Abstract
The primary objective of this study was to develop a control system for autonomous mobile robots used in Hotel management. To accomplish this objective, it was necessary to develop mobile robot having minimal centralized control. This report focuses on the development of two basic motion control algorithms, namely a GOTO algorithm and a FOLLOW algorithm, for use in a master–slave system. These robot motion control algorithms would have wide applicability in hotel operations. In this master robot receives order from the customer and passes it to the slave to place the order. Master wakes up on presence of customer and actuates to provide user a menu card. Then user places the order then these orders are placed and posted to the slave which picks them on completion and passes it to particular table. Our aim is to develop the system using ARM Processor for E-restaurant management system using robot. This increases the efficiency of restaurant management.
1. Introduction

Numerous efforts have been taken by restaurants to adopt information and communication technologies such as touch screen, PDA, wireless LAN etc. to enhance dining experience. This paper highlights some of the limitations of the PDA-based food ordering system and proposed the Multi-touchable E-restaurant Management System as a solution. The system consists of multi-touchable interactive dining menu that allows customers to make order conveniently on the developed multi-touchable dining table during the busy hours using their fingers. Orders made by the customers will be updated instantly to a centralized database and subsequently reach the cashier and the kitchen module respectively. Management staff could use the system to manage the restaurant operations digitally, starting from the creation of food items for the multi-touchable interactive dining menu to deleting it or to manage orders from customers all the way to billing it. Following are the points of introduction:

- A system and method that provides menu wirelessly interconnected with a restaurant's server is provided.
- The restaurant server provides the electronic the menu items Menu software used to navigate through the menu items and options.
- The electronic provides menu the patron with details regarding menu items including detailed descriptions, photographs and videos, and nutritional information.
- The patron's order is wirelessly transmitted to the restaurant server and communicated to the restaurant kitchen staff.
- The electronic menu device is also used to request assistance and request the status of an order that has been placed.
- The patron can pay using the electronic menu device by providing credit card information or the patron can request assistance and provide payment, such as cash, to the restaurant's wait staff.
- Robot serves the order from kitchen to the particular table.

2. System Overview

2.1. RFID

Radio-frequency identification (RFID) is an automatic identification method, used in storing and remotely bring data using devices called RFID tags or transponders. This technology requires the extent of cooperation of an RFID reader and an RFID tag. An RFID tag is an object that can be used to or implement into various product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. An RFID tag is an object that can be applied to or implement into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.[1]

2.2. Multi-touch Technology

Multi-touch technology is a developed one to the existing touch technology whereby users are allowed to control and perform operations simultaneously on the electronic visual displays using multiple fingers or gesture inputs. Large displays can be used such as from the tabletop and the
wall-screen is deemed to be essentials when dealing with multiple users sharing the same display for information visualization purposes. It is reported that the social interaction is highly improved among users, when this type of shared display and input are used. Thus, the adaptation of the multi-touch technology into a restaurant table will be of good combination as the restaurant table can now acts as a dining table, a platform for digital meal ordering using fingers on the table surface, and an entertainment platform while waiting for the food to be served. This will hopefully enhance customers’ dining experience especially during the peak hours. It also improves the speed of working.

2.3. Restaurant Ordering Systems

Restaurants one of the main industries that have been supporting the economy for decades. The usual instruction process of a meal ordering in a restaurant begins with customers making an order through waiter, then passing the information to kitchen staff for food preparation, and finally reach to cashier to record the billing[3][4]. However, often mistakes and delays will occur throughout the ordering process resulting in unsatisfactory among customers. Thus, new technologies and approaches are introduced into restaurants with the aim of improving efficiency and minimizing errors of the food ordering system. One of the technologies that been adopted by the restaurant is the PDA based wireless food ordering system. Various applications have been developed specially for such restaurant ordering system, which include e Menu, a web-based ordering system that runs on wireless connection and Easy-Orders, the first application developed to communicate with computers to deliver e-commerce tasks[5].Business that implemented such mobile technologies generally improved their operation efficiency, reduced operation costs, and improved service quality[6].Another important aspect of restaurant ordering system of dining menu. Dining menu ought to be informative, attractive and update all the time for customers to make order easily. Restaurant owners strive to outwit each other by introducing new promotions, new food menus and new attractive announcements. By doing so, dining menu is frequently changed, which involve huge amount of money and time. Errors are also prone to happen in the dining menu was introduced in some restaurants that provide customers with a computer to access the digital menu and make order accordingly at their table [7].

By introducing digitalized menu, a proper system where it allows managers and staff to modify and update the dining menu, the workflow and its contents without much hassle is sought after. A RFID-based restaurant management system is a good approach in terms of functionality, flexibility and cost.

3. Problem Faced By PDA Food Ordering system And The Proposed Solutions

In the PDA-based food ordering system, the flow of orders is as shown in figure 3.1. There are certain limitations to the PDA based ordering system. For instance, conventional menu is still being used to present food items. Any update to the food items such as pricing, availability, promotions etc. will require manual modification to the menu. Besides, conventional menu usually has limited amount of information. Thus, attendants will need to understand the menu well enough to provide additional aids to the customers when making an order. Human memory may then become a liability especially when food items are updated frequently. Furthermore, during the ordering process, the customers will not be able to view the ordered food list from the PDA device as the screen size is rather small. In order for the orders to be taken without errors, the attendants handling the PDA devices will require comprehensive training as well as to understand how the device works.
K. A. Wadile, Pandey Sushma A., Gaware Kanchan J., Tambe Sarita P :: E-Restaurant management system using robot
Figure 3.2: e- Restaurant using robot
4. Algorithm

1. Start
2. If reset go to step 3, else go to step 1
3. Initialize port pins
4. Scan all keys
5. If the key is released go to step 6, else go to step 4
6. If a key is pressed go to step 7, else go to step 5
7. Call key denounce
8. Initialize key counter
9. Initialize column counter
10. Initialize row counter
11. Detect the pressed key, If key is pressed go to step 12 else go to step 3
12. Initialize UART in slave SPI
13. Initialize UART in master SPI
14. Enable transmitter and receiver
15. Set baud rate
16. Receive transmitted data
17. Initialize LCD
18. Display data on LCD
19. Display Bill on PC
20. Print and save the Bill in Records
21. Return
22. End.

5. System Architecture

The following figure (Fig 1), demonstrates the basic architecture of our system.

![Block Diagram](image_url)
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Figure 5.2: Block Diagram

Figure 5.2: User Interface for the Multi-touchable Dining Menu
6. Conclusion

This paper reported a newly developed Multi touchable E restaurant management system on top of end framework that solved some of the limitations encountered by the PDA-based food ordering system. The MEMS provides a proper workflow for restaurant staffs to manage restaurant operations digitally, from ordering to billing systematically. A web authoring system was developed as part of the MEMS to allow manager to easily create, update and manage the multi-touchable dining menu. With the MEMS, customers no longer need to wait for attendant to serve them during the peak hours. Customers themselves could make order on their table surface by interacting with the multi-touchable dining menu using fingers, any time they wish reducing the waiting time for an attendant. In short, the MEMS if implemented properly, could possibly improve the overall restaurant efficiency, reducing labor cost, providing a better quality of services and enhance customers’ dining experience.

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8. References