AN APPLICATION OF TOUR GUIDE ROBOT VIA SHAPE RECOGNITION

MOHD ZULFADHLI AKMAL B HJ SUBARI

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BORANG PENGESAHAN STATUS LAPORAN
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HAMZAH ASYRANI BIN SULAIMAN
Penyarah
Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)
Hang Tuah Jaya,
76100 Durian Tunggal, Melaka.

Tarikh: 15 JUNE 2012

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"I declare that this report "An Application of Tour Guide Robot via Shape Recognition" is the result of my own research except as cited in the references. The report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree".

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Date : 15 JUNE 2012

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Signature : .....

Supervisor's Name : **MR HAMZAH ASYRANI B SULAIMAN**

Date : 15 JUNE 2012

Special Dedicate:

To my beloved family for their genuine love, prayers and encouragement. Then to my supervisor who guide and give moral support me and to all my friends for your help and support throughout my journey education.

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ABSTRACT

Thanks to the numerous attempts that are being made to develop autonomous robots with increasing intelligent and cognitive skills are performed. In this new sophisticated era, various kind of construction has been developed and growth up from many field such as industries, economy, and infrastructure. However, the field that has been focused by industry especially to improve the productivity is by using a modern and sophisticated technology such as robots, machines and others. Besides, the familiar electronics applications such as hand phone, computer and washing machine have been widely used by human being. Applications of these electronics instruments need a microcontroller as its brain to give command in the program such as PIC microcontroller, Atmel, Motorola and others. In this project, the PIC microcontroller that has been used and programmed to design the movement of the Tour Guide Robot, ToGouR based on the packages is PIC16F877A microcontroller. Besides that an application of this robot also had been designed using Visual Studio 2010 as a graphical user interface (GUI) that allows users to interact with electronic devices with images rather than text commands. A *GUI* represents the information and actions available to a user through graphical icons and visual indicators such as secondary notation, as opposed to text-based interfaces, typed command labels or text navigation.[1] Various alternatives have been used to make sure this project is successful carried out. This tour guide robot is suitable to be commercialized with numerous robotics companies that would like collaborate in delivering this project as a product and can be used for military or during any unexpected catastrophe such as one that occurred in Japan.

ABSTRAK

Setinggi penghargaan kepada pelbagai usaha yang dilakukan untuk membangunkan robot automatik dengan meningkatkan tahap kemahiran yang pintar dan kognitif. Dalam era yang serba canggih ini, pelbagai cubaan untuk membina robot yang bersifat automatik ini telah dimajukan dan meningkat dengan pesat dari banyak bidang seperti sektor industri, ekonomi dan infrastruktur. Bagaimanapun, bidang yang telah ditumpukan oleh pihak industri terutama meningkatkan produktiviti ialah dengan menggunakan satu teknologi canggih dan moden seperti robot-robot, mesin-mesin dan lain-lain. Selain itu, aplikasi-aplikasi elektronik biasa seperti telefon bimbit, komputer dan mesin basuh telah digunakan dengan meluas oleh manusia. Aplikasi-aplikasi alat elektronik ini memerlukan satu mikropengawal di mana mikropengawal ini adalah penggeraknya yang memberi arahan dalam program itu seperti mikropengawal PIC, Atmel, Motorola dan lain-lain. Dalam projek ini, mikropengawal PIC digunakan dan diprogramkan untuk mereka menggerakkan Tour Guide Robot, ToGouR berdasarkan pakej-pakej yang terdapat dalam mikropengawal PIC16F877A. Selain itu, satu applikasi robot ini juga telah direka bentuk menggunakan Visual Studio 2010 kerana perisian ini adalah antara muka pengguna grafik (GUI) yang membenarkan pengguna berinteraksi dengan alat elektronik menggunakan imej daripada perintah-perintah teks. Satu GUI mewakili maklumat dan tindakan-tindakan boleh didapati bagi seorang pengguna melalui ikon-ikon bergambar dan penunjuk-penunjuk visual seperti tatatanda sekunder, berbanding dengan antara muka berasaskan teks, menaip label-label perintah atau mengirim teks pelayaran.[1] Pelbagai alternatif telah digunakan bagi memastikan projek ini berjaya dijalankan. Pemandu pelancong ini amat sesuai untuk dikomersialkan dengan banyak syarikat-syarikat robotik yang mahu berkolaborasi dalam mempromosikan

projek ini sebagai satu produk dan boleh digunakan untuk sektor tentera atau semasa mana-mana malapetaka tidak diduga seperti suatu yang berlaku di Jepun.

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CHAPTER I

INTRODUCTION

1.1 Background

In recent years, much research in America [2-3], Swiss[4], Germany [5], Korea [6] and Japan [7-8] has been paid to design and implementation of tour-guide robots, in order to provide them with some innovative functions, features and appearances. Thanks to those efforts, tour guide robot, one important branch of intelligent service robots, have become more popular at various museums or other important commercial public places. For example, At World Expo 2005 Aichi the reception-tour guide robots, Actroid [7] and Wakamaru [8], successfully demonstrated the significance and application of tour guide robots.

Nowadays, we can see that tour guide is important to our country. For tourist that wants to do their research might visit some company or institute to get information. Because of this, the company faced problem to entertain tourist. To ensure visitors or tourist satisfied with their serve, they have spare time for them. But totally of employee busy with their work. To solve this problem our group decides to design a tour guide robot called as ToGouR. This robot is move in automatically system with a several backup system to avoid failure or emergency. ToGouR will be waiting for visitors in a

starting point or initial position that have been decided. The visitors or tourist just need to key in their destination that displayed on a GUI screen that have been installed. ToGouR will guide the visitors to their destinations.

The robot will be installing with a wireless camera, to get a view that will be displayed on a monitor. It is also can be controlled by manual in case the robot having a difficulty on the trip. The robot also will be installed with 3 sensors to improve the movement of robot and to ensure that ToGouR move in good condition. This robot also can return to the initial position and wait other instruction.

1.2 Problem Background

The main task for this research work is to study the method on how to wirelessly inter-connect multiple autonomous devices via a computer which will serve as an interface. The devices will use multiple sensors to scan the external environment to procure data of the unknown region. Furthermore, the challenge for such a project is to combine industrial high quality production for the mobile platforms with techniques for mobile robot navigation, interaction and putting them into real-world applications. A mobile robot needs to be able to walk to its goal pose without colliding with a static or dynamic obstacle. Furthermore, in order to know where to move to reach the next exhibit, the robot needs to learn a map of the environment first and has to be able to localize itself within this map.

Most of the previous tour guide robots, however, focused more on the involved navigation task than on natural interaction with humans.[9] Given that there is many different types of method of navigation for the robot such as hybrid navigation, shape recognition, path planning and using agent for guidance. The advantage of having this tour guide robot is to reduce man power.

1.3 Research Aim

The aim of the project is to wirelessly inter-connect ToGouR via computer which will serve as an interface in order to monitor the performance of the ToGouR and navigate the ToGouR via shape recognition.

1.4 Research Objective

The objectives for this research study are as follows:

- To design robot that guide visitor using an autonomous robot in closed area or specific location.
- To design GUI (Graphical User Interface) to enable visitor independently to choose their location either Seminar Room, Counseling officer room and Head of Section room.
- To transfer image to the control unit during manual operation of the robot.

1.5 Scope of the Study

The scope of work for the project will focus on the following areas:

1) Study and understanding the Visual Studio 2010
2) Implementation of wireless camera which will transfer/capture video and image to the control unit.
3) Designing a graphical user interface

1.6 Significance of the Study

The significance of the study is to properly monitor the performance of the ToGouR in interactive ways by using Graphical User Interface programmed by Visual Studio 2010 and installed with wireless camera. This could help the visitors to choose alternative location that had been setup via numerous buttons from the GUI (graphical user interface) to go to the selected destination and to view the movement of the robot.

CHAPTER II

LITERATURE REVIEW

2.1 Introduction

Literature review is important to the research because from the previous researches, it can be guidelines to this project. In other words, it can bring a various idea and method to glorify this project. It also become a study case for this project to overcome with the new idea and different design compared to the previous project. Otherwise, from the literature review references it can develop the contents to this research. Below is a few listing that been done from the previous project.

2.2 Feasibility study for camera selection

2.2.1. Multi-Channel 2.4GHz Wireless IR Camera with USB

Figure 1

- Horizontal resolution: 380 TV Lines
- Total Pixels: 510*492 NTSC
- Minimum Illumination: 0Lux/F2.0
- Alloyed Shell for weather proofed function
- 11 Infrared LEDs with 5 meters night vision Distance
- 2.4GHz High Frequency Signal
- Receiver has Frequency Lock for 4 Channels (no fine tuning required!)

2.2.2. Wireless Night Vision Security Camera

Figure 1.1

- Wireless receiver
- Easy to assemble
- Exceptional colors picture quality
- Infrared camera works inside/outside, day or night
- Weatherproof camera can be placed outside
- Peace of mind
- 4 channel selection avoids interference
- Minimum 100m transmission distance with 7m night vision range

2.2.3. Wireless Network Camera w/Pan, Tilt

Figure 1.2

- MJPEG/MPEG4 Compression Selectable
- Motorized Pan/Tilt/Zoom
- 802.11g Wireless LAN with WEP & WPA Support
- Optimal Synchronization of Audio & Video
- UPnP & DDNS Support
- Intelligent Motion Detection
- Pre/Post Alarm Snapshots
- Extended I/O for Sensor & Alarm
- Free-Bundled 16-Channels Recording Software

2.2.4. Infrared USB Camera with IP

Figure 1.3

- 32-Bit RISC CPU inside
- 1MB Flash Memory, 8MB Dynamic Memory
- Power input at 5.3VDC 1A Max
- 10/100Mbps Fast Ethernet connection
- Built-in 2 USB ports for 2 cameras
- Remote access using any ActiveX or Java enabled web browser
- Weight: 75g , 80g
- Dimensions: 48x63x21mm
- 35x18.5x30mm , 35 (W) x 75 (H) x 57

The suitable wireless camera for this project is wireless web cam model **DCS – 930L** from D-Link and Tinytech USB Camera. It is because of the specification of the camera such can detect motion detection, easy as Do It Yourself (DIY) and can operates in far distance suitable with the robot which will work in far range or distance, it also have a reasonable price to limit the expenses.

General specification for web cam:

2.2.5 D-Link DCS 930L

Figure 1.4

- Wireless Standard IEEE 802.11b/g/n
- HTTP Server
- Pan/Tilt/ZoomDigital Zoom : Up to 4x
- MAX Resolution640 x 480
- Lens TypeFocal length: 5.01 mm, F2.8
- Wireless Connectivity

2.2.6 Tinytech USB Camera

Figure 1.5

- Hardware: 300K (Driverless)
- Software Function: Interpolate to 16.0M Face Tracking, 10X Digital Zoom, Effect Photo Frame
- Lens: 5 glass lens
- Switch Dimmer: YES
- Microphone: YES
- Interface: USB2.0

2.3 Feasibility study for frequency interference of wireless camera

For video streaming using wireless camera, we making some research studied if there any disturbance while streaming process in progress. Wireless Cameras are a combination of three components: A camera, a transmitter to send the signal, and a receiver to receive the signal. A Wireless Camera transmits video from a built-in transmitter to a receiver, which is in turn plugged into either a monitor or other recording device.

The signal generated by a 2.4GHz Wireless Camera may be disrupted by the 2.4GHz cordless phone or other 2.4 GHz devices but not every time. Even there is an interference the visual from the camera will receive by the receiver. It is because the wireless cameras are using a specific IP address to transmit the signal. The transmission range of a Wireless Camera is usually rated by use the Line-of-Sight (LOS). Standard Wireless Video Cameras have a range of about 700 feet LOS. So there will be no problem for ToGouR wireless camera to transmit visual image to receiver.

The signal can be transmitted through most solid objects including glass, plastic, wood, fiberglass, and some metals, but the signal is attenuated. So the actual transmission range depends on the number and type of objects that are transmitting