SMART BILLING UNIT USING NODE MCU

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ABSTRACT

Most contemporary embedded systems are built on microcontrollers with built-in memory. RFID technology enhances inventory management and attractscustomers. IoT devices typically build mesh networks by sending data over longer distances to distant devicesusing middleware. This article provides an IoT and RFID-based automatic billing system. RFID tags will beused in a retail environment to categorize the various merchandise. Each shopping cart is constructed using a Product Identification Device (PID) consisting of a Node MUC, LCD, RFID reader, and IoT module.Information about the purchased item will be read by anRFID reader on the trolley, saved in a Node MCU linkedto it, and transmitted to the billing system via an IoT module. The billing system gathers information about thetrolley, gains access to the merchandise, and calculates the overall cost of purchases for that trolley. The main goal of this article was to introduce automatic billing to reduce long lines in supermarkets.

KEYWORDS: *NODE MCU ESP8266, RFID, IOT, LCD*

1. INTRODUCTION

Software applications are developed daily by programmers to increase potency and efficiency in several contexts. A system is a way of arranging, performing, or operating according to a specified plan, program, or set of rules for one or more jobs. Computer hardware with software integrated into it is one of the essential parts of an embedded system. It is a computer-based system focused on a specific application or item. It might be a liberated system or a part of a bigger system. The reason is that its software is often incorporated in ROM, it lacks the need for extra memory (Read Only Memory). With little hardware and software complications and board-level design, these systems are designed around a single 8- or 16-bit microcontroller. Perhaps batteries would be used to power them. The editor, assembler, and cross-assembler tailored to the microcontroller or processor in use are the primary programming tools for creating embedded software for these. Most often, these systems are created in "C." Even though RFID is still a young technology, recent developments in chip fabrication have created new potential for its application, particularly in the tagging of consumer items. RFID systems are built on a foundation of tiny transponders or tags attached to actual objects. RFID transceivers, which are also known as readers, wirelessly interrogate tags and gather identification data that can be connected to any type of data record. A self-activating identifying system is something like RFID systems or optical bar codes. The Internet of Things brings multi-hop and routing features to the packet-based radio system. A wireless networking protocol called the Internet of Things (IoT) is intended for automation and remote-control applications since it has low data rates uses little power and is inexpensive. The everyday essentials of customers can be purchased and paid for in a supermarket. As a result, a calculation of the quantity sold and the creation of a bill for the customer are needed. In order to encourage circulation, cashier's desks are intelligently placed. In an effort to cut labor costs, a number of grocery chains are currently employing self-service check-out machines. With the use of these tools, a single employee can manage a group of four or five machines simultaneously while attending to the daily requirements of several customers. To charge the consumer, you must know how many of each item was sold. The placement of cashier's desks is deliberate in order to encourage movement. Self-service checkout machines are currently being used by many delicatessen chains in an effort to minimize workers' costs. With the aid of these tools, a single staff may assist numerous clients while all at once managing a group of four or five machines.

2. LITERATURE SURVEY

[1] Journal of Chemical and Pharmaceutical Sciences by G. Rathana Sabhapathy and S.P. Jaya Kumaran (2017)

Constraints like distance and interference are included in the Journal of Chemical and Pharmaceutical Sciences. If there are a large number of clients, the server will be busy, and consistent internet connectivity is required to finish the billing process. In the typical shopping scenario, clients can encounter issues with wasted time at the check-out lines and inaccurate product information. The standard billing system has a tone of room for improvement to enhance customers' purchasing experiences.

[2]"Smart Trolley system using image processing" by Shweta. B. Vernekar and V. Ashwini (2017)

This system makes use of a Raspberry Pi for control, an LCD to show the price of the items that customers put in the cart, and a camera to take photographs of product barcodes. Image processing is utilized to process the barcodes because this method entails enhancing their functionality. The drawback of barcodes is that they must be fixed inside their perimeter and require a line of sight for 4 scannings. The complexity of processing the photos and the need to record them again in the event of damage is another drawback of this technology.

[3]"The Automated Shopping Trolley" by Sinath (2015)

Sainath (2015) built an automated shopping cart for a supermarket billing system that made use of barcode technology to bill things when customers scanned them with their smartphones. The invoice will be forwarded to the central billing system, where the consumer will be able to pay by presenting a unique identification number. Unlike RFID, which is a "near field" technology that simply must be within reach of the tag to be read, barcodes necessitate the scanner to maintain a direct line of sight with each code. While numerous RFID tags can be read simultaneously, barcodes are made to be scanned one at a time. An RFID tag is typically a more durable product that can endure more abuse than a barcode.

[4]"Smart shopping System" proposed by Prateek Aryan (2014)

According to Prateek Aryan's (2014) proposal, a smart shopping cart with automatic invoicing and Bluetooth transfers billing from the trolley to the user's Android smartphone. One can't assume that every consumer has a smartphone, and Bluetooth can have connectivity issues and limited range. Although Bluetooth is supported by themajority of modern mobile devices, the technology has some drawbacks, such as slow communication speeds,inadequate data security, and reduced battery life. Although it transmits data rather slowly, Bluetooth is not areplacement for quicker technologies like Wi-Fi and USB.

[5]"The RFID Based Smart Shopping Cart" by Ms. Rupali Sawant, Kripa Krishnan, Shweta Bhokre, and Priyanka Bhosale (2015)

Along with RFID readers and Zigbee, IR sensors are used to count, add, and subtract the number of products. The cancel button is used in this document to remove the purchase from the shopping basket. ZigBee is more costly; thus, Wi-Fi can be used in its place. The operation of the IR sensor is not briefly explained.

3. METHODOLOGY

The newly arrived product's information is added to the database of the website and the information includes the product's name, price, quantity, and brand name. Thedesigned system is fixed in the trolley and it is taken by thecustomer entering the shop. The buyer should use the RFID scanner to scan the RFID tag in the item. As soon as this happens, the product is added to the customer's billand the product details including the product's name, price,the brand name are displayed. The displayed information also includes the total value of all products currently purchased by the customer. When the purchase is complete, thecustomer should move to the billing counter and each Node MCU will have a unique IP address so the IP addressshould now be entered into the website. The website will now show the total amount purchased by the user and the user can pay the amount and leave the shop.

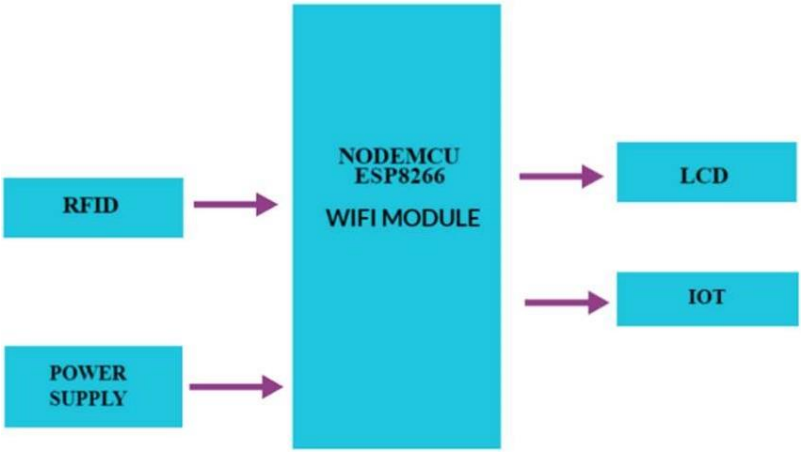

Fig 1 Block Diagram

4. COMPONENTS DESCRIPTION

Hardware and Software are required for the system. The components are:

Hardware components:

Node MUC

ESP8266RFID

LCD

Software components:

Arduino IDE

IOT

4.1 Node MCU:

NodeMCU is an open-source platform based on the ESP8266 that links items and allows data transfer over Wi-Fi. Further, it may be able to meet many of the project's requirements on its own by providing some of the most important microcontroller functions, such as GPIO, ADC, PWM, and others. It enables you to use the Arduino IDE to program the ESP8266 WIFI module Node MCU has 4MB of flash memory and an 80MHz clock speed. The Node MCU has a WIFI connection and can access the internet through WIFI. It works best for Internet of Things applications.

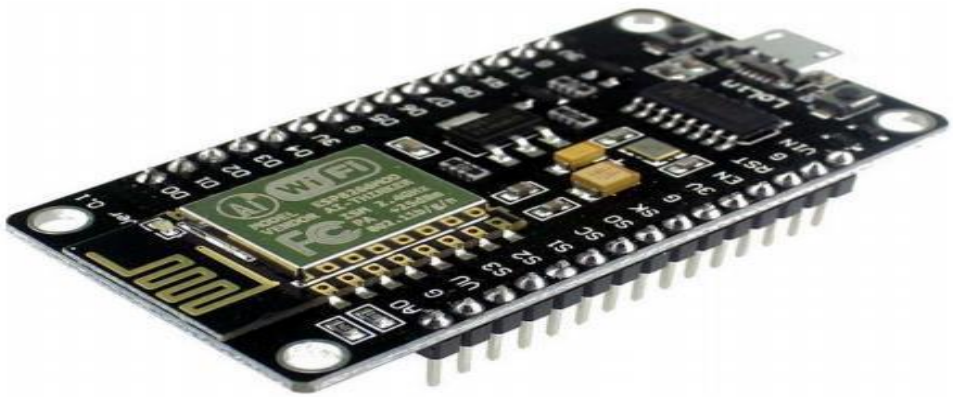

Fig 2 Node MCU

4.2 LCD:

A liquid crystal display (LCD) is a type of flat panel display. LCDs have a wide range of uses for both consumers and businesses due to their widespread use in instrument panels. When a substance is in a state halfway betweensolid (crystal) and liquid, it is said to be in a liquid crystal state. When crystals with a high degree of molecular orderare melted, they typically transform into liquids, which have fluidity but no such order at all.

4.3 RFID:

Radiofrequency identification is one of the fast-growing automatic identification and data capture technology. Thissystem transmits identity in the form of the serial number.Using radio frequency waves, this technology transmits data between a reader and a movable item to identify or track it. When the label is exposed to the waves, a microchip in the label is used to transmit. These areof two types one is RFID readers and RFID tags. Active RFID tags have a wide spectrum of communication, they have tag batteries, and they need a continuous power supply. The passive RFID are having a low range of communication, they don't have any tag batteries, and passive RFID tags are having a low range of communication, don't have any tag batteries, and need only a limited amount of power supply.

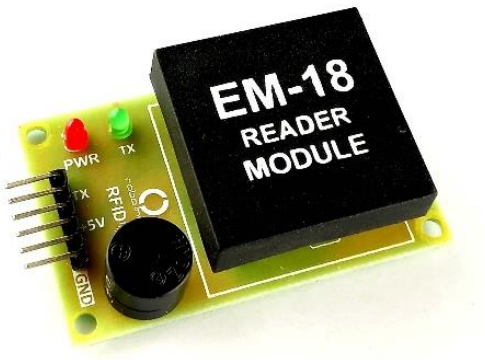

Fig 3 RFID Reader

4.4 Arduino IDE:

The Arduino IDE software is primarily used for authoring and compiling code for usage with the Arduino Module. The code compilation process is so simple. It can be used by any person without any previous technical knowledge in this field. It operates on the Java Platform, which includes built-in methods and instructions for analyzing, changing, and as well as code compilation in the environment. The basic code, also known as a sketch, written on the IDE platform will eventually generate a Hex File, which will be transferred to and uploaded to the board's controller. The Editor and Compiler are the two fundamental components of the IDE environment. This environment facilitates the languages C and C++.

4.5 IOT:

The term "internet of things" refers to a network of networked computers, mechanical and digital equipment, goods, animals, or people that have unique identities (UIDs) and the capacity to communicate data across a network without direct human or computer connection. The term "Internet of Things" refers to any living thing or machine that has a biochip transponder and can send data over a network. People with implanted heart rate monitors, farm animals with transponders, and automobiles with built-in sensors that inform the driver when tire pressure is low are all examples. The Internet of Things enables businesses to track the operation of their systems in real-time, providing insights on everything from the performance of the equipment to logistics and supply chainprocesses. Because of IoT, businesses may automate procedures and save money on manpower. It also improves service delivery; cuts waste decreases manufacturing and distribution costs and provides transparency into customer transactions.

5. NOVELTY

The proposed system uses Node MCU which has an inbuilt WIFI module, unlike other mechanisms which use a separatemodule for WIFI. The Node MCU is continuously in phase with the RFID scanner so the changes in the cart arereflected immediately without any delay. Also, the single tap feature for the addition and deletion of a product in thecart makes this system unique from the rest. The system is also power-efficient.

6. RESULT DISCUSSION AND OUTPUT

This system provides an automated billing facility in supermarkets. The system provides the output of the total amount purchased by the customer, the number of items purchased by the customer, and their respective prices. It also allows the customer to view the bill amount while purchasing and plan their purchase accordingly. The product gets added for a single tap and gets removed for adouble tap. It makes the customer’s work so simple. The system is also compact and can be fixed easily in a trolley.It makes the shopping experience simple and time-saving and reduces the number of people waiting in line for billing which is indeed more nowadays.

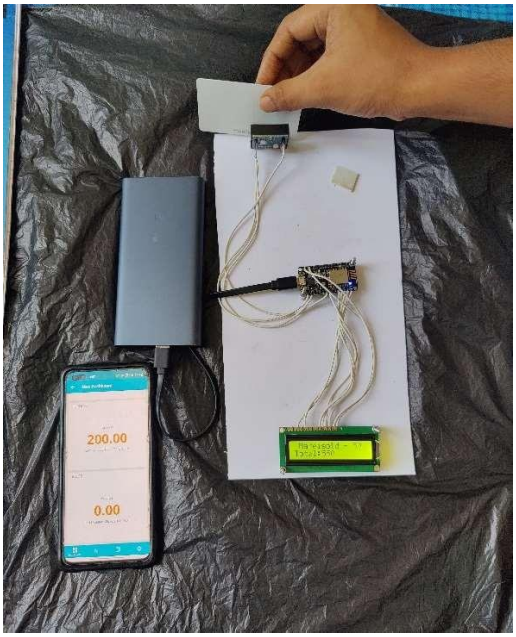

Fig 4 Working Model

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