State of art : SLAM - Point of interest detection by image processing

Zacharia Azzouzi
School of CESI
Computer Engineering
Lyon, France
Email: zacharia.azzouziclausel@viacesi.fr

Rémi Papin
School of CESI
Computer Engineering
Lyon, France
Email: remi.papin@viacesi.fr

Fabien Richard
School of CESI
Computer Engineering
Lyon, France
Email: fabien.richard1@viacesi.fr

Guillaume Woreth
School of CESI
Computer Engineering
Lyon, France
Email: guillaume.woreth@viacesi.fr

Abstract—**In the context of helping the visually impaired. There are technologies capable of reading documents, language support, counts the number of people, helps to see situations on screens, currency and face recognition, able to detect pedestrians vehicle and signage or again to driving assistance. This implementation already exists in the form of glasses produced by the company OrCam [1] or in the EVA project [2]. The objective of our research team is to train on this technology and to add the detection of dynamic objects. Calculation of the speed and estimation of the possibility of contact with the person or not.**

Keywords— computer vision, slam, datmo, mot

1. Introduction

SLAM (Simultaneous Localization and Mapping) [3] methods make it possible to estimate both the trajectory of a blind person and the structure of the world from data acquired from an on-board sensor. The goal is to produce from visual data of a dynamic scene a description usable by an information system: modeling of the static world, location of the human in this world, and how other mobile objects move there. An approach combining Segmentation by Clustering and Classification makes it possible to detect on the one hand static points taken into account in visual SLAM, and on the other hand groups of mobile points used to detect and follow the dynamic components of the scene. The overall approach is assessed on the basis of images acquired in an urban environment [4].

2. Project

In the context of helping the visually impaired. There are technologies capable of reading documents, language support, technology miniaturization, counts the number of people, helps to see situations on screens, currency and face recognition, able to detect pedestrians vehicle and signage or again to driving assistance. This implementation already exists in the form of glasses produced by the company OrCam [1] or in the EVA project [2]. The objective of our research team is to train on this technology and to add

the detection of dynamic objects. Calculation of the speed and estimation of the possibility of contact with the person or not. To meet our needs, we will use existing SLAM and DATMO (for Detection and Tracking of Moving Object) [5] technologies. In addition, we will implement Artificial Intelligence to perform model recognition from a collaborative database, allowing us to rapidly increase our datasets and offer a more efficient solution and implement more 'tools to increase the autonomy of blind and partially sighted people. In 2016, JAMA Ophthalmology conducted a study involving 12 legally blind participants to assess the usefulness of a portable artificial vision device (OrCam) for visually impaired patients. The results showed that the OrCam [1] device would improve the patient's ability to perform tasks simulating those of daily living, such as reading a message on an electronic device, a newspaper article or a menu. The Orcam [1] project still contains many limitations such as reading non-handwritten text as well as battery autonomy.

The EU-funded EVA project [2] has developed voice-activated glasses for the visually impaired. EVA, the acronym for "Extended Visual Assistant" or "Extended Visual Assistant", is based on a machine vision system that recognizes objects, text and signs and orally describes what it sees. These glasses have the advantages of being light and discreet.

The EVA project [2] still contains many limitations such as a mandatory connection to a smartphone, the use of the smartphone speaker, constraint in a street with a lot of noise, it is also a very expensive technology.

2.1. Application to our project

In this article, we consider that there may be moving objects in the human perceived world; despite this, we want to solve the problem of SLAM, and at the same time, estimate the state of each moving object. This also requires addressing the detection and tracking of these moving objects, while retaining the ability to detect a sufficient number of fixed landmarks in order to locate the human.

3. Conclusion

In this article we have presented a system that effectively addresses the problem of navigation in dynamic environments for

blind people.

We have also achieved the state of the art of our competitors in order to go beyond their limits. We have therefore defined the main technical evolutions that we are going to implement in our product:

- Detect people's feelings
- Read non-handwritten text (50 languages)
- Identify popular places and product logos
- Implement a significant number of languages in order to be able to distribute our product throughout the world
- An embedded system which attaches to glasses and which does not require a smartphone Lightweight, comfortable and stylish product
- Voice interaction with the product
- Real-time lyrics translation
- Bone conduction headphones

References

[1] "About orcam: Meet the purpose behind the tech of amnon shashua amp; ziv aviram," Mar 2021. [Online]. Available: https://www.orcam.com/en/about/

[2] "Extended visual assistant." [Online]. Available: https://www.eva.vision/

[3] Ó. M. Mozos, A. Gil, M. Ballesta, and O. Reinoso, "Interest point detectors for visual slam," in *Conference of the Spanish Association for Artificial Intelligence*. Springer, 2007, pp. 170–179.

[4] A. Gil, O. M. Mozos, M. Ballesta, and O. Reinoso, "A comparative evaluation of interest point detectors and local descriptors for visual slam," *Machine Vision and Applications*, vol. 21, no. 6, pp. 905–920, 2010.

[5] A. Pancham, N. Tlale, and G. Bright, "Literature review of slam and datmo," Nov 2011. [Online]. Available: http://hdl.handle.net/10204/5457