A PROJECT REPORT ON

Smart shopping cart

Submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electronics and Communication Engineering

By

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Under the guidance of

Prof Dr.E.Logashanmugam sir, M.E., Ph.D.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

SATHYABAMA INSTITUTE OF SCIENCE ANDTECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **MIDATANI MOHANSAI (38130135)** who carried out the Project entitled "**SMART SHOPPING CART**". Under the guidance of **Dr.E.Logashanmugam** sir, M.E., Ph.D.

, during the period NOVEMBER 2021 to MAY 2022

INTERNAL GUIDE

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DECLARATION

I, **MIDATANI MOHANSAI Here** by declare thatthe Project report entitled **SMART SHOPPING CART** is done under the guidance of **Dr.E.Logashanmugam sir, M.E., Ph.D.** is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in ELECTRONICS AND COMMUNICATION ENGINNERING.

DATE: 09/03/2022

PLACE: CHENNAI

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Abstract:

Conventional billing systems used in the supermarket nowadays are a big hassle for the customers as it creates a long waiting time for payment of the products purchased. To provide a solution for the above problem, we have designed an application called Smart Shopping Cart using IoT which can eliminate queues for billing throughout the supermarket. Using the application, we scan the products and then put them inside a Smart cart which is designed using Node MCU, and LCD to display the total price of the items in the cart. To make it more feasible the bill is also made available on the web server that makes it easy for the customer to check the list of items added and so they can manage the purchase.

CHAPTER 1

Introduction:

In our day-to-day life, we see that the use of computing technology and innovative applications have increased rapidly. Many people are connected to this digital world through their smartphones and laptops because of the highspeed internet connectivity, user-friendly interface, and personalized recommendation. This has made things simpler and easier.

The new technology such as social media has given the users a better and broader perspective of many items and information about various products in their daily life and ensures that they are of the best quality. As our cities are overpopulated, the diversity of wants and needs of the people are also huge. As a result, many people prefer to go to malls and supermarkets to buy different varieties of commodities. The major drawback here is the people coming to shopping malls and supermarkets are huge in number, resulting in large queues for billing. Customers have to wait for a long time in a queue for scanning their items and paying the bill.

An automated smart shopping system is formed by introducing the concept of IoT to connect all items in the grocery shop. In this system, an inexpensive RF-ID tag is embedded within each product. When the product is placed into a smart cart, the product detail is automatically read by the cart equipped with an RF-ID reader. Hence, billing is made from the shopping cart itself preventing customers from waiting in a long queue at checkout. If any item is not scanned due to tampered bar code, we can identify that based on weight at last. Thus, inventory management becomes easier.

This system makes both the customer and supermarket employee's work easier by reducing the time it actually takes while using the old method of billing i.e manual billing technique.

CHAPTER 2

Literature survey:

Bipin Kumar Yadav (2020); In retail stores, most of the people spend more time in billing queue than the time he spends choosing the items due to long queue in rush time. The average time that customers of any retail store have to spend in the billing queues has a direct influence on the quality analysis of services. Thus, it is important to think about different ways to reduce the waiting time in a queue in real time scenario. We propose a cart system that distributes the whole billing queue into smaller individual units so that no one has to wait for the billing process at point of sales (PoS) for specific items. This device uses radio-frequency identification (RFID) technology to scan each product. A passive RFID sticker tag is attached with all the products. The sticker tag contains information including name and price of the product. The device includes a 13.56 MHz RFID reader/writer module that reads RFID stickers attached to the products. In this covid-19 alarmed situation, this distributed cart system also helps people to maintain social distance avoiding long queues.

T Sarala; It is wireless techniques along with one more communication technology has helped in making electronic commerece very popular.In this paper we discuss on innovative concept of “Smart Electronic shopping Trolley used in commercial complex which many individual retail stores”.The main purpose here is to assist a person in shopping to reduce time while purchasing a products.Electonic trolley is fitted out with Barcode reader that scanes the identification of outcome and internet connection with shop's server.It is also consists of LCD exhibits that notify the number of items and total amount to customers and Barcode scanner identifies the outcome and updates the bill.Swiping machine will be provided to recompense the bill through credit/debit cards. In this paper,we report the performance or administraion of reliable and more efficiency smart trolley shopping using WSN such a trolley is acceptable for supermarkets,it can helps in reducing manpower and creating better shopping occurence for customers.

Kowshika, Madhumitha S, Madhu Varshini , Megha Lakshmi (2021); Even through e-commence and other online applications are growing rapidly the craze for traditional shopping has never stepped back. One difficulty is to follow up in a queue for the billing process. There, arises a demand for easy and quick payment of bills. The proposed Smart Cart in this paper, is capable of generating bill using IoT along with the mobile cart application. With the use of this mobile application and trolley, customer can make bill payment in no time. The smart cart uses the RFID tag and receiver to scan the product, load cell to prevent theft, LCD display and the Raspberry p i Along with this the customer can also log in with the mobile app which will display the list of all the products mentioned and their amount. Once done, the customer can pay the bill through the mobile application.

Tapan Kumar Das, Kathiravan Srinivasan (2020); Shopping is really fascinating and alluring; at the same time, it involves getting tired due to standing in a long queue for the bill and payment process. Hence, it is proposed to design a smart trolley which can take care of shopping and billing. By this, the customer can walk straightaway into the shop, purchase products using the smart trolley and walk out of the shop. He gets the e-bill through the mail, and he can view his purchase details using the shop's website. In order to realize this, we need an Arduino board, Radio-Frequency Identification (RFID) reader, RFID tag, LCD display, ESP8266 Wi-Fi module, database manager and a website to maintain product and customer details, which can be accessed by the admin anywhere in the world. This is an IOT based system where the trolley can interact with the network spread worldwide.

P. Chandrasekar and T. Sangeetha(2020), Contemporary embedded systems are habitually based on microcontroller's i.e. CPUs in the company of integrated memory as well as peripheral interfaces but ordinary microprocessors by means of external chips for memory and peripheral interface circuits are also still common, especially in more complex systems. Radio frequency identification (RFID) technology may not only be useful for streamlining inventory and supply chains: it could also make shoppers swarm. ZigBee is based on an IEEE 802.15 standard. ZigBee devices often transmit data over longer distances by passing data through intermediate devices to reach more distant ones, creating a mesh network; i.e., a network with no centralized control or high-power transmitter/receiver able to reach all of the networked devices. This paper provides centralized and automated billing system using RFID and ZigBee communication. Each product of shopping mall, super markets will be provided with a RFID tag, to identify its type. Each shopping cart is designed or implemented with a Product Identification Device (PID) that contains microcontroller, LCD, an RFID reader, EEPROM, and ZigBee module. Purchasing product information will be read through a RFID reader on shopping cart, mean while product information will be stored into EEPROM attached to it and EEPROM data will be send to Central Billing System through ZigBee module. The central billing system gets the cart information and EEPROM data, it access the product database and calculates the total amount of purchasing for that particular cart. Main aim of this paper was to provide an automatic billing to avoid queue in malls and super markets.

CHAPTER 3

Problem definition:

- Shopping is simple but waiting on a bill counter makes shopping too boring and a tedious task. Huge amount of rush plus cashier preparing the bill is too time consuming and results in long que. In this prevailing pandemic standing in queues for billing in malls or shopping market is not advisable as virus may spread.
- The present billing system is time consuming process which irritates people by disturbing their busy schedules.

CHAPTER 4

Proposed system & objectives:

Proposed system:

- An automated smart shopping system is formed by introducing the concept of IoT to connect all items in the grocery shop. In this system, an inexpensive RF-ID tag is embedded within each product.
- When the product is placed into a smart cart, the product detail such as price and weight are automatically read by the cart equipped with an RF-ID reader.
- And the details are shown on lcd as well as the webserver.

Hence, billing is made from the shopping cart itself preventing customers from waiting in a long queue at checkout.

Objectives:

The objectives are detailed as follows,

- To find an efficient way to implement this cart feesable.
- To scan and update the price of item in webserver.
- To have a detailed bill description.

4.1 Block diagram & CIRCUIT DIAGRAM

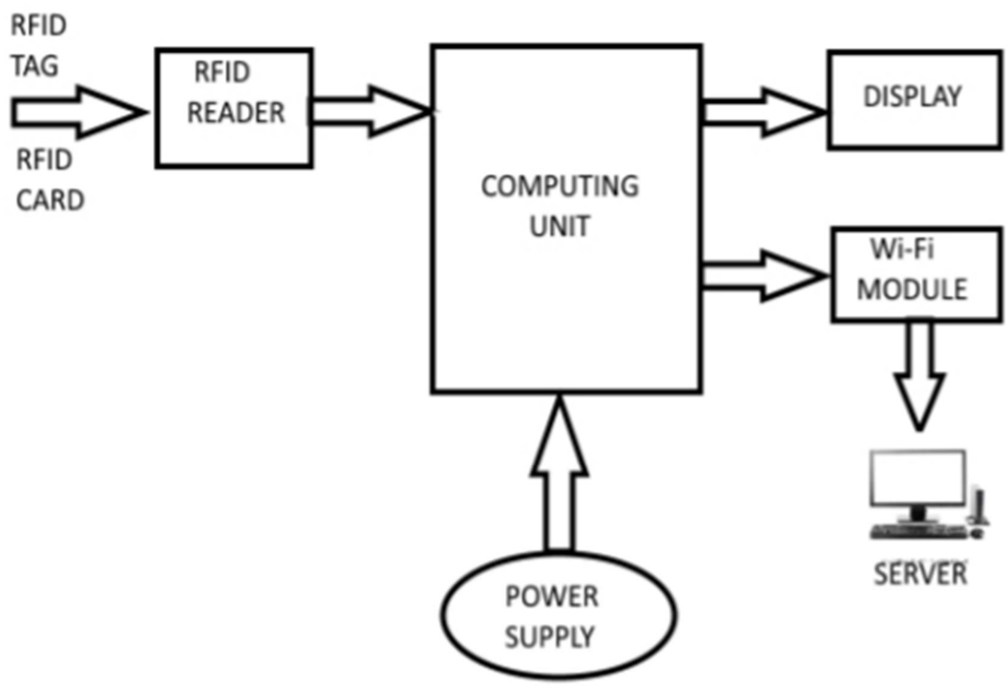

Fig 4.1: block diagram of proposed system

Hardware Required:

- Node MCU and Arduino IDE
- Jumper Wires
- RFID reader
- RFID cards
- USB Host
- LED

- Push button

Software Required:

- Arduino ide
- Embedded C
- HTML

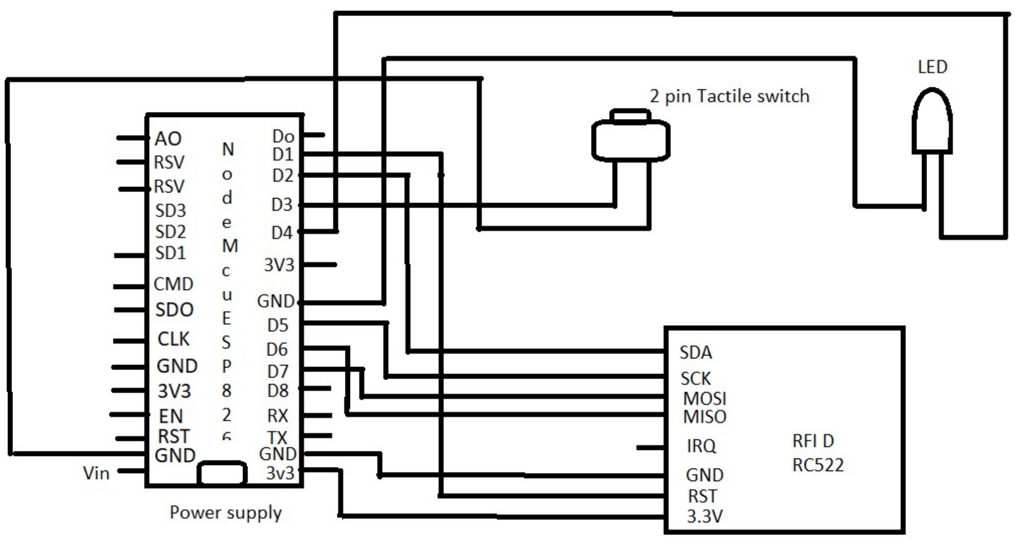

Fig 4.2 Circuit diagram

4.2 FLOW CHART OF PROPOSED SYSTEM

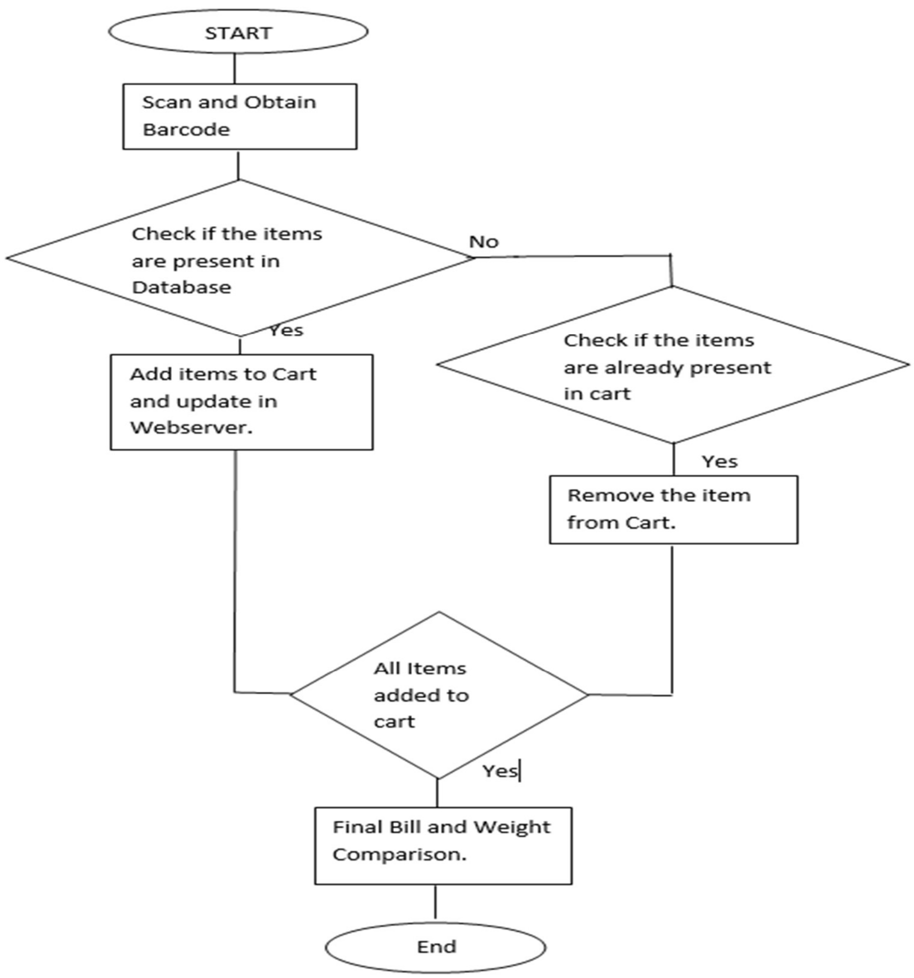

Fig 4.3flow chart of proposed system

4.3 Hardware Description

EMBEDDED SYSTEMS

4.3.1 Overview of embedded systems

An embedded system is a special-purpose computer system designed to perform one or a few dedicated functions, often with real-time computing constraints. It is usually embedded as part of a complete device including hardware and mechanical parts. In contrast, a general-purpose computer, such as a personal computer, can do many different tasks depending on programming. Embedded systems have become very important today as they control many of the common devices we use.

Since the embedded system is dedicated to specific tasks, design engineers can optimize it, reducing the size and cost of the product, or increasing the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically, embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

In general, "embedded system" is not an exactly defined term, as many systems have some element of programmability. For example, Handheld computers share some elements with embedded systems — such as the operating systems and microprocessors which power them — but are not truly embedded systems, because they allow different applications to be loaded and peripherals to be connected.

Embedded systems provide several functions

- Monitor the environment; embedded systems read data from input sensors. This data is then processed and the results displayed in some format to a user or users

- Control the environment; embedded systems generate and transmit commands for actuators.

- Transform the information; embedded systems transform the data collected in some meaningful way, such as data compression/decompression

Although interaction with the external world via sensors and actuators is an important aspect of embedded systems, these systems also provide functionality specific to their applications. Embedded systems typically execute applications such as control laws, finite state machines, and signal processing algorithms. These systems must also detect and react to faults in both the internal computing environment as well as the surrounding electromechanical systems.

There are many categories of embedded systems, from communication devices to home appliances to control systems. Examples include;

- Communication devices

eg.: modems, cellular phones

- Home Appliances

eg.: CD player, VCR, microwave oven

- Control Systems

eg.: Automobile anti-lock braking systems, robotics, satellite control

4.3.2 Block diagram of an embedded system:

An embedded system usually contains an embedded processor. Many appliances that have a digital interface -- microwaves, VCRs, cars -- utilize embedded systems. Some embedded systems include an operating system. Others are very specialized resulting in the entire logic being implemented as a single program. These systems are embedded into some device for some specific purpose other than to provide general purpose computing . A typical embedded system is shown in Fig

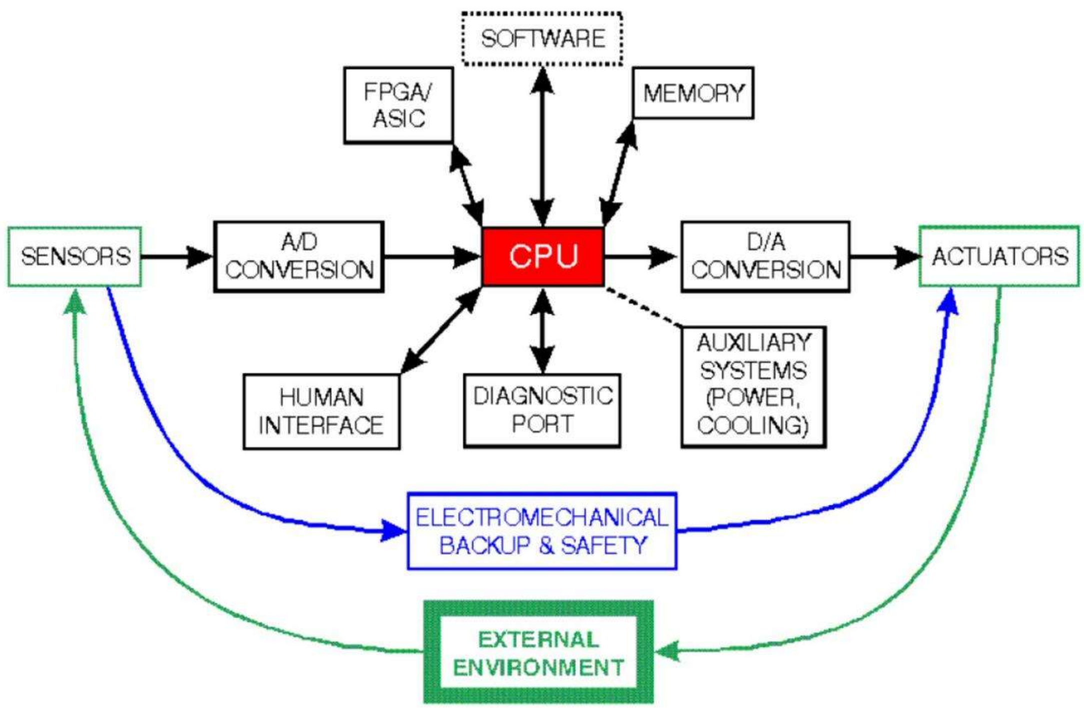

Fig 4.4 block diagram of a typical embedded system

Application Specific Systems:

Embedded systems are not general-purpose computers. Embedded system designs are optimized for a specific application. Many of the job characteristics are known before the hardware is designed. This allows the designer to focus on the specific design constraints of a well-defined application. As such, there is limited user reprogram ability. Some embedded systems, however, require the flexibility of reprogram ability. Programmable DSPs are common for such applications.

Reactive Systems

As mentioned earlier, a typical embedded systems model responds to the environment via sensors and control the environment using actuators. This requires embedded systems to run at the speed of the environment. This characteristic of embedded system is called “reactive”. Reactive computation means that the system (primarily the software component) executes in response to external events. External events can be either periodic or aperiodic. Periodic events make it easier to schedule processing to guarantee performance. Aperiodic events are harder to schedule. The maximum event arrival rate must be estimated in order to accommodate worst case situations. Most embedded systems have a significant reactive component. One of the biggest challenges for embedded system designers is performing an accurate worst case design analysis on systems with statistical performance characteristics (e.g., cache memory on a DSP or other embedded processor). Real time system operation means that the correctness of a computation depends, in part, on the time at which it is delivered. Systems with this requirement must often design to worst case performance. But accurately predicting the worst case may be difficult on complicated architectures. This often leads to overly pessimistic estimates erring on the side of caution. Many embedded systems have a significant requirement for real time operation in order to meet external I/O and control stability requirements. Many real-time systems are also reactive systems.

Distributed Systems

A common characteristic of an embedded system is one that consists of communicating processes executing on several CPUs or ASICs which are connected by communication links. The reason for this is economy. Economical 4 8-bit microcontrollers may be cheaper than a32-bit processors. Even after adding the cost of the communication links, this approach may be preferable. In this approach, multiple processors are usually required to handle multiple time-critical tasks. Devices under control of embedded systems may also be physically distributed.

Heterogeneous Architectures

Embedded systems often are composed of heterogeneous architectures. They may contain different processors in the same system solution. They may also be mixed signal systems. The combination of I/O interfaces, local and remote memories, and sensors and actuators makes embedded system design truly unique. Embedded systems also have tight design constraints, and heterogeneity provides better design flexibility.

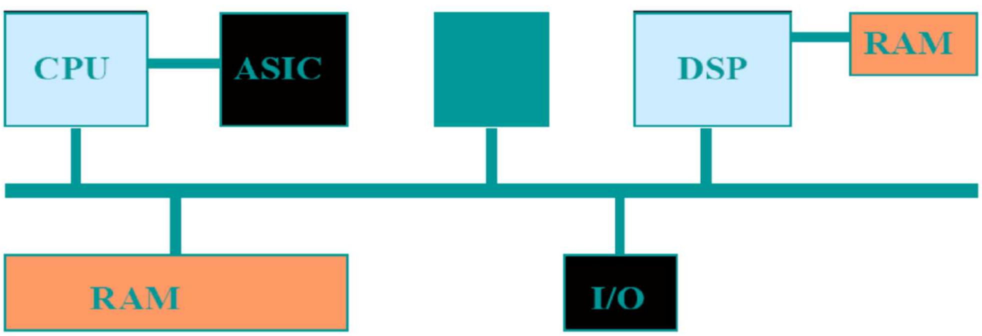

Fig 4.5 Embedded Systems having Heterogeneous Architectures

Harsh environment

Many embedded systems do not operate in a controlled environment. Excessive heat is often a problem, especially in applications involving combustion (e.g., many transportation applications). Additional problems can be caused for embedded computing by a need for protection from vibration, shock, lightning, power supply fluctuations, water, corrosion, fire, and general physical abuse.

4.4 System safety and reliability

As embedded system complexity and computing power continue to grow, they are starting to control more and more of the safety aspects of the overall system. These safety measures may be in the form of software as well as hardware control. Mechanical safety backups are normally activated when the computer system loses control in order to safely shut down system operation. Software safety and reliability is a bigger issue. Software doesn't normally "break" in the sense of hardware. However software may be so complex that a set of unexpected circumstances can cause software failures leading to unsafe situations. Discussion of this topic is outside the scope of this book, but the challenges for embedded designers include designing reliable software and building cheap, available systems using unreliable components. The main challenge for embedded system designers is to obtain low-cost reliability with minimal redundancy.

Control of physical systems

One of the main reasons for embedding a computer is to interact with the environment. This is often done by monitoring and controlling external machinery. Embedded computers transform the analog signals from sensors into digital form for processing. Outputs must be transformed back to analog signal levels. When controlling physical equipment, large current loads may need to be switched in order to operate motors and other actuators. To meet these needs, embedded systems may need large computer circuit boards with many non-digital components. Embedded system designers must carefully balance system tradeoffs among analog components, power, mechanical, network, and digital hardware with corresponding software.

Small and low weight

Many embedded computers are physically located within some larger system. The form factor for the embedded system may be dictated by aesthetics. For example, the form factor for a missile may have to fit inside the nose of the missile. One of the challenges for embedded systems designers is to develop non-rectangular geometries for certain solutions. Weight can also be a critical constraint. Embedded automobile control systems, for example, must be light weight for fuel economy. Portable CD players must be light weight for portability purposes.

Cost sensitivity

Cost is an issue in most systems, but the sensitivity to cost changes can vary dramatically in embedded systems. This is mainly due to the effect of computer costs have on profitability and is more a function of the proportion of cost changes compared to the total system cost.

Power management

Embedded systems have strict constraints on power. Given the portability requirements of many embedded systems, the need to conserve power is important to maintain battery life as long as possible. Minimization of heat production is another obvious concern for embedded systems.

4.4.1 POWER SUPPLY

All electronic circuits works only in low DC voltage, so we need a power supply unit to provide the appropriate voltage supply for their proper functioning. This unit consists of transformer, rectifier, filter & regulator. AC voltage of typically 230volts rms is connected to a transformer voltage down to the level to the desired ac voltage. A diode rectifier that provides the full wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation . A regulator circuit can use this dc input to provide dc voltage that not only has much less ripple voltage but also remains the same dc value even the dc voltage varies some what, or the load connected to the output dc voltages changes.

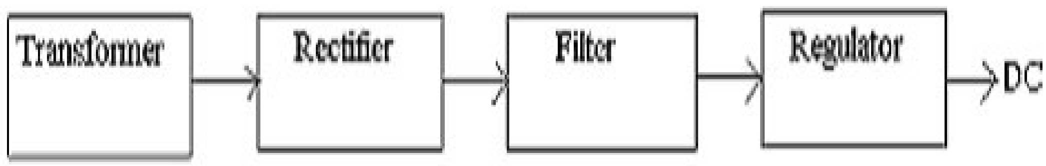

Fig 4.6 General Block Of Power Supply Unit

4.4.2 TRANSFORMER:

A transformer is a static piece of which electric power in one circuit is transformed into electric power of same frequency in another circuit. It can raise or lower the voltage in the circuit, but with a corresponding decrease or increase in current. It works with the principle of mutual induction. In our project we are using a stepdown transformer to providing a necessary supply for the electronic circuits. Here we step down a 230volts ac into 12volts ac.

4.4.3 RECTIFIER:

A dc level obtained from a sinusoidal input can be improved 100% using a process called full wave rectification. Here in our project for full wave rectification we use bridge rectifier. From the basic bridge configuration we see that two diodes (say D2 & D3) are conducting while the other two diodes (D1 & D4) are in off state during the period t = 0 to T/2.Accordingly for the negative cycle of the input the conducting diodes are D1 & D4. Thus the polarity across the load is the same.

In the bridge rectifier the diodes may be of variable types like 1N4001, 1N4003, 1N4004, 1N4005, IN4007 etc.… can be used. But here we use 1N4007, because it can withstand up to 1000v.

4.4.4 FILTERS:

In order to obtain a dc voltage of 0 Hz, we have to use a low pass filter. So that a capacitive filter circuit is used where a capacitor is connected at the rectifier output& a dc is obtained across it. The filtered waveform is essentially a dc voltage with negligible ripples & it is ultimately fed to the load.

4.4.5 REGISTERS:

The controller IC has two 8 bit registers, an instruction register (IR) and a data register (DR). The IR stores the instruction codes and address information for display data RAM (DD RAM) and character generator RAM (CG RAM). The IR can be written, but not read by the MPU. The DR temporally stores data to be written to /read from the DD RAM or CG RAM. The data written to DR by the MPU, is automatically written to the DD RAM or CG RAM as an internal operation.

When an address code is written to IR, the data is automatically transferred from the DD RAM or CG RAM to the DR. data transfer between the MPU is then completed when the MPU reads the DR. likewise, for the next MPU read of the DR, data in DD RAM or CG RAM at the address is sent to the DR automatically. Similarly, for the MPU write of the DR, the next DD RAM or CG RAM address is selected for the write operation.

The dot-matrix liquid crystal display controller and driver LSI displays alphanumeric, Japanese kana characters, and symbols. It can be configured to drive a dot-matrix liquid crystal display under the control of a 4- or 8-bit microprocessor. Since all the functions such as display RAM, character generator, and liquid crystal driver, required for driving a dot-matrix liquid crystal display are internally provided on one chip, a minimal system can be interfaced with this controller/driver

4.4.6 REGULATORS:

The output voltage from the capacitor is more filtered & finally regulated. The voltage regulator is a device, which maintains the output voltage constant irrespective of the change in supply variations, load variations & temperature changes. Here we use fixed voltage regulator namely LM7805.The IC LM7805 is a +5v regulator which is used for microcontroller.

4.5 IOT

Let's us look closely at our mobile device which contains GPS Tracking, Mobile Gyroscope, Adaptive brightness, Voice detection, Face detection etc. These components have their own individual features, but what about if these all communicate with each other to provide a better environment? For example, the phone brightness is adjusted based on my GPS location or my direction.

Connecting everyday things embedded with electronics, software, and sensors to internet enabling to collect and exchange data without human interaction called as the Internet of Things (IoT).

The term "Things" in the Internet of Things refers to anything and everything in day today life which is accessed or connected through the internet.

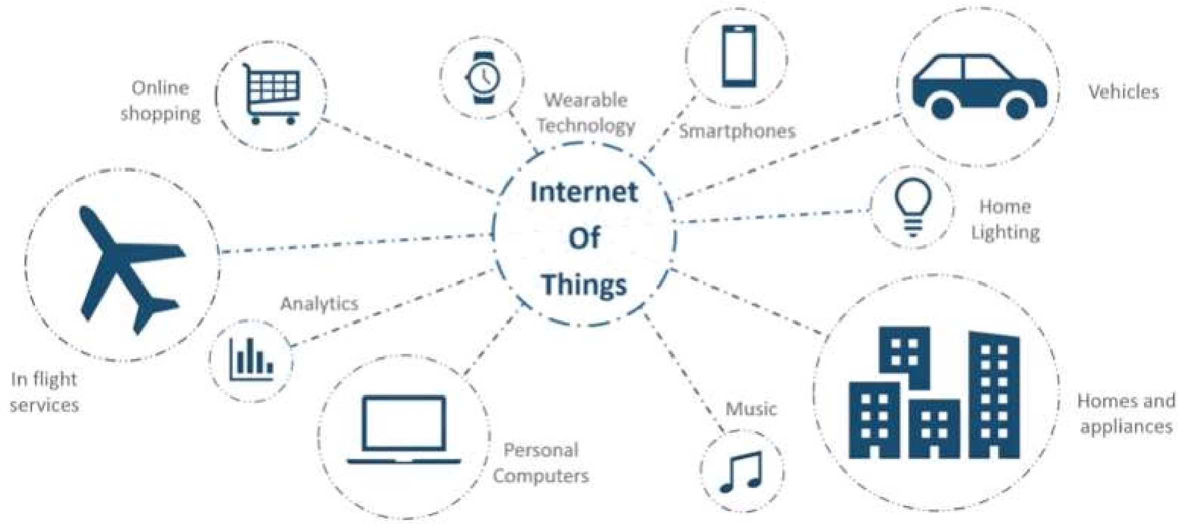

Fig 4.7 Diagram of IOT applications

IoT is an advanced automation and analytics system which deals with artificial intelligence, sensor, networking, electronic, cloud messaging etc. to deliver complete systems for the product or services. The system created by IoT has greater transparency, control, and performance.

As we have a platform such as a cloud that contains all the data through which we connect all the things around us. For example, a house, where we can connect our home appliances such as air conditioner, light, etc. through each other and all these things are managed at the same platform. Since we have a platform, we can connect our car, track its fuel meter, speed level, and also track the location of the car. If there is a common platform where all these things can connect to each other would be great because based on my preference, I can set the room temperature. For example, if I love the room temperature to to be set at 25 or 26-degree Celsius when I reach back home from my office, then according to my car location, my AC would start before 10 minutes I arrive at home. This can be done through the Internet of Things (IoT).

4.6Embedded Devices (System) in (IoT)

It is essential to know about the embedded devices while learning the IoT or building the projects on IoT. The embedded devices are the objects that build the unique computing system. These systems may or may not connect to the Internet.

An embedded device system generally runs as a single application. However, these devices can connect through the internet connection, and able communicate through other network devices.

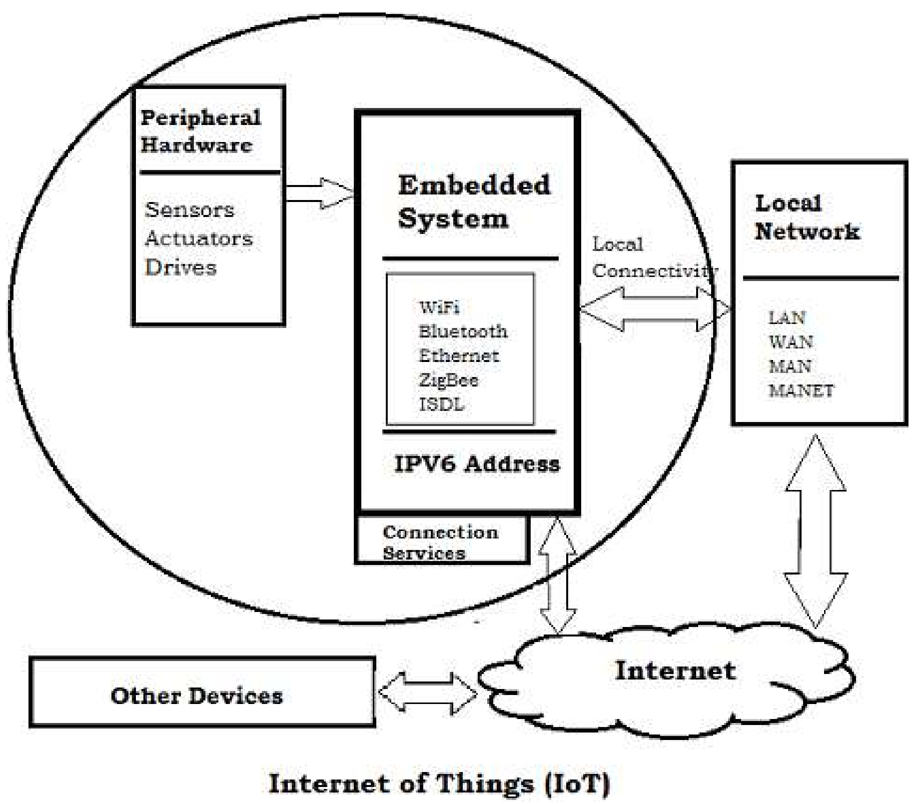

Fig 4.8 Embedded systems with IOT diagram

Embedded System Hardware

The embedded system can be of type microcontroller or type microprocessor. Both of these types contain an integrated circuit (IC).The essential component of the embedded system is a RISC family microcontroller like Motorola 68HC11, PIC 16F84, Atmel 8051 and many more. The most important factor that differentiates these microcontrollers with the microprocessor like 8085 is their internal read and writable memory. The essential embedded device components and system architecture are specified below.

4.7 Embedded System Software

The embedded system that uses the devices for the operating system is based on the language platform, mainly where the real-time operation would be performed. Manufacturers build embedded software in electronics, e.g., cars, telephones, modems, appliances, etc. The embedded system software can be as simple as lighting controls running using an 8-bit microcontroller. It can also be complicated software for missiles, process control systems, airplanes etc.

4.8 Nodemcu

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266. It uses many open source projects, such as lua-cjson and SPIFFS

NodeMCU was created shortly after the ESP8266 came out. On December 30, 2013, Espressif Systems began production of the ESP8266. The ESP8266 is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications (see related projects). NodeMCU started on 13 Oct 2014, when Hong committed the first file of nodemcu-firmware to GitHub. Two months later, the project expanded to include an open-hardware platform when developer Huang R committed the gerber file of an ESP8266 board, named devkit v0.9.Later that month, Tuan PM ported MQTT client library from Contiki to the ESP8266 SoC platform, and committed to NodeMCU project, then NodeMCU was able to support the MQTT IoT protocol, using Lua to access the MQTT broker. Another important update was made on 30 Jan 2015, when Devsaurus ported the u8glib to NodeMCU project, enabling NodeMCU to easily drive LCD, Screen, OLED, even VGA displays.

In summer 2015 the creators abandoned the firmware project and a group of independent contributors took over. By summer 2016 the NodeMCU included more than 40 different modules. Due to resource constraints users need to select the modules relevant for their project and build a firmware tailored to their needs.

ESP8266 Arduino Core

As Arduino.cc began developing new MCU boards based on non-AVR processors like the ARM/SAM MCU and used in the Arduino Due, they needed to modify the Arduino IDE so that it would be relatively easy to change the IDE to support alternate toolchains to allow Arduino C/C++ to be compiled for these new processors. They did this with the introduction of the Board Manager and the SAM Core. A "core" is the collection of software components required by the Board Manager and the Arduino IDE to compile an Arduino C/C++ source file for the target MCU's machine language. Some ESP8266 enthusiasts developed an Arduino core for the ESP8266 WiFi SoC, popularly called the "ESP8266 Core for the Arduino IDE".[16] This has become a leading software development platform for the various ESP8266-based modules and development boards, including NodeMCUs.

4.9 RFID technology

RFID or Radio Frequency Identification system consists of two main components, a transponder/tag attached to an object to be identified, and a Transceiver also known as interrogator/Reader.

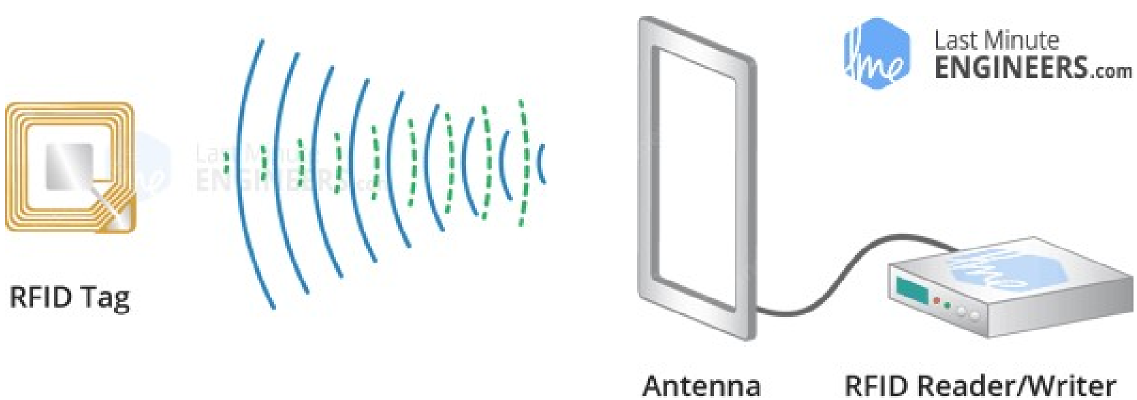

Fig 4.9 diagram of rfid technology

A Reader consists of a Radio Frequency module and an antenna which generates high frequency electromagnetic field. On the other hand, the tag is usually a passive device, meaning it doesn't contain a battery. Instead it contains a microchip that stores and processes information, and an antenna to receive and transmit a signal.

To read the information encoded on a tag, it is placed in close proximity to the Reader (does not need to be within direct line-of-sight of the reader). A Reader generates an electromagnetic field which causes electrons to move through the tag's antenna and subsequently power the chip.

The powered chip inside the tag then responds by sending its stored information back to the reader in the form of another radio signal. This is called backscatter. The backscatter, or change in the electromagnetic/RF wave, is detected and interpreted by the reader which then sends the data out to a computer or microcontroller.

Hardware Overview – RC522 RFID Reader/Writer Module

The RC522 RFID Reader module is designed to create a 13.56MHz electromagnetic field that it uses to communicate with the RFID tags (ISO 14443A standard tags). The reader can communicate with a microcontroller over a 4-pin Serial Peripheral Interface (SPI) with a maximum data rate of 10Mbps. It also supports communication over I2C and UART protocols.

The module comes with an interrupt pin. It is handy because instead of constantly asking the RFID module "is there a card in view yet? ", the module will alert us when a tag comes into its vicinity.

The operating voltage of the module is from 2.5 to 3.3V, but the good news is that the logic pins are 5-volt tolerant, so we can easily connect it to an Arduino or any 5V logic microcontroller without using any logic level converter.

Here are complete specifications:

Frequency Range	13.56 MHz ISM Band
Host Interface	SPI / I2C / UART
Operating Supply Voltage	2.5 V to 3.3 V
Max. Operating Current	13-26mA
Min. Current (Power down)	10µA
Logic Inputs	5V Tolerant
Range	5cm

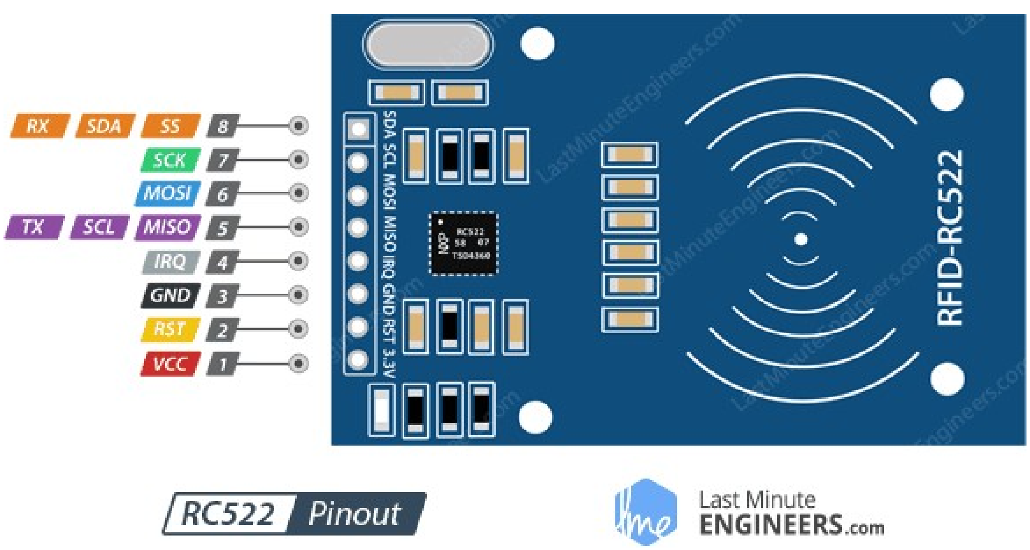

Fig 4.10 RC522 RFID PIN CONFIGURATION

VCC: supplies power for the module. This can be anywhere from 2.5 to 3.3 volts. You can connect it to 3.3V output from your Arduino. Remember connecting it to 5V pin will likely destroy your module!

RST: is an input for Reset and power-down. When this pin goes low, hard power-down is enabled. This turns off all internal current sinks including the oscillator and the input pins are disconnected from the outside world. On the rising edge, the module is reset.

GND: is the Ground Pin and needs to be connected to GND pin on the Arduino.

IRQ: is an interrupt pin that can alert the microcontroller when RFID tag comes into its vicinity.

MISO / SCL / Tx pin: acts as Master-In-Slave-Out when SPI interface is enabled, acts as serial clock when I2C interface is enabled and acts as serial data output when UART interface is enabled.

MOSI (Master Out Slave In): is SPI input to the RC522 module.

SCK (Serial Clock) : accepts clock pulses provided by the SPI bus Master i.e. Arduino.

SS / SDA / Rx pin : acts as Signal input when SPI interface is enabled, acts as serial data when I2C interface is enabled and acts as serial data input when UART interface is enabled. This pin is usually marked by encasing the pin in a square so it can be used as a reference for identifying the other pins.

CHAPTER 5

Result and discussion

Whenever the customer using this cart is adding a product into the shopping cart the product that is attached with RFID tag is scanned and the details required are fetched. These details are then fed into the microcontroller and based on the code the microcontroller then produces a bill with required fields in it. This bill gets updated within no time the product gets added to it. The bill is then displayed on lcd screen and also on the webserver which makes customer more comfortable in viewing the detailed bill of products added and then cross check for the products to be added. The products can also be removed from cart, when the customer wants to remove a product he can use the push button and scan it so the product is removed from the bill.

Smart Shopping Cart using IoT

ITEMS	QUANTITY	COST	WEIGHT(gm)
Biscuit	2	70	200
Soap	2	76	300
Rice	0	0	0
Tea	0	0	0
Grand Total	**4**	**146.00**	**500.00**

Pay Now

Fig5.2 bill outcome on webserver

CHAPTER 6

CONCLUSION

The basic idea is to make shopping more easy and comfortable in the overpopulated cities. This shopping cart is built with a system that enables customer to bill their products at cart itself without standing in long ques for billing.

Finally, a system named smart shopping cart is designed in which the microcontroller(node mcu) and rfid technology plays a vital role in scanning the products,preparing bill and displaying it on lcd and also uploading the same into the webserver .This helps the user to view the bill on his/her device.

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