Passenger Detection and Pose Estimation

Master in eletronics and computer engineering

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1ST SYMPOSIUM OF APPLIED RESEARCH

BACKGROUND

Autonomous vehicles are increasingly being introduced in our daily lives, and with them the need to monitor all passengers. It is the aim of this project to create a monitoring solution using Time of Flight (ToF) cameras, obtaining a depth image of the interior of the vehicle. ToF cameras have a great advantage over RGB-D, their immunity to the presence of light [1]. Applying the right algorithms to this depth image, it should be possible to determine the position and pose of each passenger of the vehicle.

OBJECTIVES

The aim of this project is to detect the presence of humans and estimate their respective body posture, namely the spatial location of the articulations of the skeleton in three-dimensional space, from images captured with ToF cameras located inside the vehicle.

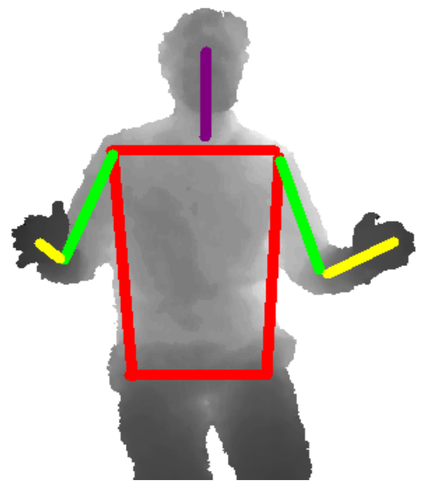

Fig. 1 – Human pose detection by a depth image

METHODOLOGY

In order to develop this thesis, it is necessary to study the most efficient algorithms for this detection. In the field of artificial intelligence there are algorithms capable of detecting many types of objects very effectively, from RGB images and ToF images. Some traditional algorithms use classic machine learning methods [2]. Most of the latest algorithms are developed using techniques based on deep learning.

1. Identification of classical methods for people detection and estimation of pose and its implementation;
2. Identification of methods based on deep learning for people detection and estimation of pose and its implementation;
3. Selecting an appropriate dataset with ToF images and human pose information [3];
4. Selection of a deep learning framework;
5. Development of a deep neural network, to train the dataset;
6. Testing and validation of algorithms, using images taken with the ToF camera;
7. Comparative analysis of the performance of the algorithms in terms of their efficiency and effectiveness.

Fig. 1 – Dateset with human pose information

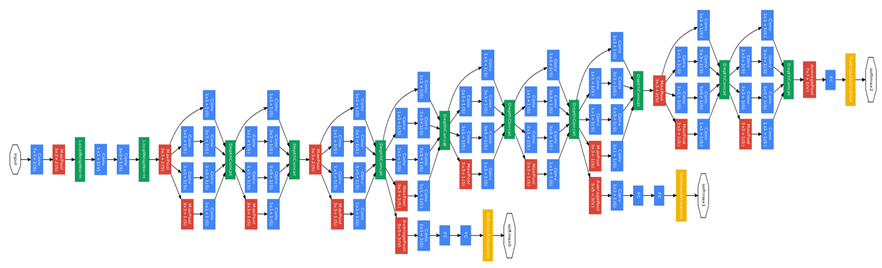

Fig. 2 - GoogLeNet deep neural network architecture

Fig. 3 – Real images classified by a neural network

RESULTS AND CONCLUSIONS

To determine the effectiveness of the algorithm is intended to compare one or more solutions made in basic machine learning and one or more solutions based on deep learning.

BIBLIOGRAPHY

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