

The Development of Menu Ordering System Using RF Module

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Abstract- A menu ordering system enables a customer to use a terminal device to order food, but can respond rapidly to changes and additions to the menu. The system may be used by a restaurant to facilitate ordering menu items by a customer to increase the effectiveness and efficiency to help both parties. When this system starts up, it transmits an operating program from main management equipment to each of a number of order-taking terminal devices. This project is to create a portable device with wireless connection between waiter and the kitchen using an RF Module with a microcontroller. The front end system with screen is for order takers that link to kitchen display and integrated with back end system that manages every menu system in a restaurant by handling orders, tracking payments, and alerting waiters when customers need assistance. The goal is to provide a reliable system that improves accuracy and efficiency of menu ordering.

Keywords- RF module, microcontrollers, menu ordering system

I. INTRODUCTION

A. Overview Of Study

At least 5 out of 7 people on UK had bad experience when ordering food at restaurant. These bad experiences occur when the order taken was not prepared, wrong menu for wrong table and human error. [1] These major problems will easily affect the good service that some restaurant is trying to promote.

There is a need for a new system in ordering service to increase the effectiveness and efficiency to help both parties. This project consists of two tasks to complete the system which are software and hardware.

A suggestion of solving is to create a portable device with wireless connection between waiter and kitchen. The main issue is to determine the required transmitter power to cover 20' x 70' area which is similar to typical size of a restaurant. Size of the prototype is also discussed, such as in determining what suitable size for the system will it required for demo purpose.

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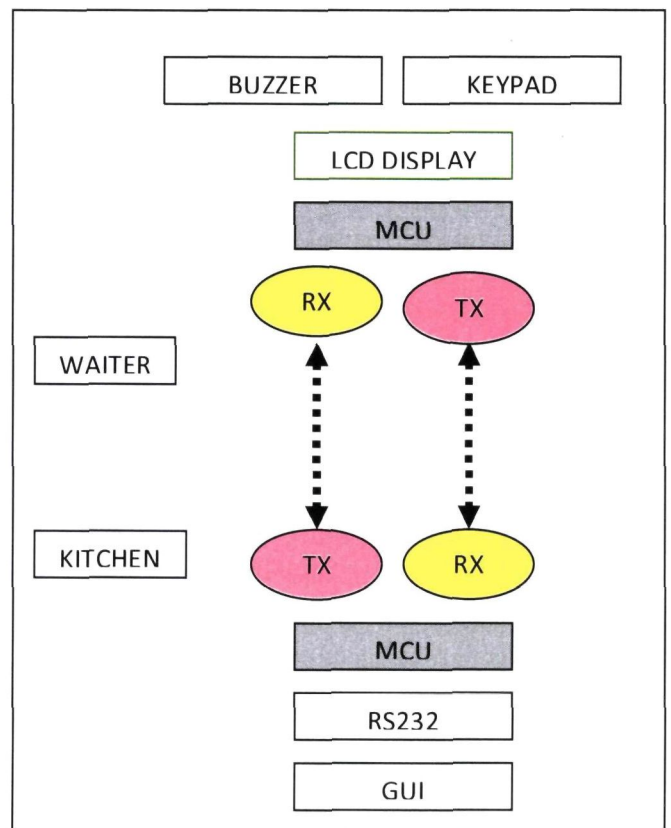


Figure 1: Proposed solution

B. Problem Statement

Below are some of restaurants owners' problems:

- 1) Mistaken orders due to poor handwriting by waiters.
- 2) A system to covers cash register

- 3) To updates on table and order status.
- 4) To automatically generates bills and receipts

C. Problem Identification

Although this project is successful, below are most problems encountered in solving issue.

The main issue is to determine the required transmitter power to cover 20' x 70' area which is similar to typical size of a restaurant.

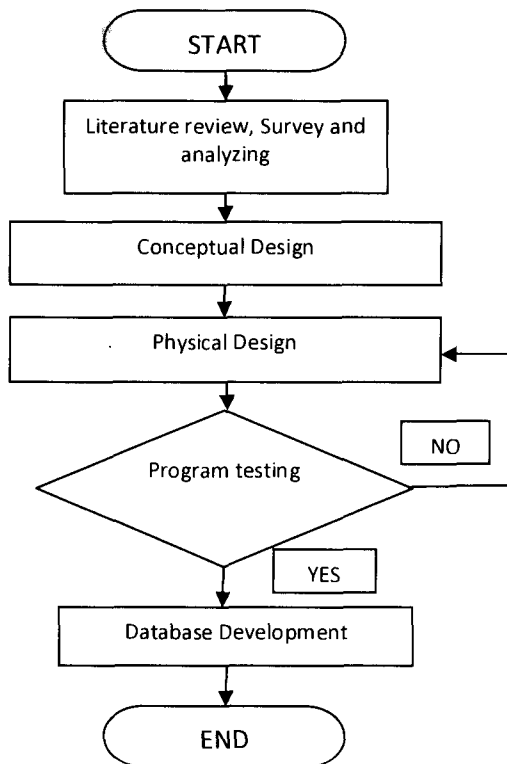
Size of the prototype is also discussed, such as in determining what suitable size for the system will it required for demo purpose.

D. The Relevancy Of The Project

At the moment, such systems is available but with high cost in installation and maintenance as most of these systems were brought in from overseas.

II. METHODOLOGY

Several steps were taken to realize the objective and mentioned below. Each of the stage is dependent of earlier stage.



The detail descriptions of the methodology used in project were given below:

A. Literature review, survey and analyzing.

In this stage literature review, survey and analyzing work was been done. The literature review been done in order to understand and study the history and the purpose of this project. The preliminary studies of the database and system specification were also developed.

Ex. Books, websites, library,

B. Conceptual Design:

User requirement study and analysis has been done in this stage to understand how the database will ease the user who used it. Conceptual design use system process flow diagram and documentation in developing the prototype database.

Ex. Restaurant Owner, people of interest, hobbies, bloggers,

C. Physical Design:

In physical design, the database structure has been developed. Here the parameters were arranged into structured tables, screen design which is identifying the elements to be displayed on the screen.

Ex. Hardware Design, to program PIC Microcontroller

D. Program or Unit Testing:

In this stage the program should be compiled and assembled and do necessary software debugging until all source codes can be successfully assemble into object files without any errors occur and lastly functional test which is to test programming to ensure that the final result conforms to the project requirement.

Ex. Debug, RS232, port setting

E. Database Development:

The database development is the last stage where the part used to produce the database system required to produce the system requirement and objective of the project.

Ex. Graphic User Interface (GUI)

III. HARDWARE

A. RF Module

1) RF Transmitter (315MHz):

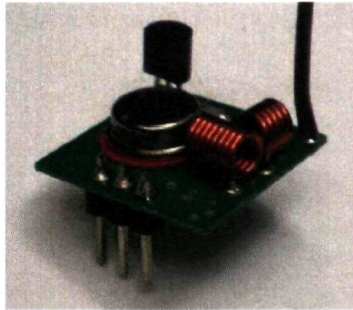


Figure 2

This low cost RF transmitter can be used to transmit signal up to 100 meters (the antenna design, working environment and supply voltage will seriously impact the effective distance). It is good for short distance, battery power device development.

It has benefits of:

- Wide input supply (2.5V-12V)
- Easy to integrate (Data, Vcc and GND)
- Very small dimension

2) RF Receiver (315MHz):

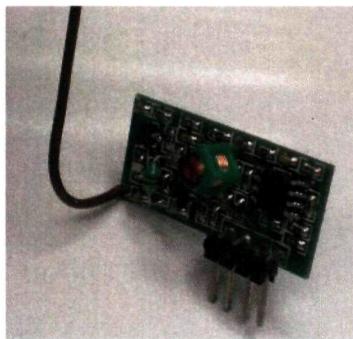


Figure 3

This low cost RF Receiver can be used to receive RF signal from any 315MHz transmitter. Super regeneration design ensure sensitive to weak signal.

It has benefits of:

- Low power consumption (4mA)
- Easy to integrate (Vcc, GND and Data)
- Super regeneration design

3) PIC16F873A (Microcontroller)

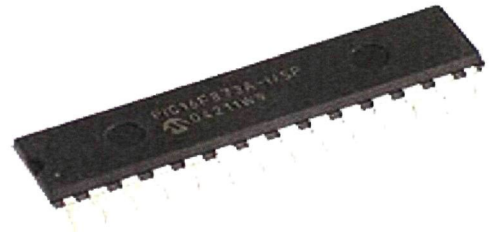


Figure 4

This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchip's powerful PIC® architecture into an 28-pin package.

The PIC16F873A features:

- 256 bytes of EEPROM data memory
- Self programming
- An ICD
- 2 Comparators
- 5 channels of 10-bit Analog-to-Digital (A/D) converter
- 2 capture/compare/PWM functions
- The synchronous serial port can be configured as either 3-wire Serial Peripheral Interface (SPI™) or the 2-wire Inter-Integrated Circuit (I²C™) bus
- A Universal Asynchronous Receiver Transmitter (UART)

B. Power Supply for Circuit

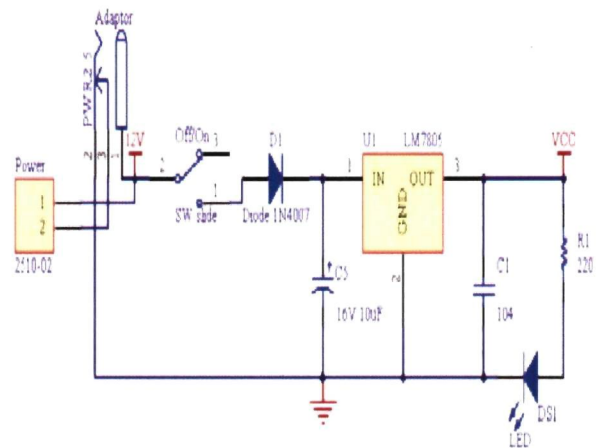


Figure 5

For this project, the voltage range of power source could be given for this circuit board is between 7V and 15V. Higher input voltage will produce more heat at LM7805 voltage regulator. Typical voltage is 12V. Anyhow, LM7805 will still generate some heat at 12V.

There are two type of power connector on the circuit board, DC plug 'Adaptor' is for AC-DC adaptor and 2510-02 'Power' is for battery source. Normally AC to DC adaptor can be plugged to 'Adaptor' type connector. LM7805 (1A

maximum) will regulate the given voltage to 5V (Vcc) for supplying power to the PIC16F873A and pull-up the push button (input).

The purpose of using diode (D1) is for circuit protection in case the polarity of the power source is incorrect. Capacitor (C5) and capacitor (C1) is use to stabilize the voltage input and output of the LM7805. DS1 is a red LED (small) as power indicator

C. RS232

RS232 is a popular communications protocol for connecting modems and data acquisition devices to computers. RS232 devices can be plugged straight into the computer's serial port (also known as the COM or Comms port).

Data acquisition devices include GPS receivers, electronic balances, data loggers, temperature interfaces and other measurement instruments.

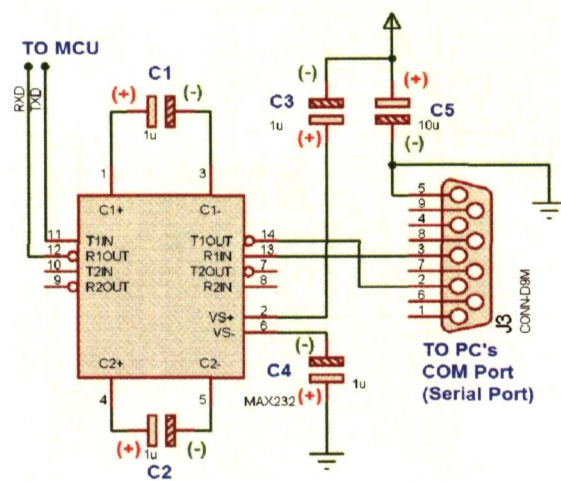


Figure 6

IV. SOFTWARE / ALGORITHM

A. Visual Basic

As the world turn to graphic user interface (GUI), visual basic is one of the languages that changes to accommodate the shift. [8]

Visual Basic is designed to allow the program run under the windows without the complexity generally associated with windows programming [11].

The designed screen can holds standard windows button such as command buttons, check boxes, option buttons, text boxes, and so on. Each of these windows

object, operates as expected, producing a “standard” windows user interface.

Visual Basic that recently appears as one of the most popular programming language is chose. It provided standard windows object and graphic user interface that will make the program become user friendly.

B. MPLAB IDE

```

MenuRX2_UITM - Notepad
File Edit Format View Help

11st      p=16f873
ERRORLEVEL -302
_CONFIG _PWRTE_OFF & _HS_OSC & _WDT_OFF & _WRT_ENABLE_

#include <p16f873.inc>

;*****TX CONFIGURATION
packet_len EQU 2 ;packet length 1 + 1 adr
;TX pin is portc, 6

#ifndef TXINV
#define TXLOW BCF PORTC, 5
#define TXHIGH BSF PORTC, 5
#else
#define TXLOW BSF PORTC, 5
#define TXHIGH BCF PORTC, 5
#endif

;***** CONSTANT VALUES
EXPIRE_TIMER EQU 0x12
LATCH_MASK EQU 0xff
VALID_BIT EQU 4
hdrcntmin EQU 0x0c ; minimum number of header
hdrcntmax EQU 0x10 ; maximum number of header

; decoder time tolerances are set at : 0.5T, 1.5T, 2.5T
; measured in 9xinstr.time (9usec) counts

; input port bit
#define RXBIT PORTB, 6

; normal decoder logic input
#define SKL btfsc
#define SKH btfss

; inverse decoder logic input
#define SKL btfss
#define SKH btfsc

;***** FLAGS
#define IF_SHORT flags, 0
#define FIRST_HALF flags, 1
#define HEADER flags, 2
#define VALID flags, 7
if_short_val EQU 1 ; bit value of IF_SHORT flag

```

Figure 7

V. DEMONSTRATION

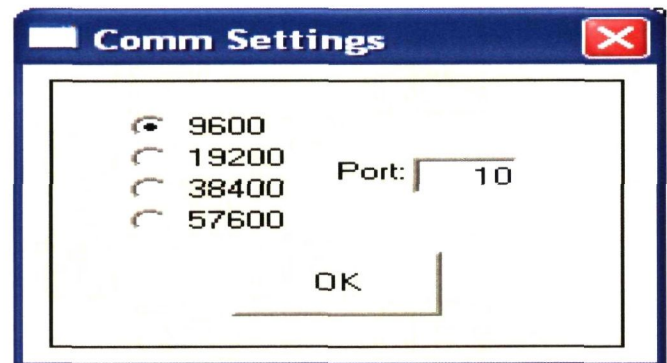


Figure 8: Setting Port for Serial Communication

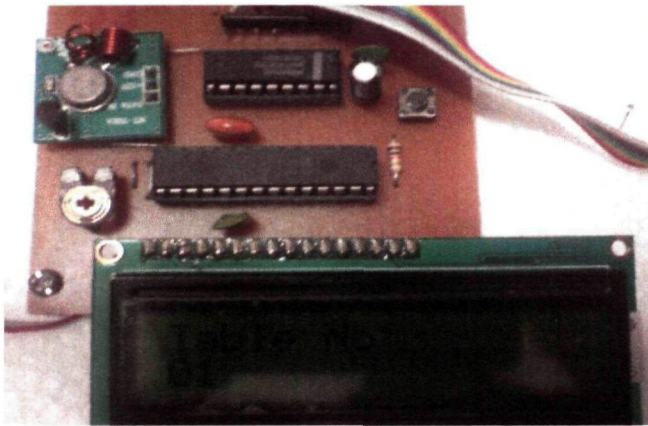


Figure 9: Keypad entered '01' for table number.

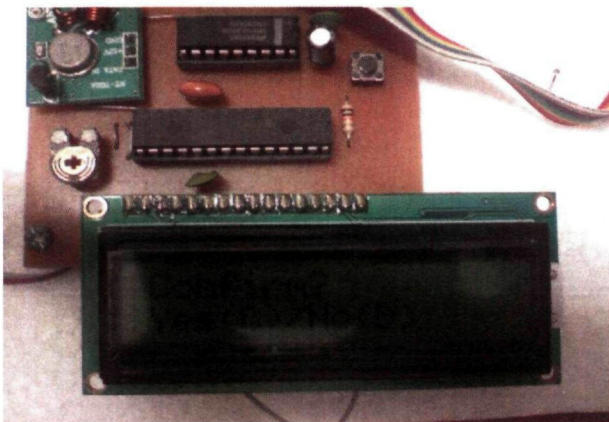


Figure 10: After all the menu code entered, presses 'C' to start transmitting.



Figure 11: Transmitting data

Item No.	Code	Description	Price (RM)
1	01	Teh Ais	1.30
2	02	Kopi Ais	1.50
3	03	Nescafe Ais	1.50
4	04	Teh Tarik	1.50

5	05	Fresh Orange	1.50
6	06	Kopi Panas	1.50
7	07	Limau Ais	1.50
8	08	Teh Halia	1.50
9	09	Teh O Panas	1.50
10	10	Apple Juice	4.50
11	11	Nasi Goreng Ayam	4.50
12	12	Nasi Lemak Kukus	4.50
13	13	Nasi Goreng Cina	4.50
14	14	Kue Teow TomYam	4.50
15	15	Nasi Goreng Belacan	4.50
16	16	Mee Goreng	4.50
17	17	Nasi Goreng Seafood	4.50
18	18	Nasi Ayam	4.50
19	19	Mee Hailam	4.50
20	20	Nasi Goreng Kampung	4.50

Table 1

A. The Information of Columns in Table 1

Table 1 is constructed similar to ordering pamphlets. By referring to this table, code will be entered by handheld device. Table 1 consists of the following parameters:

- 1) **Item No.**
- 2) **Code**-Code number to be entered designated to each menu
- 3) **Description**-Description of the menu
- 4) **Price**-Price for menu in Ringgit Malaysia

The above table was constructed by following a typical price and by own observation for presentation purpose only.

VI. RESULT AND DISCUSSION

A. Result

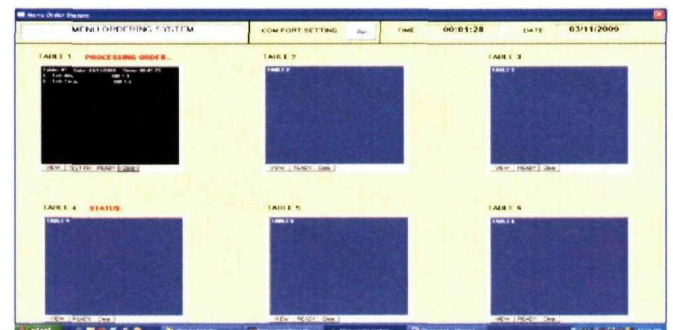


Figure 12: Table No. 01 menu received.

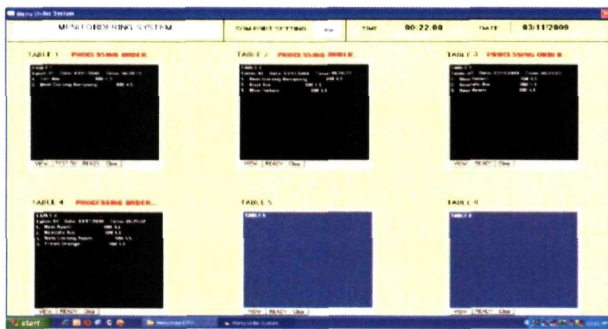


Figure 13: Table 02, 03 and 04 menus received.

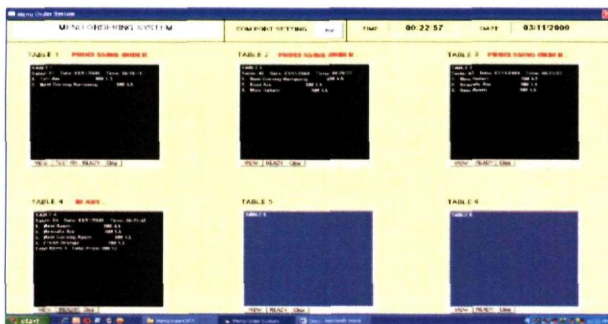


Figure 14: Table 04 menus price calculated.

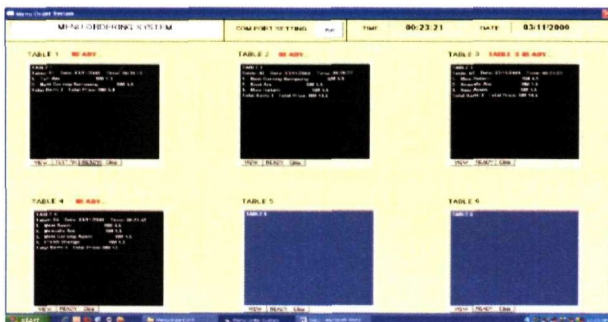


Figure 15: Table 01, 02, 03 and 04 menus total price calculated.

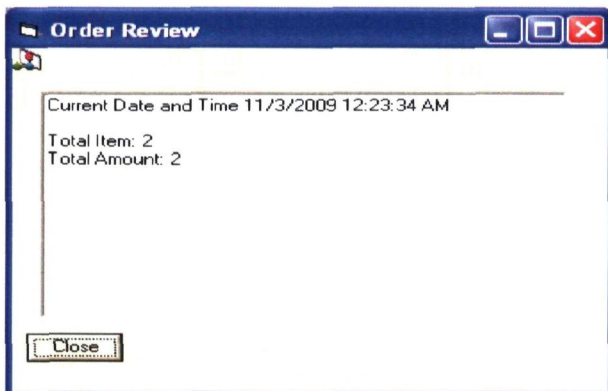


Figure 16: Total order per day

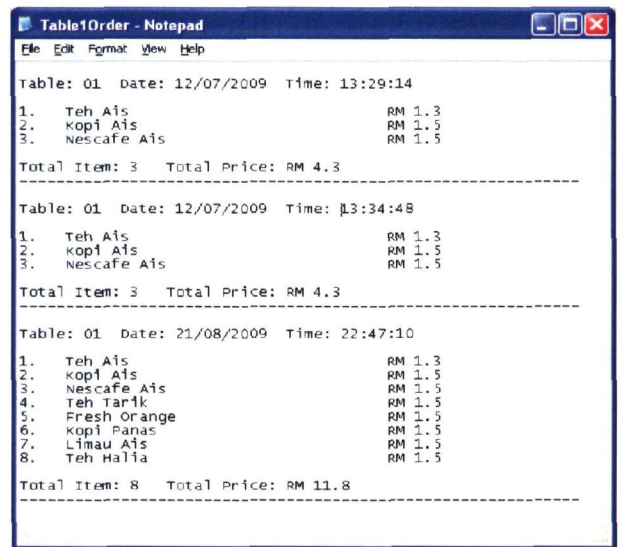


Figure 17: Past test result

B. Discussion

Based on Figure 12-15, all data transmitted from portable device were successfully received and process. Upon total price calculated, the next step is to send back signal indicating which table is ready to serve.

Figure 16 displays the total number of item and total price for each desired table. This help to total up every time shift closed. Figure 17 shows the past test result when the system is in trial-run stage.

Upon completion, below are some objectives achieve:

- Orders taken electronically so no more mistaken orders due to poor handwriting by waiters.
- A system covers cash register, table tracking reports, and a real-time menu system.
- Real-time updates on table and order status.
- Waiters save time by walking less distance around restaurant
- System generates bills and receipts with accurate itemization of each and every cover.

VII. CONCLUSION

In order to achieve the objective of the project, there are several scope had been outlined. It can be concluded that this project can produce a solution to the scenario discussed earlier.

Although this project can be considered successful, below are most problems encountered in solving issue.

- using MPLAB IDE to program microcontroller PIC 16F873A,
- hardware for the system, and
- interface the hardware to computer by using RS232 serial port communication
- to execute a GUI by Visual Basic.Net.

The project was successfully done and has achieved all the objectives. In addition, the ordering system is paperless and time-saving. The system also enables the user (restaurant owner) to monitor the customers order.

The database developed has a function of:

- data entry
- data retrieve
- data query
- Graphical User Interface (GUI) has been produced.

VIII. FUTURE DEVELOPMENT

As this project is combination of two systems (wireless communication and GUI), it can say that the project was successful and the objectives was achieved as the system can be demo.

For future works, some recommendations have been listed based on the problems in order to improve the performance.

Recommendation:

- 1) IR or Bluetooth communication to replace 315MHz RF Module.
- 2) Also to include function for total up for other table. As for this project, only Table 1 is include with that function.
- 3) Double the system function and memory capacity as other Microchip PIC Microcontroller can be proposed to upgrade its design and application.
- 4) Try to reduce power consumption for portable device.

5) Smaller circuitry designs such to improve the system to apply to real world.

ACKNOWLEDGEMENT

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REFERENCES

- [1] Connolly, Thomas, and C. Begg (2002), "Food & Restaurant " Harlow.
- [2] <http://www.mmail.com.my/content/10201-furious-over-poor-restaurant-service>
- [3] E.F. Codd (1970). "A Relational Model of Data for Large Shared Data Banks". Communications of the
- [3] D. M. Dob Muhammad H. Rashid. *Power Electronics Circuits, Devices and Applications*. 3rd edition. kin (2008), "The RF in RFID: Passive UHF RFID in Practice", Elsevier Inc.
- [4] *PIC Microcontroller Project Book*. 2nd Edition. Singapore: Mc Graw-Hill. 121-123; 2000.
- [5] Lawrence A. Duarte. *The Microcontroller Beginner's Handbook*. 2nd Edition. United States of America: Prompt Publication. 3-5; 1998.
- [6] <http://www.airborn.com.au/rs232.html>
- [7] MPLAB IDE, Simulator, Editor User's Guide
- [8] *Programming in Visual Basic 6.0*. Version 6. New York: McGraw-Hill/Irwin. 2002
- [9] <http://www.seattlerobotics.org/encoder>
- [10] <http://www.microchip.com>
- [11] *Visual Basic 6.0 for Dummies*. New York: McGraw-Hill 2002