UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF A SMART BABY STROLLER USING BLUETOOTH

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Industrial Electronics) (Hons.)

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DEDICATION

This report is dedicated to my beloved parents who educated and supported me throughout the process of doing this project. I am also wanted to say thank u to my supervisor and my friends who have encouraged, guided and inspired me to complete this project

Signature :…………………………………………..

Author's Name : NUR SYAFIQAH BINTI ABD RAMA

Date :…………………………………………..

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirement for the degree of Bachelor of Engineering Technology (Industrial Electronics) (Hons.). The member of the supervisory is as follows:

…………………………………………

(Madam Norain Binti Rahim)

ABSTRAK

Projek ini adalah untuk melaksanakan teknologi ke dalam kereta bayi bayi. Mengangkut dan membawa bayi atau anak kecil bukan tugas yang mudah di tempat awam atau orang ramai. Sistem ini menggabungkan perisian dan perkakasan yang mempunyai keupayaan untuk mengawal dan mengendalikan pergerakan dorong bayi menggunakan teknologi Arduino dan Bluetooth. Pengetahuan dalam merekabentuk dan menggunakan program dalam perisian Arduino bertujuan untuk belajar dan memperbaikinya. Pemilihan aplikasi invertor MIT adalah aplikasi sumber terbuka yang lebih baik pada pengaturcaraan komputer untuk mewujudkan aplikasi perisian untuk sistem operasi Android. Projek ini akan dibahagikan kepada tiga bahagian. Bahagian pertama adalah merekabentuk invertor apl untuk Android. Bahagian kedua merancang bahagian perkakasan untuk projek itu. Bahagian ketiga menggabungkan keseluruhan komponen yang telah direka bentuk. Projek ini dicipta dan bukan kawalan pergerakan manual kepada kawalan pergerakan susulan menggunakan sambungan teknologi Bluetooth. Projek ini dibangunkan kerana ketidaktentuan ibu bapa dalam mengendalikan bayi mereka di tempat orang ramai. Projek ini juga mengesan rintangan datang ke arah kereta dorong bayi menggunakan sensor ultrasonik. Kereta bayi ini direka untuk memudahkan ibu bapa dan menjaga bayi mereka di zon selesa.

ABSTRACT

This project is to implement a technology into the baby stroller. Transporting and carrying babies or young child is not an easy task espcially in public or crowd place. This system is combining of software and hardware which have the ability to control and operate the movement of the baby stroller using Arduino and Bluetooth technologies. Knowledge in designing and using program in Arduino software purposing can be learn and improve through it. The selection of MIT app invertor is a better open source application on computer programming to create software application for Android operating system. This project will be divide in the three parts. The first part is designing the app invertor for Android. The second part is designing the hardware part for the project. The third part is combining entire component that had been design. This project created instead of manual movement control to the follow up movement control using the connection of Bluetooth technology. This project was developed because the unawareness of the parent in handling their babies in crowd places. This project also detected the obstacle comes toward the baby stroller using an Ultrasonic sensor. This baby stroller is designed to ease the parent and keep their babies on comfort zone.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

AC-DC   - Alternate Current to Direct Current

B4A   - Basic for Android

DC   - Direct Current

EPROM   - Erasable Programmable Read-only Memory

FTDI-USB   - Future Technology Device International- Universal Serial Bus

IDE   - Integrated Development Environment

IP   - Internet Protocol

LED   - Light Emitting Diode

MIT   - Massachusetts Institute of Technology

OS   - Operating System

PWM   - Pulse Width Modulation

Rx   - Receiver

SRAM   - Static Random-Access Memory

Tx   - Transmitter

CHAPTER 1
INTRODUCTION

This chapter aims on the project's introduction, background, problem statement, objectives and project's scope based on the project. Problem statement was the main reason why this project was developed. Last but not least, of the chapter the organization of the thesis will be explained in details.

1.0   Project Background

This project is about to implement a technology into the baby stroller. Transporting and carrying babies or young child is not that easy especially in public or adventure places. This also happened to parent who have a child more than one. The main idea of this project is to redesign the multifunctional baby stroller in the sense of the baby stroller is equipped with the technology and can be used as a safety and alert system using an MIT apps in controlling the movement of the baby stroller. This baby stroller is designed to ease the parent and keep their babies on comfort zone when in the baby stroller wherever they go. This project adds an innovation to a current technology instead of manual movement control to the follow up movement control by using Bluetooth platform as the connection. The inventiveness of this project is to overcome the traumatism and careless of the parent in monitoring infant with the baby stroller. Other than that, it is also help them cope with challenging task in taking care of their babies and also ease a self-parenting.

1.1   Problem Statement

Parents are usually faced several problems to control the movement of their baby stroller. This always happened when they in a mall, where they also need to control the trolley. Most of the parents legit to hand a grocery bag or other item at the handle of the baby stroller that could cause a stroller to fall. Other than that, parents always careless when they are too focusing on shopping and do not give an attention to their baby. This phenomenon has happened tonnes where the parents lost their child in the crowded place. Most of the parent cannot estimate the distance between their baby when there is an obstacle or danger towards their baby, especially in public places. This unsecured parameter is one of the problems may occur when they use the baby stroller. Stroller needs to be controlled by manually to automatically. With self-propelled, the baby stroller may have a dangerous tendency to since their introduction to sidewalks. This phenomenon is potentially dangerous if the parent or the person pushing the stroller is clumsy or cumbersome. By installing this system into the baby stroller, it might help parents out there to reduce the problem occurred.

1.2   Project Objective

The goal for this project is to minimize the risk of the mentioned problem. There are the objectives for this project has been defined to serve as a guide to achieve the goal. The objectives are:

a) To develop a smart baby stroller using Arduino to provide new levels of child safety.

b) To analyse the distance between obstacle and the baby stroller.

1.3 Scope Of Project

The scope of this project is to develop a hands-free baby stroller and obstacle detector for any dangerous action towards the baby stroller. This project focuses on the baby. The limitation of this project is to analyses distance between obstacle and the baby stroller. This stroller is driven hands free and follow their parents by signaling from the phone. The connection between the baby and parent is to ensure the safety of their children and the alertness of the parent in monitoring their baby with the baby stroller.

This project covers software design using Arduino IDE and installing a set of a program in Arduino UNO board. For the simulation, a Proteus software is used to design the circuit before proceed to the hardware part to avoid any troubleshoot. A set of program is installed in the Arduino IDE to create the program that can make the baby stroller driven hands free and follow their parent. The DC motor is used to move the baby stroller left, right, forward and backwards. A Bluetooth technology is a use as the platform of connection by signaling through the smartphone. A Bluetooth is used to allow low bandwidth that involves any form of connection without using wire. This module contains an ultrasonic sensor that can detect an obstacle in front of a stroller. This sensor will alert the parent and sign the parent that there is an obstacle or danger in front of their babies. The aim is to design the baby stroller for safety, security, comfort and enhancing functionality.

1.4 Organization Of Thesis

This thesis is divided into five chapter which is explain about the procedure and method for complete these project. Each of the chapter separately because of the different tittle for completed this project. This thesis covered on the introduction, literature review, research methodology, discussion, conclusion and recommendation.

Chapter 1 is covered with the overview of the project. This means, people know about this project without follows its progress for development of this project throughout overview. Then,

overview covered by introduction of the project, problem statement which are the reasons this project should develop, project objective, and scope of work. The purpose of objectives is created because this project based from the problem statement to develop a solution. Then, this project will follow the objective to make this project successfully. Then scope of project that is the methodology has been use in order to complete this project. It consists usage of software and hardware.

Chapter 2 focuses on the literature review. Literature review is information that has been used as references by researching in journal, books, internet and many more. Literature review contains all the facts, methodology, scopes project, idea and view of the author about research. Furthermore, this literature review also explains about the basic knowledge of Arduino UNO, ultrasonic sensor, Bluetooth module and many more.

Chapter 3 focuses about the methodology that has been used to complete this project. This part is elaboration and details about the usage of hardware and software. Methodology is important part because it consists the flow of the project. If it not organized correctly it will causes problem to achieve in this project.

Chapter 4 consists of the results were obtained from the testing and modification process in order to complete this project. This part it should have simulation, testimony and many more result from the test to this project. Furthermore, this result important because it can determine the circuit and component correctly before the hardware were in process. From this part component can buy based on the simulation thus can save the money from waste by build the wrong circuit.

Lastly chapter 5 is made after through all process and methodology to achieve the objectives for this project. This part is the conclusion that has been concluded based on the final stage of project. Furthermore, this part will explain and discuss detail about this project. Then, a future recommendation for this project also include to improve this project by using the latest technology or can adding some features to make it more usage for this project.

CHAPTER 2
LITERATURE REVIEW

Literature review was research part about the whole project to gain knowledge and skills needed to complete smart baby stroller project. The main for this part are from the previous project and thesis that related to this project. This source is able to obtain from books, journals and articles from internet. Then, by analysis the project did by other researchers, there is a possibility to know what features are lacking in their project. It is very important to improve and to develop a successful project.

1.0   History of Baby Stroller

Various methods of transporting children have been used in different cultures and times as the era of technology. These methods include prams, infant car seats, portable bassinets (which are carrycots in British English), stroller or pushchairs and slings. The large, heavy prams (short for perambulator) became popular an era of Victorian which was replaced by the lighter design during a half year the 1990s. A stroller (referred to the North American English) is used for small children up to three years old child in a sitting position facing forward. A travel system is typically a set consist of a chassis with a detachable baby seat. Thus, the system can be switched between a pushchair and a pram.

An early stroller has been developed by William Kent in early of 1733. Kent obliged by constructing a shell shaped basket on wheels that the children could sit in. In early of 1830, Jesse Armour Crandall makes an improvement and additions to the standard models. These included by adding a brake to carriages, folded designs for parasols and an umbrella hunger. In June 1889, William H. Richardson patented his idea of the first reversible stroller where the bassinets can face out and face in toward the parents. The Richardson's designs allowed the wheel move separately in order to increase the stability of the carriages. The prams became safer with larger wheels, brake, deeper prams and sturdier frames. In the 1970s, the trend became more forward towards the version where the detachable body is known as carrycot been introduced. The carrycots are not fully sprung on the prams. Up until 1980, the stroller industry has developed with a new feature, safer construction, more accessories and easier for parenting. As for today technologies, new materials and manufacturing methods have enabled strollers to become more affordable and durable.

Modern strollers come in a number of varieties, namely travel systems, lightweight strollers, jogging strollers and umbrella strollers. Travel systems are the most expensive and heaviest but include a car seat that can be used in both the car and integrated into the stroller. Another modern design showcases a stroller equipped with a hand or foot brake. Speeds can up to 10 mph. The first kind of stroller be introduced in 2005 by Valentin Vodev and in 2012, Quinny starts to design another model which relative to the late coming technologies.

1.1   Previous Related Project and Research

1.1.1   Baby Stroller Movement Control by Android Application

For this project, Hazirah binti Hassan (2015) aims to design a combination system of software and hardware which ability in controlling and operating the movement of the baby stroller wirelessly using Android application. Designing and programming by Arduino software and the selection of Basic4Android software (B4A). This project is using a DC motor and android device. The system consists of five modes which are moving forward, moving backwards, turn left or right and stop.

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1.1.2 Line Following Robot

Amithash E. Prasad (2005) aims that this project is about a four-wheel line up following robot. This robot is programmed to follow the line background and detect turns. This project used steering system to turn the robot and each wheel has a dedicated motor while the front wheels are free to rotate. For a straight line, the motor is given the same voltage as the polarity. For the sharpness turn, the motor on the left side is given less voltage. The control of this operation has 6 modes which turn left or right, move left or right and drift left or right. The control direction and speed of a motor of two back wheels caused the actual action of a robot. This robot is programmed to find and decide the types of line of user interfacing. The control motor can be modified to steer a vehicle conventionally. Any obstacles or possible object pass the robot, an attachable sensor at robot allows it to detect and to maintain the robot at the line so the robot will get back to the line. The information can transmit by attached the position and distance sensing devices to track the lost carrier.

1.1.3 Detachable Pothole Detection and Warning System

Kwok Yu Mak, Valentin Siderskiy and Lamia Iftekhar (2008) aim for this project on building a detachable device specialization in detect potholes close range obstacle detection. The device was a combination of two systems which one is mounted in front of a vehicle such as baby strollers, carts, and the other maneuvering vehicle. Firstly, the system will detect if there is any obstacle and sends the signal wirelessly. Then, the second system warns the user by vibrating and blinking the LED. The non-contact ultrasonic sensor is used to detect any of these obstacles and two BASIC Stamp modules run the device. The BASIC Stamp is consisting of two types module which are BASIC Stamp Board of Education and BASIC Stamp 2 microcontroller. The device controlled by these two modules. Both of them are run by a separate BS2. System A and system B are referred in this system. System A is a device sensing part where the lower front of a vehicle is mounted with two distance sensors. The sensor is attached on servomotor and powered by

a single BS2 module on a Board of Education. The servomotors allow the sensor to align towards the critical angles. A signal is sent wirelessly when the sensors detect an object through a transmitter to System B and system receives the signal from the wireless receiver. System B is worn on the wrist of the user and has a vibration motor. The wristband starts vibrating when the system detects the signal of pothole detection and then LEDs light up based on which sensors sensed the obstacle either left or right. The third LEDs display the status of the whole system which on or off, the other two display the battery meter and lights up when the battery is running low and indicate the user to change the battery. Two switches are used to ease the user where one switches to shut the whole system and the other switch to turn off the vibrator.
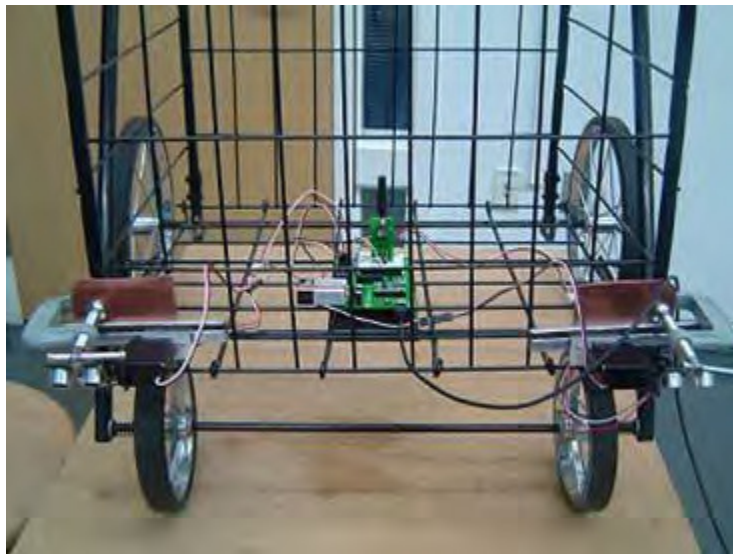

Figure 2.1: Detachable Pothole Detection and Warning System

2.1.4 Multi Sensor System for Automatics Fall Detection

C. Nadee and K. Chamnongthai (2015) aims for this project is to reduce elderly person falling risk in the area where the surveillance system is unavailable due to the privacy reason. They come out with a detection system where can detect elderly falling using an ultrasonic sensor. These ultrasonic sensors are connected to Arduino

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microcontroller which to send the elderly person fall signal using a Wi-Fi to the processing unit. The sensors are positioned as an array on the roof and wall of the room. The signal is analyzed to recognize human by sensing distance and also detect the posture action either standing or sitting. The proposed system can recognize almost 93% accuracy of falling detection. In general, ultrasonic sensors use the frequencies where is approximate to 40 kHz with an 8 pulses signal waveform. The sensor radiates a pulse signal, Tx, to the object and receives the reflected signal, Rx, back to the sensor. The distance is measured by calculating the time used between the reflector targets and sensors.
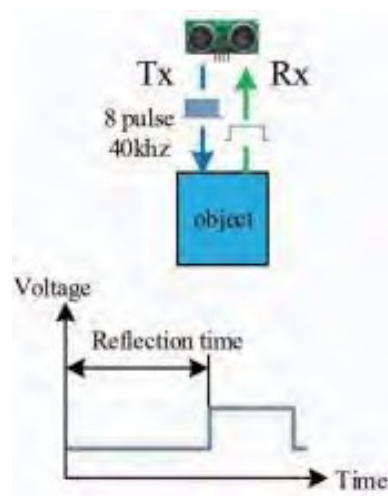

Figure 2.2: A distance measurement by ultrasonic

2.1.5   Design and Control of a Biped Robot

A. I. Botas and R. Solea (2011) aim for this project is about a practical realization a biped robot and been controlled. Its remote control is via Bluetooth communication using C++ language. This robot has a different six degrees of freedom within its height which is 25 centimetres. This robot consists of six servomotors which functioned as a mover of a robot. This robot was designed for allowing a straight movement and turning left or right. This design consists of infrared sensors which the robot capable to avoid a static obstacle and stop at the edges of the surface displacement to avoid any accidental happened. The data transmit between the host computer which will run a command software via a

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Bluetooth device. Bluetooth module is a transferring data working mode and as a USB Bluetooth that used as a transparent transferring data.

Figure 2.3: Communication of the project

2.1.6 Sensor Based Autonomous Color Line Follower Robot with Obstacle Avoidance

K. M. Hasan et.al (2013) introduced the multiple sources Multiple Destination Robot that have the capability to choose the desired line among multiple lines automatically. The robot can differentiate the different colour of line among a various colour then it chooses the desired ones automatically. This robot is also availability to detect an obstacle on its own path. This robot also is able to correct its path using a simple feedback mechanism. Thus, it's capable of following even at the edges of curves as it receives a continuous data from the sensors. A line follower robot is designed for autonomous driving and to stay on the line using an artificial intelligence (Dean A. Pomerleau, Jay Gowdy, Charles E. Thorpe, 1991). This robot avoids a collision each other whether there is an obstacle or not but this robot team also capable of following up lines (K.D. Do, 2009). An obstacle sensor must in high accuracy and high sensitivity to trace an obstacle where this robot designed for industrial usage for moving on the shop floor, household application or transporting from one room to another room (Charles A. Schuler, Willam L. Mcnamee, 2003).