UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SMART AUTOMATIC INTELLIGENT TROLLEY

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electrical Engineering Technology (Robotics) with Honours.

by

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DECLARATION

I hereby, declared this report entitled "Design of Smart Automatic Intelligent Trolley by Using Arduino" is the results of my own research except as cited in references.

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Date   :   …………………………………

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Robotics) with Honours. The member of the supervisory is as follow:

………………………………

(Encik Zul Hasrizal bin Bohari)

ABSTRAK

Projek ini menerangkan penggunaan trolley di pasar raya dengan menggunakan kaedah *"robot follower"*. Idea ini diperolehi kerana robot follower biasanya menggunakan IR sensor untuk mengesan objek dihadapannya. Antara kelemahan yang di perolehi dengan cara ini adalah, robot follower ini tidak boleh mengesan berdasarkan warnanya. Oleh sebab itu, robot ini dinaik taraf untuk mengesan berdasarkan warna objek di hadapannya. Lalu ainya telah di tambah baik sistemnya menggunakan trolley sebagai medan untuk mengesan warna pada pengguna dan mengikuti pengguna tanpa perlu menolak trolley. Kamera pixy ini menggunakan kaedah mengesan sesuatu berdasarkan warna yang telah dikodkan dan disimpan di dalam software PixyMon. Kemudian dengan kod yang telah di set didalam Arduino, robot trolley ini akan bergerak mengikuti pengguna menggunakan DC gear motor.

ABSTRACT

This project describes the use of trolley in the supermarket using the "robot follower" method. This idea is derived because robot follower usually uses IR sensor to detect the object in front of it. Among the weaknesses found in this way is that the robot follower cannot detect it on its colour. Therefore, this robot is upgraded to track based on the colour of the object in front of it. Then its value has been added to its system using trolley as a field to detect colour on user and follow the user without having to push the trolley. This pixy camera uses a method of detecting something based on the colour that has been encoded and stored in the PixyMon software. Then with the code already set in Arduino, this trolley robot will move and follow the user using the DC gear motor.

DEDICATION

I dedicate my dissertation work to my family. A special feeling of gratitude goes to my loving parents, who always support me about importance of education. They not only gave me moral support, but instilled in me a tireless work ethic and persistent determination to be whatever I wanted to be in life without limitation.

I also dedicate this to my supervisor in PSM encik Zul Hasrizal who have supported me thoughout this process. I will appreciate all you have done for me, especially the spend time during meeting and the text message. In addition always gave me some advice to finish my project.

Lastly not to forget to my fellow friends, who helped me a lot during all this process. They always beside me when I'm so stressed and almost gave up in find the solution to build this project. Thank you so much, I cannot find the appropriate words to describe my appreciation to all of you.

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LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inersia
l	-	Length
m	-	Mass
N	-	Rotaional velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
Re	-	Reynold number
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

CHAPTER 1

INTRODUCTION

1.1 Introduction

In this chapter, it provides an introduction about this project. Basically, it contains the background of the project, problem statement, objectives, work scope and conclusion of development of smart trolley that will follow human in supermarket.

1.2 Project Background

Nowadays, most of the things in this world use the science for greater productive life. The people always find something to assist them doing a works rather doing them self due to the fact of their busy life. However, this new technology which is designed for purchasing or carrying heavy issue has in no way used before. Trolley is quietly used to carry any heavy items, mostly trolley used in supermarket or luggage at airport and also used in industry. By the use of a trolley, humans do no longer want to sense stricken and will no longer get worn-out for carrying goods even though it are pretty lot. In manual trolley, human labor is nevertheless required to utilize trolley. They nonetheless need to push the trolley or bring the basket to deliver the stuff. So, if there is a trolley that can be run automatically, then bring the stuff will be easier and efficient.

After making commentary and wondering some idea, a selection to build an Automatic Trolley Human Follower for established or industrial person has been made. This Automatic Trolley Human Follower is aggregate of generic trolley with idea human follower robot. Robots can support humans in complicated daily tasks, such as indoor

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and outside navigation and facts supplying, or carrying heavy objects. The cause of designing this venture is to help buying administration or industry to use this tool as a commitment to increase satisfactory of service and work

1.3 Problem Statement

From the observation has been done in industrial, there tons of individuals in Asian nation area and commonly in Malaysia are use a manual trolley to hold serious issue. Most of them do not expose to a processed trolley technology for substitution existing tools and improve the standard of services. Accordingly, these applied sciences have been set up to carrying tools that too heavy, that its makes use of a lot of electricity to push the trolley. The innovation of computerized trolley can avert from injury to user because repetitive or sustained awkward posture when managing trolley can motive damage. Furthermore, the manual trolley is not user friendly to pregnant girl and disables people. There was an accident involved uncontrolled trolley which one historic lady died in China because of that manual trolley was slides down shape an escalator.

1.4 Objective

The objectives of the project are:

I. To develop and design portable chassis for trolley and produce a follower trolley.

II. To develop a vision system using color detector.

III. To analyze the performance of the designed system based on different characteristics of the system.

1.5   Scope of the Project

In this project, the main aim is to create and operated a chassis for smart intelligent trolley that will follow human or user at the supermarket by using the Arduino UNO controller. On this project also will consist of 3 types of design for this smart intelligent trolley

   I.   Mechanical design:

         -To design and develop the base and chassis for the trolley and the shape of the chassis to minimum the friction of the wheel.

   II.   Electronic design:

         -To electronic design, the arduino uno is used as a controller and pixy-camera as a sensor for control the direction and movement of DC motor.

   III. Software design:

         -For the software design, Arduino IDE is used to simulate the programming code for this project and PixyMon is used for Pxy-CMUcam hardware that to memorized and save the signature color have choose.

1.6   Conclusion

This chapter mainly brief about introduction of this project. Nowadays the manual trolley in the supermarket is commonly used because the smart trolley not well-known yet. The main reasons by create this smart trolley is to easier the user to shopping in the supermarket without need to push the trolley. Therefore, the improvement of the technology, Smart trolley is developed to reduce the human burden. This chapter also discussed about the objectives and work scope of this project about smart intelligent trolley by using arduino controller.

CHAPTER 2

LITERATURE REVIEW

2.1   Introduction

Literature review is the study of previous research that has been done in the observation of the behaviors. The literature review is used as a reference in completing this paper and as supporting evidence and details in this project paper. Furthermore the finding that been found also can help on the researchers as a guideline in order to achieve the objective of this study.

2.2   Previous study

This part will be discusses the previous study on the robot human follower impact to human. Many tools have been used in the finding toward the robot follower. A key of finding is counseled that decision has been made from a mixture of some robots follower that has presently with a manual trolley that existing.

According to the study of (Rastogi, Agarwal, & Singh, n.d.), showed the study of shopping for trolley is an important device for buying in supermarkets or grocery shops. There are also shopping for trolley security problems such sliding down from an escalator. Our cause is to enhance a computerized shifting trolley with a sensible shopping for device to resolve those troubles. This paper represents the software program application and hardware design of the automatic transferring trolley. The end

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result of the checking out at the used sensors like ultrasonic sensors, IR sensors are offered.
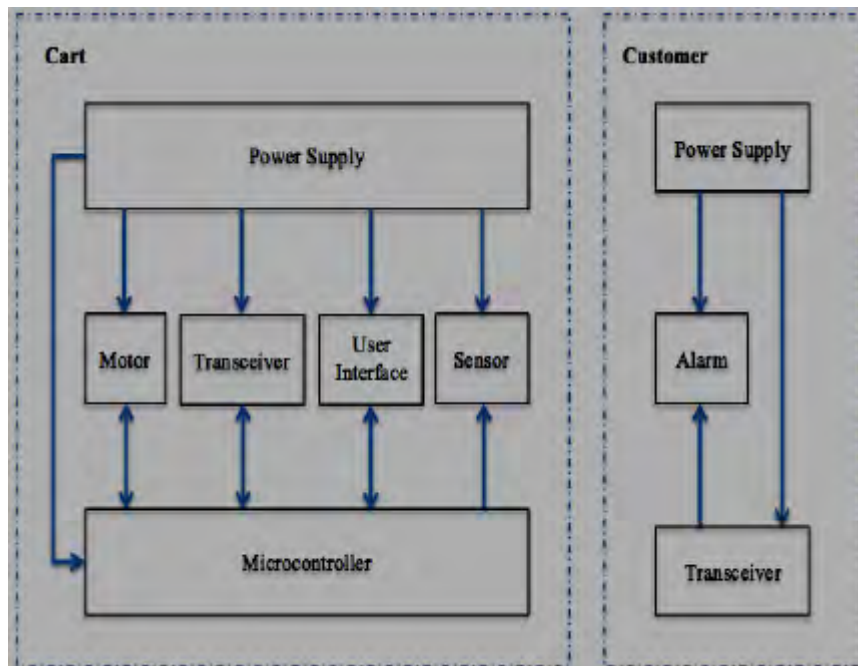

Figure 2.1: Automatic moving system

The purpose of this mission is to implement an automated buying cart that offers fantastic comfort and effectively to customers, which eliminates human labor to push heavy loaded carts. The objective consists of keeping off collisions with barriers and detecting reachable routes and informing clients while the cart is blocked. To reap these dreams, we designed each and every module based totally on our desire of microcontroller, Arduino, when you consider that it has a consumer excellent working platform and good ample processing speed that satisfies the want of our project. This project is capable to cross automatically under the pressure of two 12V DC motor, whose voltage enter is controlled by Arduino to modify moving speed. Three PIR sensors are embedded in front, left and proper of the cart, detecting which path is reachable and alarming the customers when boundaries discovered in its range. The main microcontroller, Arduino, works as the statistics transfer and processing centre.

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The IR sensor which keeps distance between trolley and the patron is connected to port zero of microcontroller. According to distance among trolley and client, microcontroller takes desire whether or not to strain motor or not. Motor cause pressure circuit is hooked up to port 2 of microcontroller. Consistent with the output degree of sensor, trolley run or stops. Each time consumer desires to flip the trolley, he clearly has to press the corresponding button on a long way off manipulate. Now each and every time client needs to store for a product, he is going to stop and the trolley too. In automatic trolley there automatic move and can transport heavy trolley. It routinely follows the purchaser. Also it maintains protected distance between the clients, obstacles and itself.

The result from the previous study of (Udgirkar, Tulpule, Lalchandani, Satpute, & Bhonsle, 2016), this project use a vision primarily based object tracking robotic which is pushed by way of wheels and managed by a computer along with software. The goal of this project is to make a automaton that is mechanically controlled via computer to tune and adjust to a colored object. Emphasis is given on precision imaginative and prescient based robotic applications. Image acquisition by using the robotic is achieved by way of ANDROID based totally camera, then send to image processing software program for similarly processing. The universal paper describes a visible sensor machine employed in the discipline of robotics for identification and tracking of the thing.
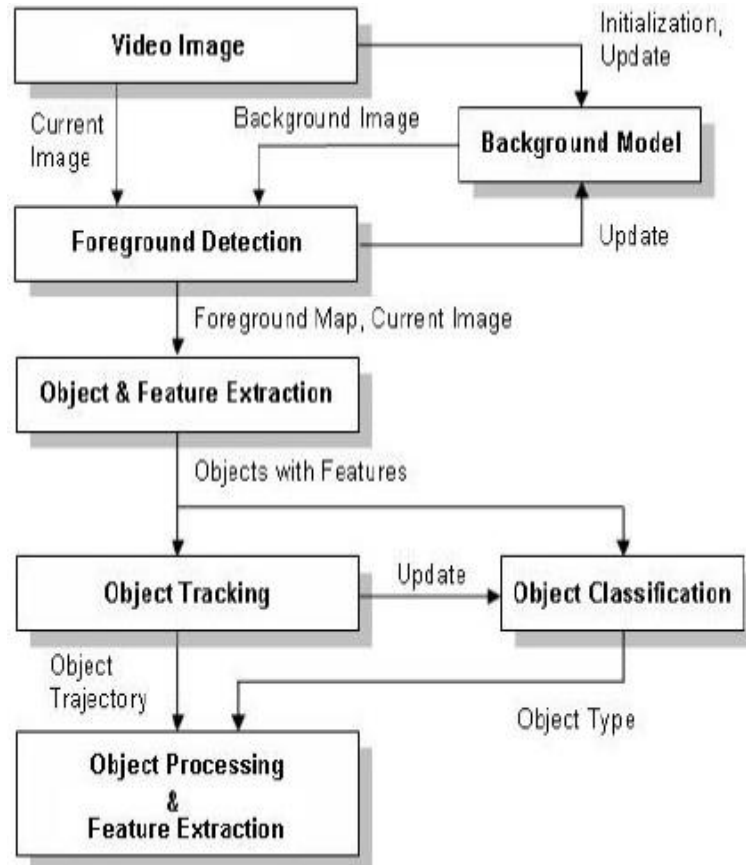
Figure 2.2: Image detection process

Image processing is processing of pix the usage of mathematical operations with the aid of the usage of any form of sign processing for which the input is an image, such as a photograph or video frame, the output of picture processing can also be both either picture or a set of traits or parameter associated to the image. Most of the image processing techniques use the picture as a two dimensional sign also making of trendy signal-processing strategies to it.
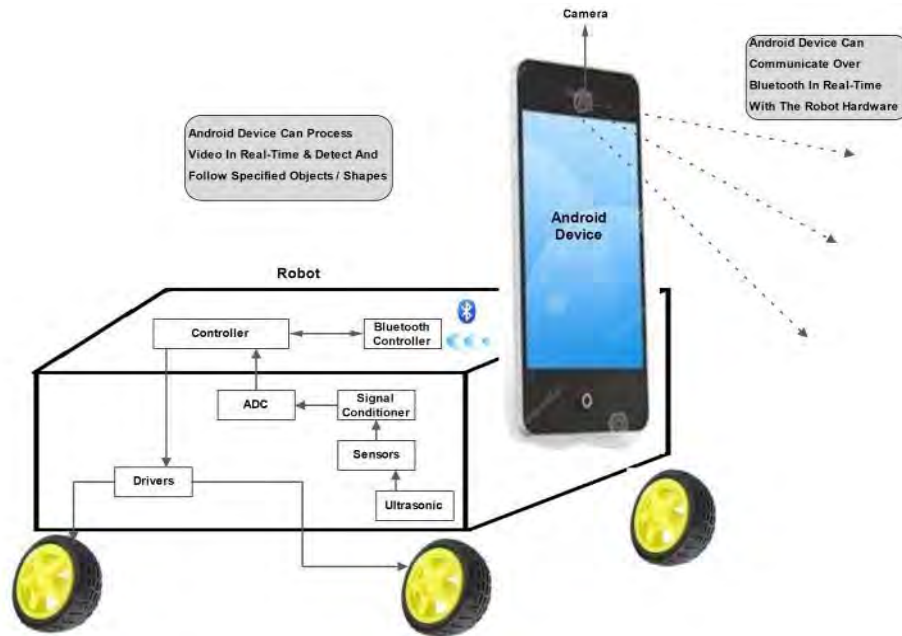
Figure 2.3: Operation using Android Camera

This project mostly offers with "Smart Trolley Using Vision Based Technique". It is in the main related with the vision Based Image Processing. This project use a vision based mostly object observation automaton that is pushed by using wheels and controlled with the help of a computer with software package. Stress is given on exactitude originality and discerning based mostly whole robotic functions android camera, then it's send to photograph process software package program for any process. The general paper describes an evident detector machine utilized in the discipline of artificial intelligence for the identification and observation of the thing. It can be then used for various functions like Super-market, development lines, manufacturing unit use, etc. For authentic implementation of this object we mount it on a trolley. It is vital to be aware of that every actual world requirement of the robot would use one of a kind depth of energy inputs in accordance to the load.

Based on the study of (Leng Ng, Siong Lim, A. Danapalasingam, Loong Peng Tan, & Wei Tan, 2015), they were found a buying trolley is a vital machine to shopping in supermarkets. However, there are buying trolleys deserted in all places in supermarkets after being used. There are moreover manual trolley protection troubles such as sliding down from an escalator. It is acknowledged to be associate inconvenience and obstruction for shoppers measure in rush to look for desired merchandise during a food market. Besides, an automatic human and line following searching trolley with a wise buying system is developed to remedy these issues. A line following transportable automaton is connected underneath the trolley to guide the users to the items section that they commit to stock the food market. This project affords the hardware and also the software program graph of the transportable robot. The give up result of the checking out on the used sensors like ultrasonic and line sensors are presented. Lastly, the graphical consumer interface of Android utility at some stage in the shopping trolley in operation is explained.

Based on (Kumar, Kumar, Nath, Singhal, & Professor, 2017), In the case of this project produced an Automatic Trolley Human Follower for widespread or industrial user. Computerized trolley human follower is developed to help a consumer or manufacturing industry. This automatic trolley human follower is controlled via a PIC 16F877A micro-controller that can observe the person mechanically with built-in circuit of ultrasonic and IR sensor. The 12V DC motor was used as the strength furnished to move the trolley routinely observe a consumer in hypermarket or industrial use. In this venture a robotic vehicle is fabricated which runs like a ordinary trolley by means of carrying equipment from area to every other to reduce the utilization of human strength in order to elevate heavy things. This is completed by means of the use of a set of