MAP-i Thesis Proposal

Title: Human detection and identification for Human-Robot interaction

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1 Introduction

The area of Social Robotics is the study of robots that are able to interact and communicate between themselves, with humans, and with the environment, within the social and cultural structure attached to its role. For a robot to be able to interact with its surroundings, it has to be able to do some basic tasks, being one of them to see and understands the environment. In the recent years there have been many advances in the Computer Vision research area, where we start seeing the first effective results with real robots in the interaction with humans.

To be possible the interaction between robots and humans, it is very important to create a usable solution for the problem of people detection, identification and tracking in an unconstrained environment.

The task of people detection is no trivial task if you realize that the human body can assume very different shapes and stances, and that a normal household is sometimes cluttered, partially hiding the person.

In an effort to mimic the brain and the human visual system, several work have been made using color image cameras where the processing could be done in a gray-scale image or a color image. In addition to color cues, the human brain is also capable of perceiving distances. This led researchers to bet in another type of visual information beyond color: depth information. Some of the technologies used to measure scale and depth are Stereo Vision systems, Laser-Range Finders or Time of Flight (TOF) cameras. These systems enable spatial object segmentation because objects may not have consistent color and texture but must occupy an integrated region in space.

Recently, another category of cameras has been created, one that fuses the two types

described before, RGB-D cameras. RGB-D cameras present a solution where the user has acess to RGB and Depth images in the same device, and examples of this cameras can be the Microsoft Kinect and Asus Xtion.

Finally, there is recent research work being done in the field of infrared thermal imaging due to the fact that infrared thermal sensors are only sensitive to objects that are able to generate heat and are not affected by the illumination.

Some advances have been made in the field of people detection and identification using the referred image sensors, however their application in real world situations with autonomous mobile robots are still in an early state.

2 Objectives

The aim of this PhD is to develop time-constrained computer vision algorithms for human detection and identification that can be used by autonomous mobile robots, based on the use of different type of image sensors, namely RGB, depth and thermal cameras.

Moreover, in this PhD, the developed algorithms should be integrated in robotic platforms available in the University of Aveiro and new Human-Robot interaction algorithms should be implemented.