Point Cloud-Based Scene Understanding in MOVEs

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Description

Tula Labs. (https://www.tula-labs.com) is a company devoted to the development of electronics, robotics and software solutions for the smart cities, mobility, telecommunications and energy areas. It is part of the ProCME group (http://en.procme.pt), and acts as its innovation engine.

Tula Labs. has been developing a disruptive novel generation of autonomous electric urban vehicles, with bidirectional capabilities, designated as **MOVE** (Fig. 1). This kind of vehicles allows to transport persons and goods in public or private spaces, such as hospitals, hotels or universities.

Figure 1: Example of the MOVE vehicle running at the Hospital Rovisco Pais (Tocha).

MOVE vehicles are equipped with outdoor laser scanners ([1]) that generate 3D point clouds (Fig. 2), which are sets of data points that reflect the structure of the external surface of the objects in the surrounding environment. Point clouds can be used for various purposes, including metrology, visualization, animation and rendering.

This work aims at the development of a deep learning-based solution for scene understanding based in point cloud analysis. In particular, we are interested in the detection of the different kinds of objects that are the most likely in the outdoor urban/industrial scene where the vehicle is moving (e.g.: "persons", "cars", "bikes", "pets", "trees" and "roads").

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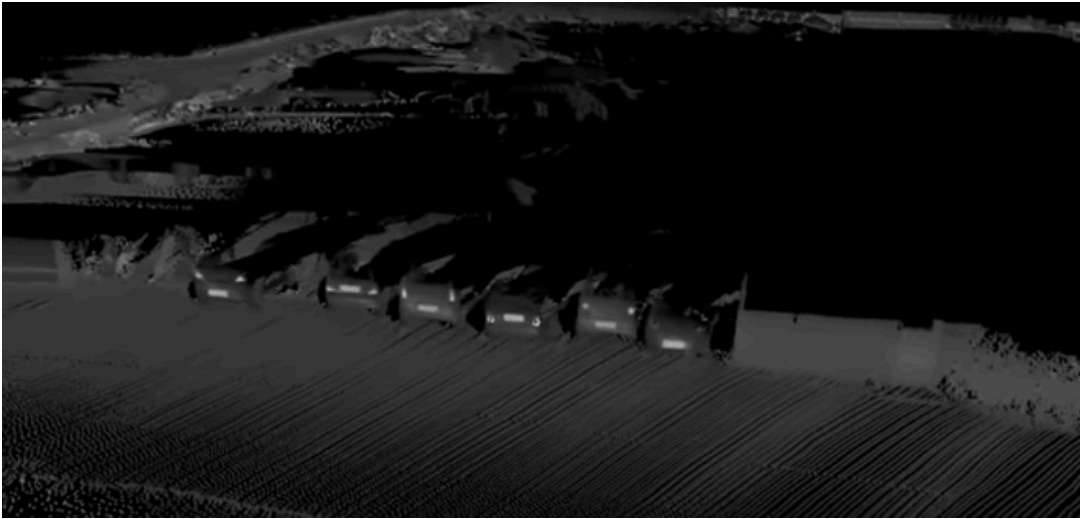
Figure 2: Example of a Point Cloud of an outdoor environment, produced by a Laser device similar to the used in **MOVEs**

Workplan

1- **Comparative study** of the existing point cloud-based scene understanding methods and solutions;

2- **Acquisition** and **annotation** of a **data set** for development and evaluation purposes;

3- **Development**, **implementation** and **test** of a deep learning-based solution for point cloud-based scene understanding;

4- Writing of a **Technical Report**, describing all the work carried out in the scope of the dissertation.

5- Writing of the **M.Sc. Dissertation**.

Prerequisites

- Basic skills in English writing/reading;

- Good programming skills, preferably in Python, Keras and TensorFlow languages.

- Previous knowledge about Machine Learning and Artificial Intelligence.

References

[1] https://www.sick.com/ag/en/c/products