

Artificial Vision for Helping Human Navigation

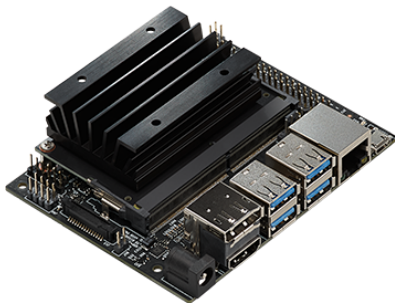
Project proposal

1 Goals

Currently we are developing a portable system that can be used by a blind person or a person with serious vision difficulties, to help them understand what exists in their vicinity and also navigate the real world. The goal is to take advantage of 3D cameras and integrate several computer vision algorithms for the recognition of places or locations, people and objects [1, 2, 3].

This project will focus on the navigation part of the system: it will give auditive feedback to the person regarding the 3D location of objects, in real time.

The code will be done using PyTorch on Linux and will run on an nvidia Jetson Nano.



2 Work plan

The project has the following tasks:

- T1** Introduction to computer vision algorithms (3 weeks).
- T2** Study the requirements for the application and integrate already existing code (4 weeks).
- T3** Implement new code to solve some of the remaining necessary requirements and integrate everything in the prototype (6 weeks).
- T4** Write the project's report (2 weeks).

3 Technical and Academic Requirements

Be able to program using Python on Linux, use a source code repository and produce documentation (using doxygen, sphinx or other similar tool).

It is desirable that the student has grades above 13 on the following courses: Estruturas de Dados, Probabilidades e Estatística, Inteligência Artificial.

4 Expected Results

- A method for giving object location audio feedback to a user, from the processing of the input 3D image;
- Source code and documentation of all code developed;
- Project report.

5 References

- [1] Luís A. Alexandre. 3D descriptors for object and category recognition: a comparative evaluation. In *Workshop on Color-Depth Camera Fusion in Robotics at the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, Vilamoura, Portugal, October 2012.
- [2] Luís A. Alexandre. 3D object recognition using convolutional neural networks with transfer learning between input channels. In *13th International Conference on Intelligent Autonomous Systems*, volume 301 of *Advances in Intelligent Systems and Computing Series*, Padova, Italy, July 2014. Springer.
- [3] Joao Maria, Joao Amaro, Gabriel Falcao, and Luís A. Alexandre. Stacked autoencoders using low-power accelerated architectures for object recognition in autonomous systems. *Neural Processing Letters*, 43(2):445–458, 2016.