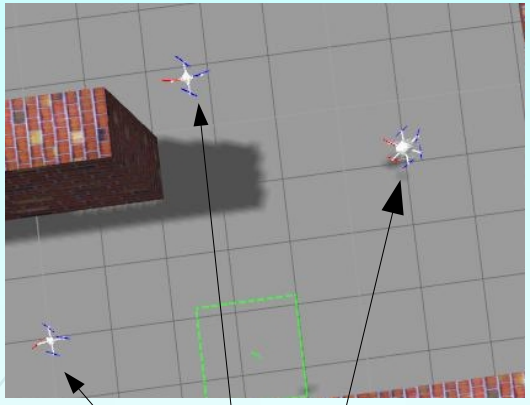
- Drone swarms can accomplish more than a single drone, however they must be able to communicate with each other. Our control algorithm will maintain the communication link while the swarm navigates an urban environment.

Proposed Approach

- Two approaches:
  - Apply RRT to each drone and have them work by themselves.
  - Propose a control algorithm, TRY-CHECK, that apply RRT to TRY three best planning paths toward to the desired destinations, then CHECK its communication constraints. If these constraints are broken by movements, this algorithm do TRY and CHECK again to keep constrained connections.



System Description



OUR PACKAGE IMPLEMENTATION

TRY-CHECK

RRT Path Planning

SOFTWARE

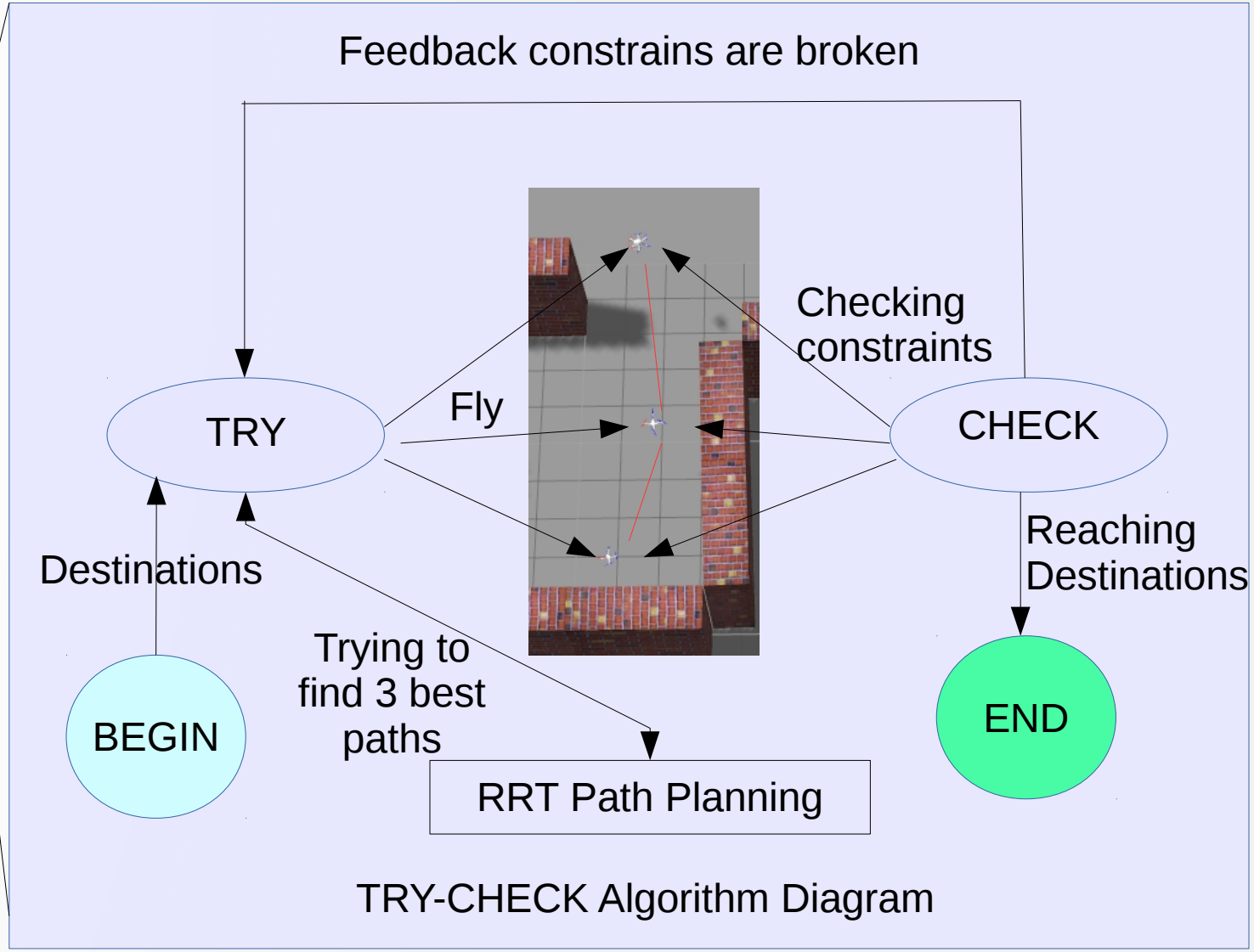
Rotors Simulator

ROS Indigo
Gazebo

Ubuntu 14.04 TLS

HW

GTX-980M, Core i7
2.6GHz, 16 GB RAM



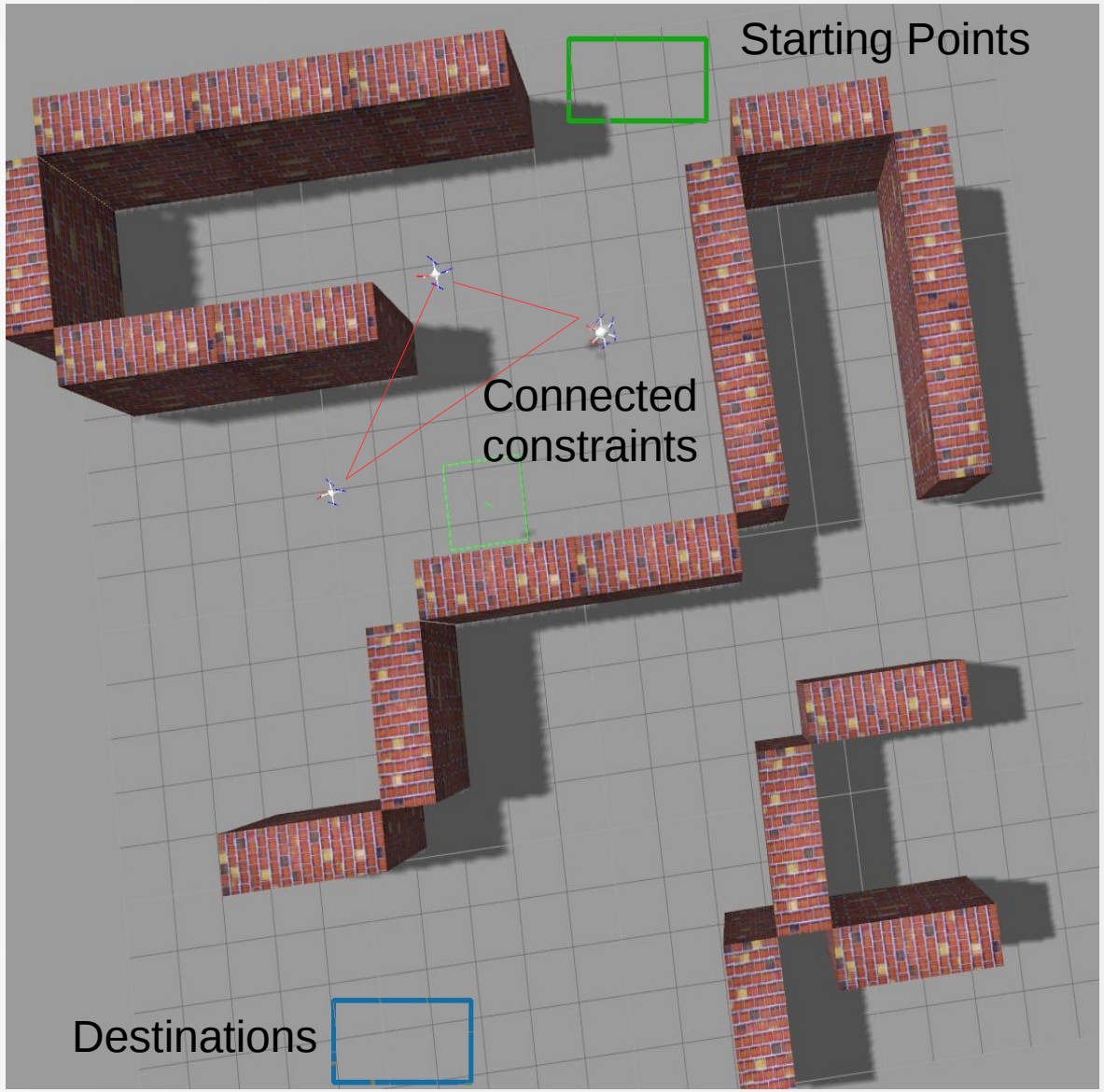
TRY-CHECK Algorithm Diagram

Results

- Building a static world and map.
- Proposing TRY-CHECK algorithm, and implementing the RRT, TRY-CHECK algorithms by C++ on Rotors-simulator, Gazebo, ROS to control three drones.
- Testing RRT and TRY-CHECK algorithms.

Future Works

- Accomplishing further done for our algorithm.
- Implementing it on a real school of drones with integrated more sensors on drones.
- Testing it on a real environment.



Thank you very much!