Simulation environment for the deployment of robots in precision agriculture

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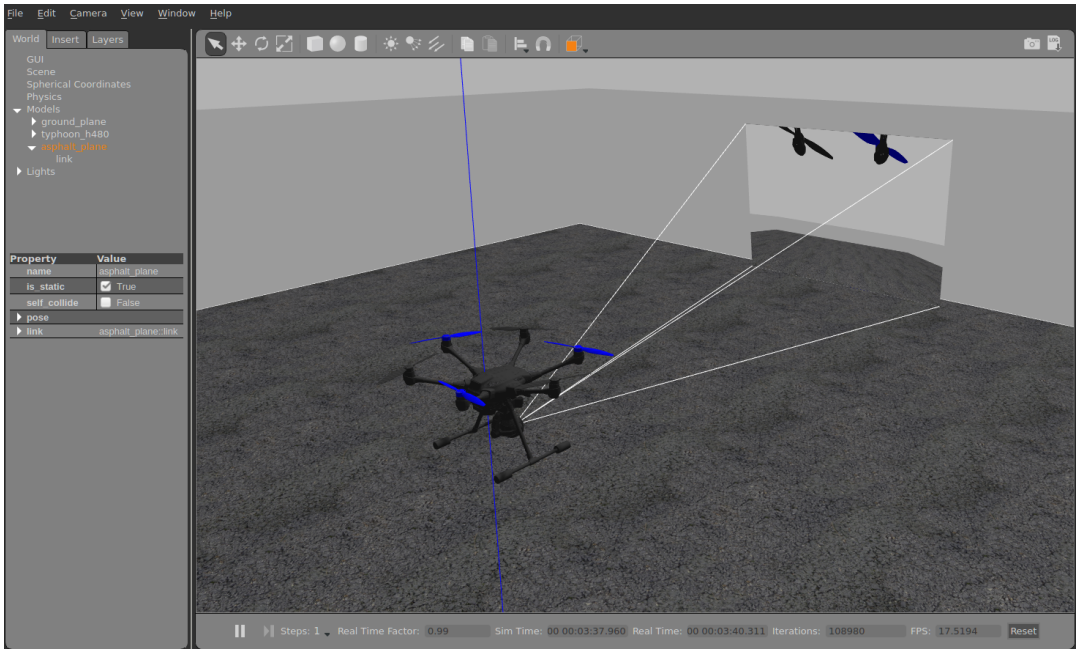
Robots for agriculture

Robots for agriculture

- Mission planning
- Trial and error is not the best policy
- External factors limit the task execution

Features of a robotic simulator

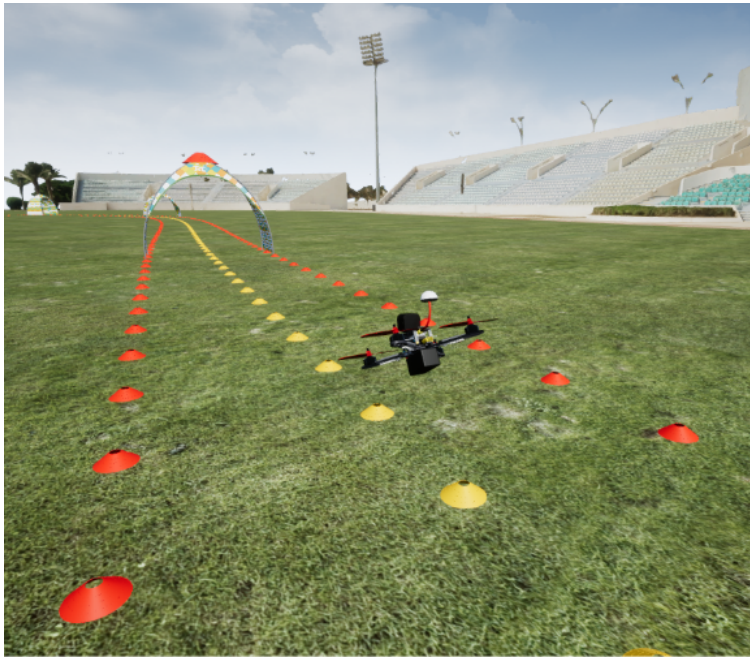
- Cost
- Transferability
- Compatibility
- Accuracy in the representation



Game engines

CARLA

Sim4CV



Proposed Solution

- Implement a simulation environment for precision agriculture
- Our approach is based on the work [1]
- We extend their approach by looking at the overall mission

[1] M. Di Cicco, C. Potena, G. Grisetti, and A. Pretto, “Automatic model based dataset generation for fast and accurate crop and weeds detection,” arXiv preprint arXiv:1612.03019, 2016.

Case study

- Donwny Mildew
- The main symptoms are the change of the leaves color and the dwarfism phenomenon
- Our approach focuses on determining the height of the crops to detect the presence of the parasite

Infected sunflowers

Proposed Solution

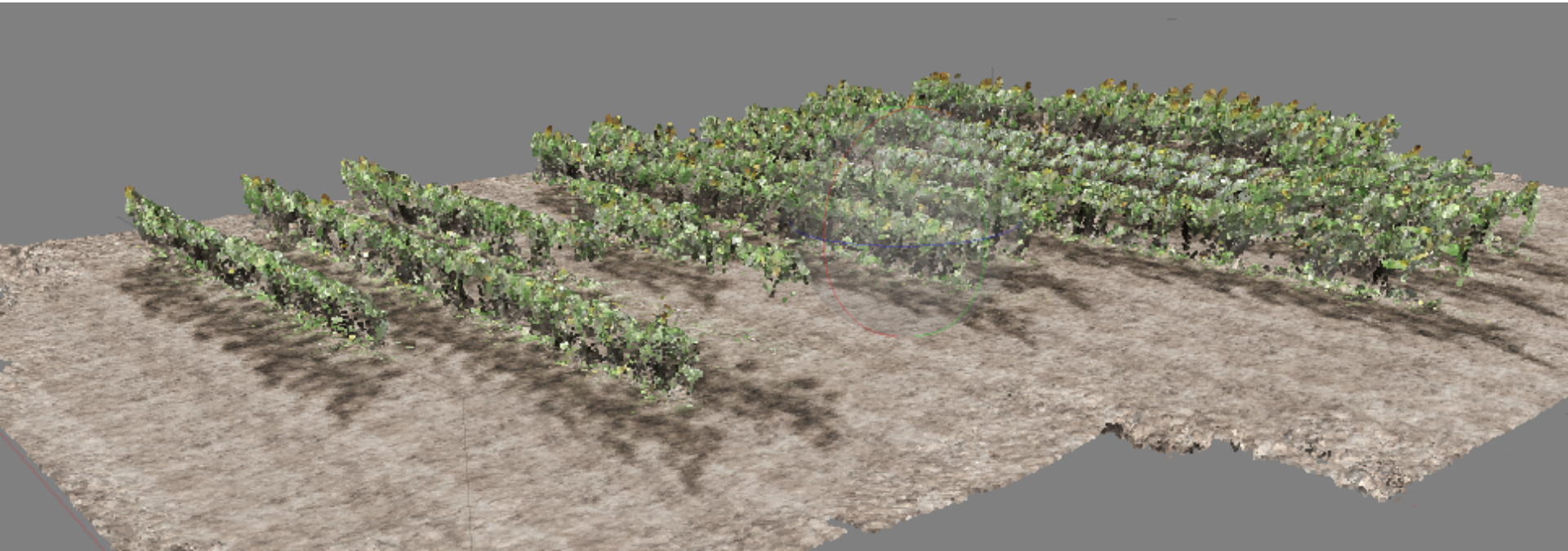
Our work is divided into two parts

- Development of the simulation environment
  - Model of the plants
  - Adding a UAV to explore the crops
  - Perform the data collection
- Determining the height of the crops by using 3D reconstruction

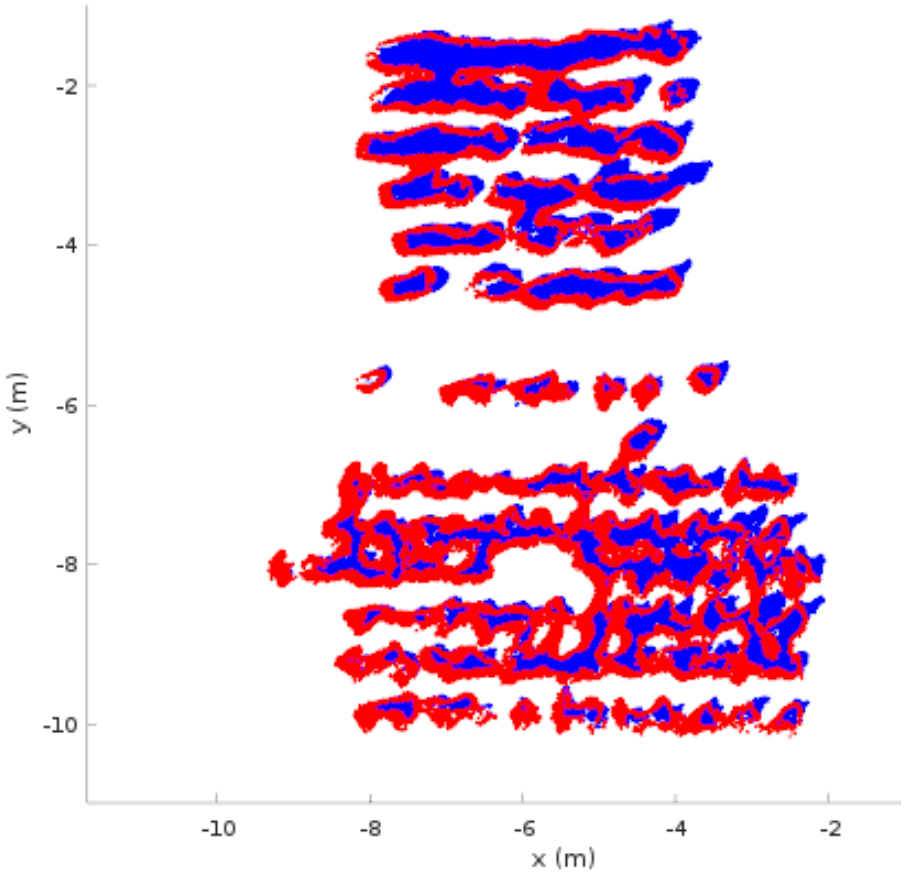
Simulation environment

Crops 3D reconstruction

- We use Photoscan as a first easy off-the-shelf implementation
- The height information of the crops is extracted from the point cloud



Preliminary results homogeneous vegetation



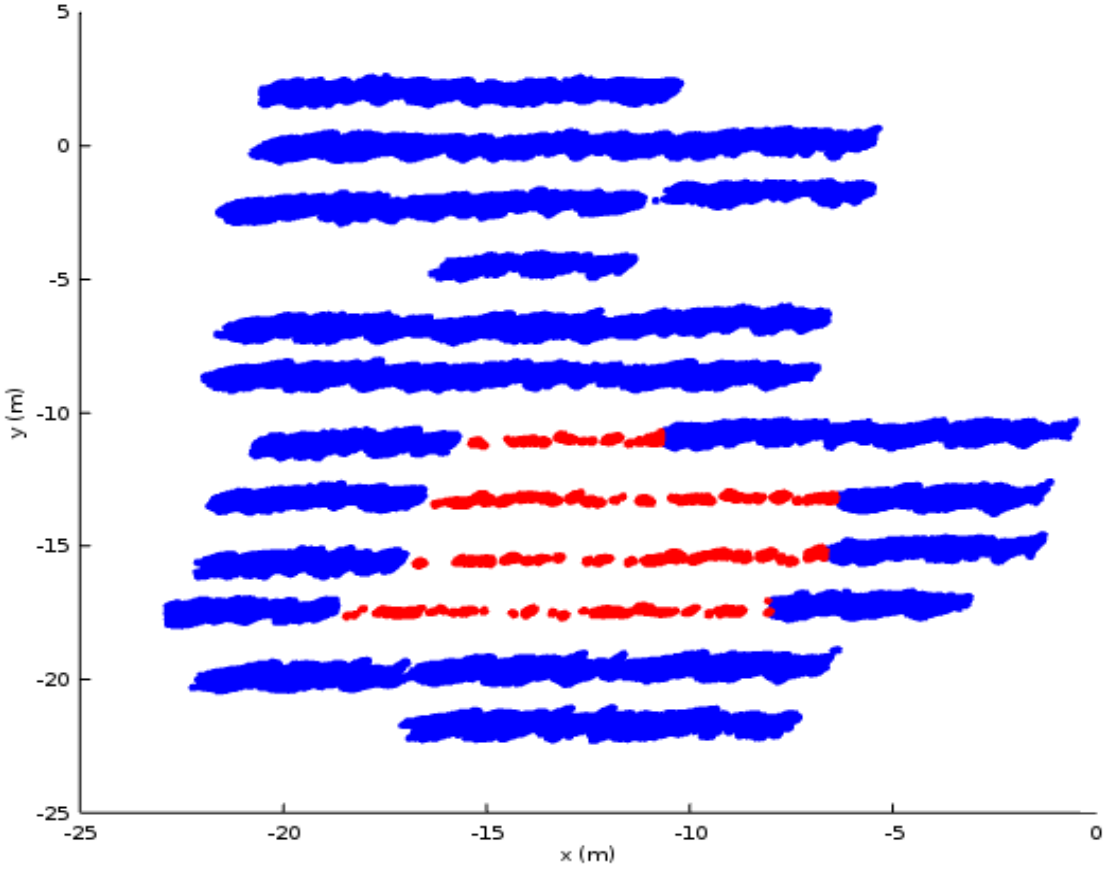
Ground truth crops height

Model 1: 2.1 m

Model 2: 1.0 m

Flying altitude	Crops height	
	Model 1	Model 2
5m	5.71%	3.00%
10m	7.14%	11.00%
15m	59.05%	58.0%
20m	69.05%	70.0%

Preliminary results mixed vegetation



Future work

- Improving the methodology to differentiate between the healthy and the infected crops
- Using additional features for the detections of the infected plants (e.g color)
- Testing in a real scenario