# IOT Based Smart Cart with Automatic Billing for Futuristic Shopping Experience

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***Abstract***

*A creative item with societal acknowledgment is the one that guides the solace, accommodation and effectiveness in regular daily existence. Acquiring and shopping at enormous shopping centers is winding up day by day action in metro urban areas. We can see huge surge at these shopping centers on siestas and ends of the week. Individuals buy distinctive things and place them in trolley. After fruition of buys, one needs to go to charging counter for installments. At charging counter the clerk set up the bill utilizing standardized identification per user which is extremely tedious process and results in long line at charging counter. In this paper, we talk about a item "Smart Shopping Cart" being produced to help a man in regular shopping as far as diminished time spent while buying. The primary target of proposed framework is to give an innovation situated, minimal effort, effectively adaptable, and rough framework for helping shoppingfacetoface.*

## I.INTRODUCTION

In busy world, waiting in the long queue during shopping as become tedious process. And this consume the lot of time of the user in the shopping market. To avoid this problem, we are proposing a futuristic shopping system. This reduces the billing time of the user. And user no longer need to wait in the long queue for billing. This is system will replace conventional and time-consuming system. The proposed system used emerging technology like Internet of Things along with Android and RFID. User can experience prepaid shopping system, where user have to recharge the cart with amount of his/her requirement. And for every item that he/she includes in the shopping cart the amount will be automatically detected. Amount will be credited to user prepaid shopping account, if added item is taken out of the cart. Near Field Communication system (RFID) is used here, to uniquely identifies the each item in the super market and to know about other

details like price. Entire system is communicated via IoT.

## II.WORKING

Prime controller for this robot is NodeMCU Board integrated with IoT. The operating voltage of this robot is 5V-9V and we are using the regulated DC 5V supply for the control circuit and for the motors DC 9V supply is given. And mechanical arrangement is provided for movement of the motor which is driven through motor driver circuit. This entire electromechanical arrangement is controlled through IoT interfaced android/desktop web application. The wireless camera helps for live streaming of video transmission with secured connection using cloud to an android mobile/PC. This robot is enabled with laser module to serve as defense mechanism, this is will help the soldier to kill the enemy if there is a situation.

**Block diagram**

**ROBOT Section**

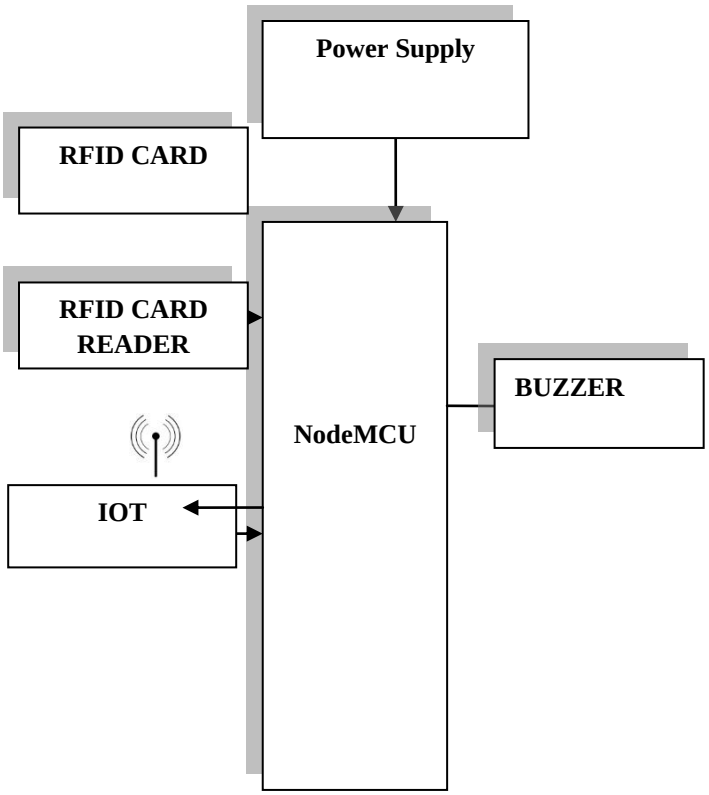



**Fig 3.1 Robot Section**

## III.POWER SUPPLY

Power supply block consists of following units:

- Step down transformer.
- Bridge rectifier circuit.
- Input filter.
- Voltage regulators.
- Output filter.
- Indicator unit.

### *A. Step down transformer*

The step-down transformer is used to step down the supply voltage of 230v ac from mains to lower values, as the various IC's used in this project require reduced voltages. The transformer consists of primary and secondary coils.

The outputs from the secondary coil which is center tapped are the ac values of 0v, 15v and 15v. The conversion of these ac values to dc values to dc values is done using the full wave rectifier unit.

### *B. Rectifier unit*

A diode bridge is an arrangement of four diodes connected in a bridge circuit. That provides the polarity of output voltage of any polarity of the input voltage. When used in its most common application, for conversion of alternating current (A.C) input into direct current (D.C) output, it is known as a bridge rectifier.

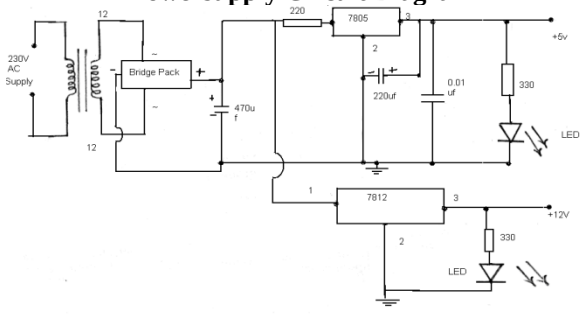
### *C. Input filter*

Capacitors are used as filters. The ripples from the dc voltages are removed and pure dc voltage is obtained. The primary action performed by capacitor is charging and discharging So it allows only ac voltage and does not allow the dc voltage. This filter is fixed before the regulator. Capacitors used here are of the value 1000uF.

### *D. Regulator unit*

Regulator regulates the output voltage to a specific value. The output voltage is maintained irrespective of the fluctuations in the input dc voltage. Whenever there are any ac voltage fluctuations, the dc voltage also changes, and to avoid this regulators are used.

**Powersupply Circuit Diagram**




## IV.PCB FABRICATION

The PCB manufacturing process involves use of expensive equipment, but homebrew PCB fabrication is less expensive. It requires Intel Pentium PC,600-1200dpi laser printer with premium-quality paper or butter-paper and miscellaneous items like single side copper laminated board, Lacquer thinner, sand paper and others

### *A. Pc Based Artwork*

The PC based artwork consists of drawing the conductor pattern. For putting artwork on the component side of the board, flip the whole image before or while taking the print. When the pattern has been drawn, take the print out in 600 to 1200 dpi on a translucent or butter paper. Keep the paper side on which the toner is deposited facing down over the copper laminated boards copper side and then when the board is turned component side up, the pattern on the conductor will be found properly aligned with the components. Finally we take the printout of the PCB.

### *B. Taking The Pcb Layout Print Using A Laser Printer*

Take the printout of the circuit layout from a laser printer. The idea is to use a coated paper so that the toner comes loose when heated which would transfer a sharp black print on to copper laminate. Print for each of the required layers should be taken on separate paper.

### *C. Transfer of the conductor pattern*

Scrub The Copper Side Of The Copper Clad Laminated Used For The PCB Board With A Sponge. The Scrubbing Involves Removes Oxidation, Stains, Etc. And It Also Makes The Copper Surface Some-What Rough Which Helps The Toner To Adhere To The Copper Surface. The Next Step Is to Degrease The Board Thoroughly Using A Paper Towel Soaked With Acetone Solvent. Keep Doing It Until No More Discoloration Is Seen On The Paper Towel. Rub Hard and Keep Switching To Clean Parts Of Towel. Place And Align The Paper On The Copper Side, Using An Iron Box To Maximum Setting On The Back Of The Paper For At Least Half A Minute.

### *D. Etching*

Etch the unwanted copper from the board using the ferric chloride solution for 20 or more minutes. One pint can etch at least 3.6 sq. meters of the 28gm board. Heating the etchant will speeds up the etching process. The PCB is attached to a wooden piece and dip in to the solution. Lift the PCB up and Check whether all the unwanted copper is removed. Then it is immersed in to cold water to clean. When etching is complete, board is

removed from the solution and rinse it under running tap water .Acetone or lacquer thinner is used to remove the toner .Lacquer thinner is used as a solvent in painting industry. Wash the board in lacquer thinner solvent, rubbing with a paper towel, to remove the toner instantly. .

### *E. Caution*

Lacquer thinner is extremely volatile, inflammable and explosive. Acetone can irritate eyes and respiratory system .Ferric chloride is corrosive, so avoid skin and eye contact.

## V. NodeMCU

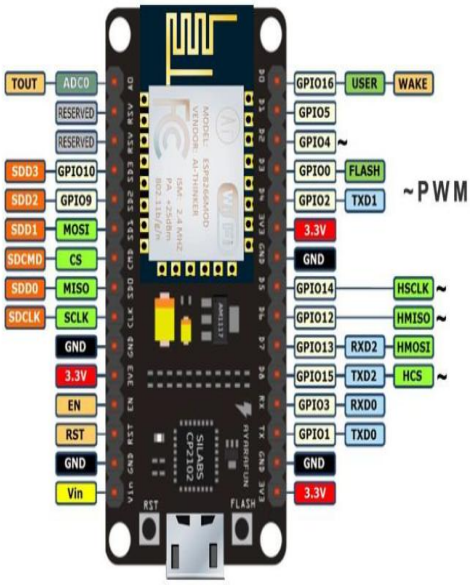



**FIG 5.1 NODEMCU**

The best way to develop quickly an IoT application with less Integrated circuits to add is to choose this circuit "NodeMCU". Today, we will give a detailed Introduction on NodeMCU V3. It is an open-source firmware and development kit that plays a vital role in designing a proper IoT product using a few script lines.

The module is mainly based on ESP8266 that is a low-cost Wi-Fi microchip incorporating both a full TCP/IP stack and microcontroller capability. It is introduced by manufacturer Espressif Systems. The ESP8266 NodeMcU is a complex device, which combines some features of the ordinary Arduino board with the possibility of connecting to the internet. NodeMCU is also an open-source firmware and development kit that helps you to prototype your IOT product within a few LUA script lines, and of course you can always program it with Arduino IDE.

## VI. RFID READER


**Fig 6.1 RFID Reader**

**Radio-frequency identification** (**RFID**) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic induction from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Unlike a barcode, the tag does not necessarily need to be within line of sight of the reader and may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture (AIDC).

RFID tags are used in many industries. For example, an RFID tag attached to an automobile during production can be used to track its progress through the assembly line; RFID-tagged pharmaceuticals can be tracked through warehouses; and implanting RFID microchips in livestock and pets allows positive identification of animals.

Since RFID tags can be attached to cash, clothing, and possessions, or implanted in animals and people, the possibility of reading personally-linked information without consent has raised serious privacy concerns. These concerns resulted in standard specifications

development addressing privacy and security issues. ISO/IEC 18000 and ISO/IEC 29167 use on-chip cryptography methods for untraceability, tag and reader authentication, and over-the-air privacy. ISO/IEC 20248 specifies a digital signature data structure for RFID and barcodes providing data, source and read method authenticity. This work is done within ISO/IEC JTC 1/SC 31 Automatic identification and data capture techniques.

In 2014, the world RFID market is worth US$8.89 billion, up from US$7.77 billion in 2013 and US$6.96 billion in 2012. This includes tags, readers, and software/services for RFID cards, labels, fobs, and all other form factors. The market value is expected to rise to US$27.31 billion by 2024.

### *A. Internet of Things*

The Internet of Things is an emerging topic of technical, social, and economic significance. Consumer products, durable goods, cars and trucks, industrial and utility components, sensors, and other everyday objects are being combined with Internet connectivity and powerful data analytic capabilities that promise to transform the way we work, live, and play.. The Internet of Things engages a broad set of ideas that are complex and intertwined from different perspectives. Key concepts that serve as a foundation for exploring the opportunities and challenges of IoT include:

### *B. Enabling Technologies*

The concept of combining computers, sensors, and networks to monitor and control devices has existed for decades. The recent confluence of several technology market trends, however, is bringing the Internet of Things closer to widespread reality

### *C. Connectivity Models*

IoT implementations use different technical communications models, each with its own characteristics. Four common communications models described by the Internet Architecture Board include: *Device-to-Device*, *Device-to-Cloud*, *Device-to-Gateway*, and *Back-End Data-Sharing*. These models highlight the flexibility in the ways that IoT devices can connect and provide value to the user.

### *D. Transformational Potential*

If the projections and trends towards IoT become reality, it may force a shift in thinking about the implications and issues in a world where the most common interaction with the Internet comes from passive engagement with connected objects rather than active engagement with content. The potential realization of this outcome – a "hyperconnected world" — is testament to the general-purpose nature of the Internet architecture itself, which does not place inherent limitations on the applications or **services that can make use of the technology.**

Five key IoT issue areas are examined to explore some of the most pressing challenges and questions related to the technology. These include security; privacy; interoperability and standards; legal, regulatory, and rights; and emerging economies and development.

### *E. Security*

While security considerations are not new in the context of information technology, the attributes of many IoT implementations present new and unique security challenges. Addressing these challenges and ensuring security in IoT products and services must be a fundamental priority.Users need to trust that IoT devices and related data services are secure from vulnerabilities, especially as this technology become more pervasive and integrated into our daily lives. Poorly secured IoT devices and services can serve as potential entry points for cyber attack and expose user data to theft by leaving data streams inadequately protected. The interconnected nature of IoT devices means that every poorly secured device that is connected online potentially affects the security and resilience of the Internet globally.As a matter of principle, developers and users of IoT devices and systems have a collective obligation to ensure they do not expose users and the Internet itself to potential harm. Accordingly, a collaborative approach to security will be needed to develop effective and appropriate solutions to IoT security challenges that are well suited to the scale and complexity of the issues.

### *F. Privacy*

The full potential of the Internet of Things depends on strategies that respect individual privacy choices across a broad spectrum of expectations. The data streams and user specificity afforded by IoT devices can unlock incredible and unique value to IoT users, but concerns about privacy and potential harms might hold back full adoption of the Internet of Things. This means that privacy rights and respect for user privacy expectations are integral to ensuring user trust and confidence in the Internet, connected devices, and related services. Indeed, the Internet of Things is redefining the debate about privacy issues, as many implementations can dramatically change the ways personal data is collected, analyzed, used, and protected. For example, IoT amplifies concerns about the potential for increased surveillance and tracking, difficulty in being able to opt out of certain data collection, and the strength of aggregating IoT data streams to paint detailed digital portraits of users.

### *G. Emerging Economy and Development Issues*

The Internet of Things holds significant promise for delivering social and economic benefits to emerging and developing economies. This includes areas such as sustainable agriculture, water quality and use, healthcare, industrialization, and environmental management, among others. As such, IoT holds promise as a tool in achieving the United Nations Sustainable Development Goals. The broad scope of IoT challenges will not be unique to industrialized countries. Developing regions also will need to respond to realize the potential benefits of IoT. In addition, the unique needs and challenges of implementation in less-developed regions will need to be addressed, including infrastructure readiness, market and investment incentives, technical skill requirements, and policy resources. The Internet of Things is happening now. It promises to offer a revolutionary, fully connected "smart" world as the relationships between objects, their environment, and people become more tightly intertwined. Yet the issues and challenges associated with IoT need to be considered and addressed in order for the potential benefits for individuals, society, and the economy to be realized. Ultimately, solutions for maximizing the benefits of the Internet of Things while minimizing the risks will not be found by engaging in a polarized debate that pits the promises of IoT against its possible perils. Rather, it will take informed engagement, dialogue, and collaboration across a range of stakeholders to plot the most effective ways forward.

## VI. CONCLUSION

The Internet of Things is one such technology that connects various objects in The Internet of Things is one such technology that connects various objects in a network and is a milestone in the era of the smart world. The smart shopping cart features these technology enabling users to shop efficiently. Internet of things is the leading technology that makes the world experiences a seventh sense. By the year 2020, around 1 billion objects will be connected thus making the world smart. Thissmart shopping cart is implemented in such a way that it allows the customer to scan the item that he/she wants to purchase and automatically updates the bill thus preventinglong queues at the checkout. Also, another interesting feature of this smartshopping cart is the cart-to-cart communication that helps the customers to shop parallelwith friends and family.

Asking to shop as owner Pop up asking Email IDPop up asking Email ID of partner. Shopping with the saved list

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