Final Year Project Report

Tour Guide Robot

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Dedication

We dedicate our project to our parents whose endless support and unconditional love enabled us to be at this stage today and our teacher Mr. Umar Suleman, whose continuous guidance helped us to complete this task.

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Project Title Tour Guide Robot

Undertaken by Dr. Umar Suleman

Supervised by Dr. Umar Suleman

Starting Date 20 September 2017

Completion Date 25 July2018

Tools Used

- IP webcam
- Android Studio
- Java
- Opencv
- Openface
- Python
- Pycharm

Operating System Ubuntu, windows

Acknowledgement

We would like to thank Almighty Allah who helped us a lot throughout our journey to complete our project. We are very grateful to our faculty members who have worked so hard in order to make us learn new technologies and knowledge. We are extremely blessed to have great teachers Dr. Umar Suleman and Dr. Adnan Shahzada as our supervisors who has guided us so competently throughout our project and actuate us to accomplish our tasks. In the success of our project they hold a specific place. Their technical advices and recommendations were the key factor behind the completion of our project.

Abstract

As technology developed, artificial intelligence has been used to make machines more capable of serving people in much more diverse areas and better than ever before. In recent years, artificial intelligence has become more and more applicable in our society due to its functionalities and utility. One of the major field where artificial intelligence has great impact is robotics. In the beginning, robots were automated machines and they only performed a limited number of tasks, but with the passage of time, their usefulness has increased. Throughout these years, engineers and scientists are trying to improve robotic capabilities to the point that they are comparable to human abilities in several aspects.

One application where human and robot interaction is rising is the tour guide robot. The lack of tourist guide is common therefore to fulfill the requirements of guide many autonomous tour guide robots have been built to ease the process of tourists guides. These robots have replaced the current human guide. In order to properly guide the tourists there are guides provided to help them. The lack of tourist guide is common therefore to fulfill the requirements of guide many autonomous tour guide robots have been built to ease the process of tourist guides. These robots have replaced the current human guide.

Hence, we decided to work on a tour guide robot which will be helpful for its organization saving the manpower and giving the tour to the tourists by itself. Tour guide autonomous Robot specifically design for tourists, and it will provide them information about places they are seeing for the first time. It will move on the dynamic paths based on predefined map fed in it. It will provide information to the tourists about all the persons whose facial information has been stored in the system. It will move between any two coordinates given by the user and we demand it to take the shortest route in order to move between two coordinates. We also want the robot to provide information to the tourists about places around it upon reaching specific coordinates.

In this paper we describe the complete architecture of “Tour Guide Robot”. We use Histogram of Oriented Gradients algorithm for face detection. As our Robot has to recognize the specific persons so, for recognition of face we use deep learning algorithm called “Convolutional Neural Networks”. We use many computer vision techniques in our project. Tour guide robot enabled to navigate at high speed through crowds and also capable to reliably avoiding collisions with obstacles. For voice synthesis we use “espeak” library.

For hurdle detection we used triangle similarity. First of all, we calibrated the system for the calculation of focal length and for that we gave an image containing objects whose distance from the camera was known. On the basis of this calculation we substituted the values in our equation and are capable of finding the distances of unknown images from the camera. Several laser light spots are used as the object in the image from which the distance to the camera is to be calculated

For navigation, we manually made the map of the area in which we want to operate our robot. Then we specified the directions for the map i.e. east, west, north and south. We found the path between two specific coordinates by using the A steric algorithm. Then on the basis of on which direction our robot is facing we moved the robot from a specific coordinate to another coordinate.

Revision Chart

Version	Primary Author(s)	Description of Version	Date Completed
1.0	Naima	Initial draft created for distribution and review comments	01-02-2018
1.1	Maria	Second draft incorporating initial review comments, distributed for final review	03-02-2018
1.2	Maria	First complete draft, which is placed under change control	05-02-2018
1.3	Farseen	Revised draft, revised according to the change control process and maintained under change control	06-02-2018
1.4	Naima	Revised draft, revised according to the change control process and maintained under change control	11-02-2018
1.5	Farseen	Testing	20-05-2018
1.6	Naima	Module Updating	01-07-2018
1.7	Maria	Uses Cases and Updated decision tables	15-07-2018
Final	Maria	Final version	25-07-2018

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Definitions and Acronyms

Acronym	Definition
UMT	University of Management and Technology
HOG	Histogram of Oriented Gradients
SVM	Support Vector Machine
CNN	Convolutional Neural Networks

Table 1: Definitions and Acronyms

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1. INTRODUCTION

1.1 Motivations

Many advancements in the discipline of robotics has taken place in recent years. The main focus of developers is towards the interaction of human beings and robots. Robots are being used to decrease the man power. Manpower is required giving a tour to tourists and providing them information about the places they are seeing for the first time.

Hence, we decided to work on a tour guide robot which will be helpful for its organization saving the manpower and giving the tour to the tourists by itself. The robot will move on a predefined map which has been fed in it. This robot will go to specific places along with the tourist and upon reaching those coordinates will provide information to the visitor about places around it. During this tour, this robot will also be taking pictures after a specific period of time on runtime and sending them to the system.

System will receive these pictures on runtime and apply face recognition and hurdle detection on these pictures one by one. Robot will also provide some information about the recognized persons to the visitor.