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Smart Shopping Trolley Using Internet of Thing (IOT)

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Abstract: ***Currently, billions of consumers shop at large in shopping mall stores for their everyday necessities. In today's life, purchasing has become a part of everyday life. On holidays and weekends, malls experience massive crowds .The integration of Internet of Things (IoT) technology into shopping trolleys presents a significant advancement in the retail industry, revolutionizing the shopping experience for consumers. The proposed SST utilizes a network of sensors and connectivity solutions to enable real-time monitoring, inventory management, and personalized services. Through IoT integration, the SST offers features such as automatic item detection, seamless checkout processes, and personalized recommendations based on individual shopping habits. Moreover, the system empowers retailers with tools for efficient inventory management, reducing stock outs, and analysing consumer behaviour for targeted marketing strategies. Intelligent Carts and automated recognition systems are being utilized by merchants to enhance the efficiency of their offerings and to boost market demand, enabling them to save time and money.***

Keywords: Smart Shopping Trolley, Internet of Things (IoT), Retail Innovation, Sensor Networks, Real-time Monitoring, Personalized Services, Automatic Item Detection,

I. INTRODUCTION

Technology has a major impact on human life. The evolution of ecommerce has altered our consumer patterns and styles during the last decade. E-Commerce and the Internet are inextricably connected. Online shopping has become feasible thanks to the Internet, advertisement, and promotion. Because of the presence of specialized sites such as Amazon, Julie Chic, Integra, among others, online shopping has spread. However, the presence of ecommerce has not hindered the expansion of conventional markets. Different methods have arisen to establish sourcing, where there are several trolleys that are used in different forms such as mobile grocery carts, infant strollers, and shopping carts, where the advent of entrepreneurial thinking leads to the increase of trade transfers dependent on the selling and buy. When shoppers realize precisely how much they are spending, they're more willing to cut corners on product names, and they are spending more, people left the store satisfied than those who didn't get this information. Non-budget consumers, on the other side, are more frugal because of this real-time shopping input. They pay 19 percent less on average and buy fewer national labels and more in expensive supermarket brands. Except for an integrated tablet and detector installed near the shopper, the shopping cart appears like every other. When a shopper swipes there shopping card, his buying background is usable for a number of reasons, including providing a recommended shopping item, alerting to deals, and warning about perishables bought a month before.



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II. LITERATURE

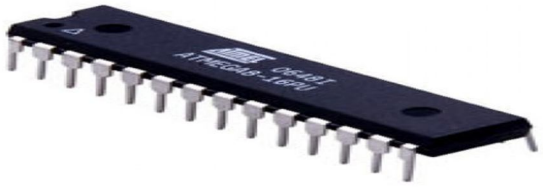
The Internet of Things (IoT) explores new scope and makes human life very easy in today's scenarios in various fields such as health monitoring, environmental monitoring, wearable's, traffic monitoring, smart grid and agriculture smart supply chain. Many authors have created automatic shopping trolleys using IoT for shopping malls, and there is a lot of overlap in all of these research papers. The automated shopping trolley uses a barcode reader for the product. By exploring these areas in the literature, you can gain a comprehensive understanding of the various aspects involved in designing and implementing a smart shopping trolley using IoT technologies. Additionally, you can identify best practices, challenges, and opportunities that can inform your own research or development efforts in this domain.

III. DESIGN METHODOLOGY

It describes the implementation of smart shopping cart using radio frequency identification using the RFID sensors, Arduino microcontroller, Bluetooth module, and Mobile application. Where the mobile is connected to the shopping cart and the application is already installed, the data is shared using the Bluetooth from the arduino microcontroller and the mobile then with the server. "Intelligent shopping cart using BOLT based on IOT". IOT kit consists of barcode scanner, LCD display, Bolt ESP8266. The broad clarification of its process is, when consumer takes an item and put inside the trolley, that time barcode scanner scan the item barcode and value as well as gain to show into the digital display panel. Later than consumer concluded their purchasing and the bill is send to the counter section. The LCD used is a 16x2 and zigbee modules make the wireless network to work even at long distance due to its wide range, the RFID scanner scans the product's unique code and its price. And it gets displayed on the LCD screen. So after costumer has finished with the shopping he/she has to visit the counter and pay the bill as displayed on the LCD screen fitted on the trolley.

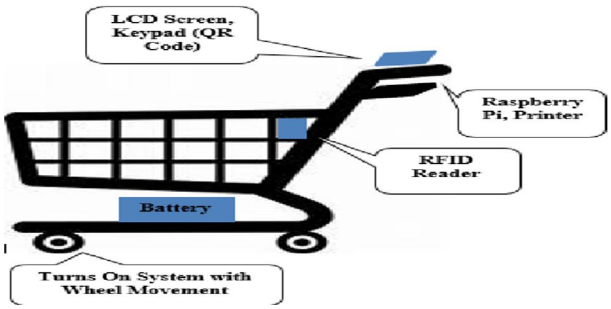
IV. COMPONENTS USED

A. Microcontroller



A microcontroller could be a tiny laptop on one metal-oxide semiconductor(MOS) computer circuit (IC) chip. A microcontroller contains one or a lot of CPUs (processor cores) alongside memory and programmable input/output peripherals. ATMEGA is an 8-bit microcontroller chip that delivers high performance at a low price. It will be simply operated at 1-15 Volts.

B. RFID TAGS





Each tag is fitted with a semiconductor device that's used for storing the amount still as a coil that is employed as associate degree antenna for the radiation of knowledge through radio-frequency waves. Radio-frequency identification uses magnetic force fields to mechanically determine and track tags hooked up to things. Associate degree RFID system consists of a small radio electrical device, a receiver and transmitter.

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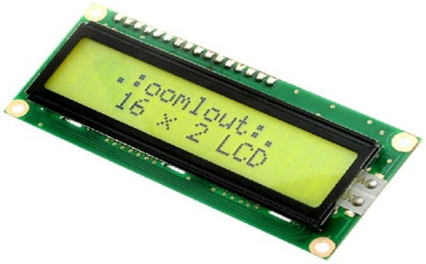
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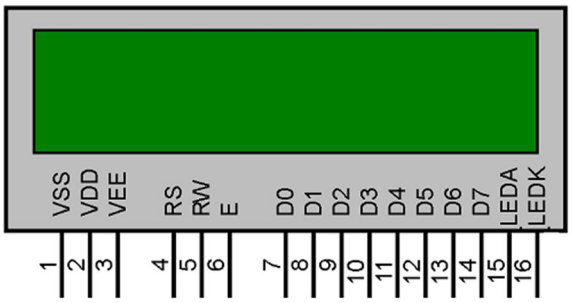
C. RFID Reader

Every trolley is bolstered with an RFID reader, and also the variety of reader that's utilized in RFID RC522.An RFID reader is that the brain of the RFID system and is critical for any system to operate. Readers, conjointly known as interrogators, are devices that transmit and receive radio waves so as to speak with RFID tags

D. LCD Display

A 16X2 LCD touch-enabled LCD screen is employed for displaying the knowledge. A liquid-crystal show (LCD) may be a flat-panel show or different electronically modulated optical devices that use the light-modulating properties of liquid crystals combined with polarizers. Liquid crystals don't emit lightweight directly, instead employing a backlight or reflector to supply pictures in color or monochrome.





E. Servo Motor

Servo motors used in solar trackers are designed to precisely control the orientation of solar panels to track the movement of the sun throughout the day. Solar trackers require accurate positioning, so servo motors are chosen for their precision and ability to move to specific angles with minimal error.



F. Push Button

The OK button is employed to show the overall value of all the things within the self-propelled vehicle, that were scanned victimization either the screen on the app. The Cancel button resets the overall price to default

V. WORKING PRINCIPLE

In sensible trolley system, the android automaton app is employed to send barcode information serially to the Arduino Bluetooth module once a button is pressed on the appliance. The Receiver Bluetooth module at different finish receives the information and sends it to the Arduino Uno through the receiver pin of the Bluetooth module.

A. Working

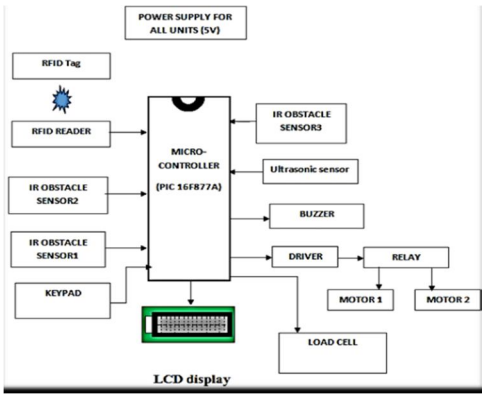
The key target of future framework is to convey a talent disquieted regarding, ease, effectively out
There, and a good framework for supporting looking. The RFID management driven electronic looking trolley car is worked to enhance the full looking understanding for laptop gadgets store shoppers.
Some of these technologies are used whereas some square measure still in experimental section.

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Therefore, essentially what this project will is that it enhances client looking expertise. The bill is generated at the same time, therefore you would like not fill in a queue, expecting individuals ahead of you to unload their things so the cashier might scan them and generate invoice. additionally, once the bill is being generated, you'll keep track of your budget and by this you'll additionally economize and time.



Circuit Connection



Block Diagram

VI. FUTURE SCOPE

The future scope of smart shopping trolleys using the Internet of Things (IoT) is promising, with numerous opportunities for innovation and enhancement. Smart shopping trolleys can leverage data collected from sensors and customer preferences to provide personalized product recommendations. By analyzing past purchases, browsing history, and contextual information, such as location within the store, the trolley could suggest relevant items to the shopper in real-time. Integrating IoT technology with automated checkout systems can streamline the shopping experience further. Smart trolleys could automatically detect items placed inside them, calculate the total cost, and facilitate payment through mobile applications or RFID/NFC-enabled payment methods, reducing the need for traditional checkout counters. Future smart shopping trolleys can incorporate sustainability features, such as energy-efficient components, recyclable materials, and options for reducing plastic waste. Additionally, they can promote sustainable shopping practices by providing information on eco-friendly products and packaging alternatives. Overall, the future of smart shopping trolleys using IoT is bright, with endless possibilities for enhancing the retail experience, improving operational efficiency, and driving customer satisfaction and loyalty.

VII. CONCLUSION

The implementation of a smart shopping trolley leveraging the Internet of Things (IoT) brings significant advantages to both consumers and retailers. By integrating sensors, connectivity, and data analytics, these smart trolleys offer a seamless and enhanced shopping experience while also streamlining operations for retailers. For consumers, smart shopping trolleys provide real-time product information, personalized recommendations, and convenient checkout options, leading to increased satisfaction and loyalty. On the retailer side, IoT-enabled trolleys offer valuable insights into consumer behavior, preferences, and inventory management. This data can be leveraged to optimize store layouts, product placement, and marketing strategies, ultimately driving sales and improving operational efficiency. Moreover, the ability to track inventory levels in real-time helps prevent stockouts and reduce waste, leading to cost savings and improved profitability. Overall, the smart shopping trolley represents a promising application of IoT technology in the retail sector, revolutionizing the way we shop and enhancing the overall shopping experience for both consumers and retailers alike. As technology continues to evolve, we can expect further innovations in this space, driving even greater convenience, efficiency, and personalization in the retail environment.

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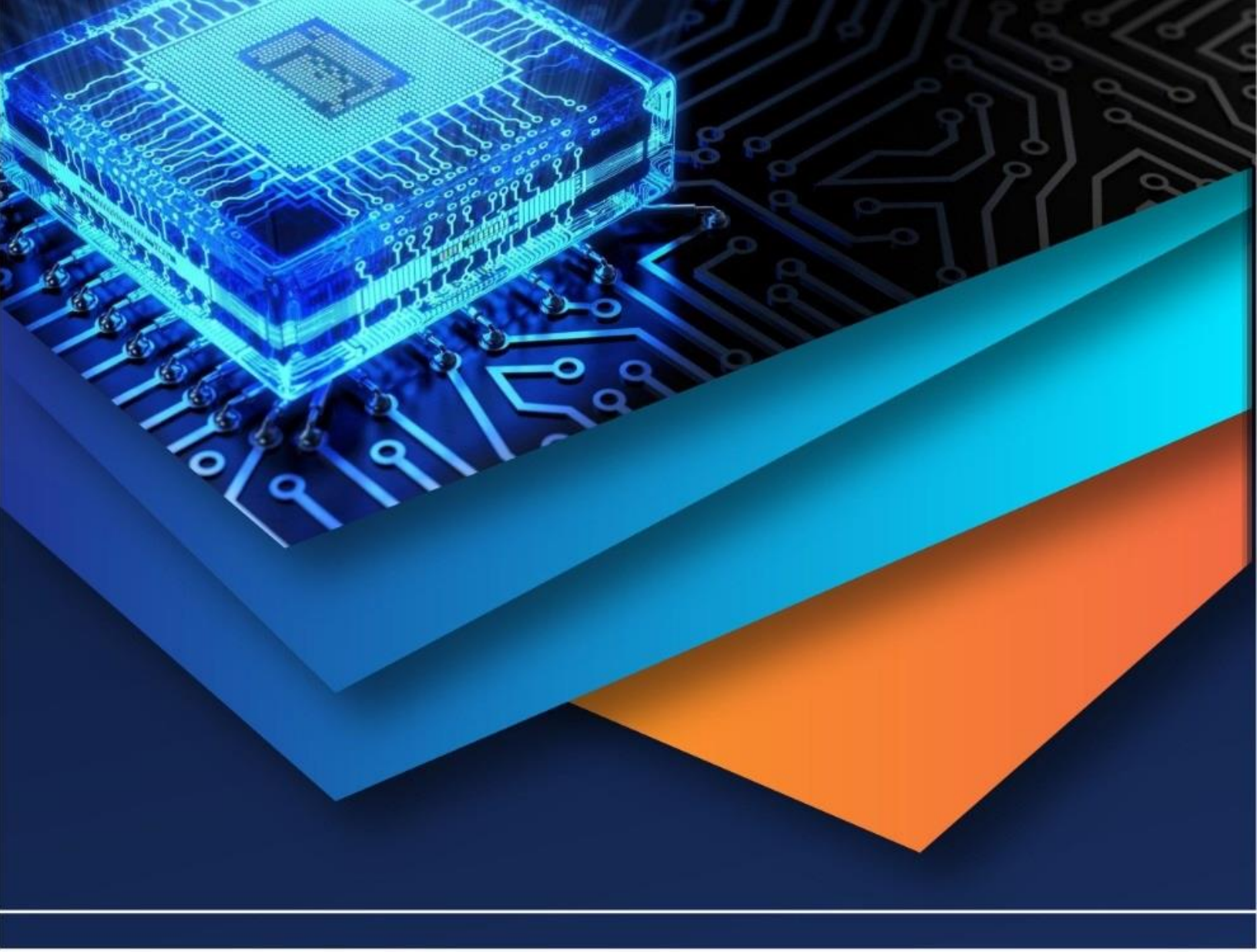
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