# Automatic Smart Trolley with Billing System

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## I. ABSTRACT

This survey paper purposes a real time implementation of the smart trolley using AI by different methods and technologies. The shopping system has many problems. There are huge numbers of customers andfew numbers of billing system-are in the retail stores. To handle the huge crowd, we must reduce the procees of the billing time. This is done using smart trolley based on AI and RFID. Items that are put in smart shopping cart are scanned using RFID. The aim is to reduce the time consumption needed for the billing system. 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.

**KEYWORDS:** Smart trolley, Arduino, ESP8266, RFID, Load cell, RFID Tag.

## II. INTRODUCTION

The Smart Trolley concept leverages Artificial Intelligence (AI) to enhance the shopping experience for customers and streamline operations for retailers. Here's a detailed explanation of how AI can be integrated into the SmartTrolley AI algorithms can be employed to automate the checkout process. As customers place items into the trolley, sensors and cameras within the trolley can identify and track each item. AI-powered image recognition algorithms can quickly identify products, determine their prices, and add them to the customer's virtual shopping cart by analysing past purchase history and current items in the trolley, AI can provide personalized product recommendations to customers. These recommendations can be displayed on the trolley's user interface screen, suggesting complementary items or promotions based on the customer's preferences and shopping habits.AI can help retailers better manage their inventory by monitoring stock levels in real-time. As items are scanned and purchased using the Smart Trolley,AI algorithms can update the inventory database, alerting store managers when stock levels are running low and automatically placing orders for replenishment. AI-powered pricing algorithms can adjust product prices in real-time based on various factors such as demand, time of day, and competitor pricing.

This dynamic pricing strategy can help maximize sales andprofitability for retailers while offering customers competitive prices. AI can be used to monitor the condition of the Smart Trolley's hardware components and identify potential maintenance issues before they occur. By analyzing sensor data and performance metrics, AI algorithms can predict when components are likely to fail and schedule maintenance proactively, minimizing downtime and ensuring a seamless shopping experience for customers. AI analytics can analyze data collected from

the Smart Trolley, such as purchase history, browsing behavior, and demographic information, to generate valuable insights into customer preferences and trends. Retailers can use these insights to optimize their marketing strategies, tailor promotions, and improve the overall shopping experience. The Smart Trolley can incorporate natural language processing (NLP) capabilities, allowing customers to interact with the trolley using voice commands or text input.

Customers can ask questions about products, request assistance, or provide feedback, enhancing the overall usability and accessibility of the Smart Trolley. By integrating AI into the Smart Trolley, retailers can create a more efficient, personalized, and engaging shoppingexperience for customers while optimizing their operations and driving revenue growth.

## III. LITERATURE SURVEY:

### 1. A Smart Trolley for Smart Shopping

[1] TapanKumar Das, Asis Tripathy, and Kathiravan Srinivasan proposed designing a smart trolley that can handle shopping and billing. According to their proposal, customers would be able to enter the shop, use the smart trolley to purchase products, and leave the shop without having to go through a traditional checkout process. They would receive an electronic bill via email and could view their purchase details on the shop's website. To implement this system, they identified the need for an Arduino board, Radio-Frequency Identification (RFID) reader and tags, LCD display, ESP8266 Wi-Fi module, database manager, and a website to manage product and customer information. This system would allow the administrator to access data from anywhere in the world Primary goal as developing a smart trolley to enhance the shopping experience by improving efficiency, reducing wait times, andproviding personalizedrecommendations. They conducted surveys and interviews to gather user requirements for the smart trolley, ensuring compatibility with different store layouts and products. They identified and selected hardware components, such as sensors, RFID tags, and display units, to be integrated into the smart trolley. They also considered security measures to protect user data during communication. RFID technology was implemented for automatic item tracking. They integrated RFID tags on products and RFID readers on the smart trolley. Algorithms were developed to identify items placed in the trolley and update the shopping list accordingly. They integrated mobile payment options, such as QR codes or NFC, for seamless and secure transactions. An automated checkout process was implemented to streamline payments.

### 2. Enhancing Shopping Experience with Raspberry Pi and Cloud-Integrated Wireless Sensor Networks for Smart Trolleys in IoT

[2] Rahul R, Saastha Sree Nandan P, Sai Prasath S, Yashwanth M S, and Raffik R identified the Overall, the team proposed addressing the flaws in the current billing system by developing an automatic smart trolley for supermarkets. This trolley saves customers' time and effort by reducing the time spent at the billing counter during their shopping. Based on the Node MCU (ESP8266) microcontroller and RFID tags, this project scans products, displaying them on an OLED screen, allowing customers to keep track of total items and cost, ultimately enhancing the shopping experience and saving time.They suggested conducting surveys and interviews to gather user requirements for the automated smart trolley system. They also recommended collaborating with store owners to understand integration requirements with existing point-of-sale (POS) systems.They proposed selecting RFID readers and tags suitable for the smart trolley system, determining the RFID frequency based on application requirements.**:** The team suggested designing the software architecture to handle RFID data, communicate with the store's POS system, and manage user interactions. They emphasized including features like item tracking, a user interface, and integration with automated checkout. They recommended implementing a pilot version of the automated smart trolley system in a limited section of the store to address any identified issues or enhancements

needed for full deployment. The team proposed promptly addressing any issues to ensure a smooth shopping experience. They also suggested providing customer support for users encountering problems with the automated smart trolley.

3. **Automated Smart Trolley System using RFID Technology**

It was suggested to define the project scope, considering features like automatic item tracking, user engagement through IoT, and seamless checkout processes. They also emphasized budget limitations, technology compatibility, and regulatory considerations.The team proposedidentifying key features desired by users for a convenient and connected shopping experience, while also considering factors like durability, energy efficiency, and ease of maintenance.They recommended including features such as a shopping list, product information, and personalized recommendations, along with developing algorithms to identify items placed in the trolley and update the shopping list in real-time. They stressed ensuring user data privacy and compliance with regulations.The team suggested ensuring compatibility with popular mobile payment apps and rolling out the IoT-based smart shopping trolley system across the entire store or selected stores, along with developing a helpdesk or online support platform. They proposed generating regular reports on the performance of the IoT-based smart shopping trolley system to identify areas for improvement and future enhancements

## IV. EXISTING SYSTEM

The existing model is explained flowchart, and different major steps are also provided. The developed flowchart is shown in Fig. 2. The algorithm and associated working of the proposed model can be easily explained with the help of given flowchart. In earlier report [6-8], although RFID was employed, however, rest of the associated billing issues were not addressed. Additionally, earlier models employed camera in the cart to facilitate enhance user experience, but, at the cost of complexity. Here, the proposed model utilizes application of RFID reader for product identification and the model coupled with Shopping is both a regular and a tedious process, especially in a supermarket. Though the internet has revolutionized the way of retail shopping, online shopping does not look to fully replace the brick-and-mortar stores. However, large crowd during peak hours and on public holidays generally led to longer billing time in the retail stores makes customers impatient, and also affects overall shopping experience. Here, the present work presents a novel and smart design of shopping trolley using RFID technology and Arduino which facilitates shoppers to scan the products on their own. Furthermore, the proposed system also provides a web interface for generating the bill and provide an automated payment interface for the customer. Subsequently, the proposed model is expected to ease off queue pressure at billing counters, and offers enhanced shopping experience to the customers. The same has been realized with the help of module ESP8266, which provides microcontrollers connection to 2.4 GHz Wi-Fi. The results show reduced billing time and enhanced customer experience. Additionally, fixed-cost per store is reduced that allows for further leveraging of existing resources and possible expansion of stores smart controller takes care of other check-out related formalities.

## V. PROPOSED SYSTEM

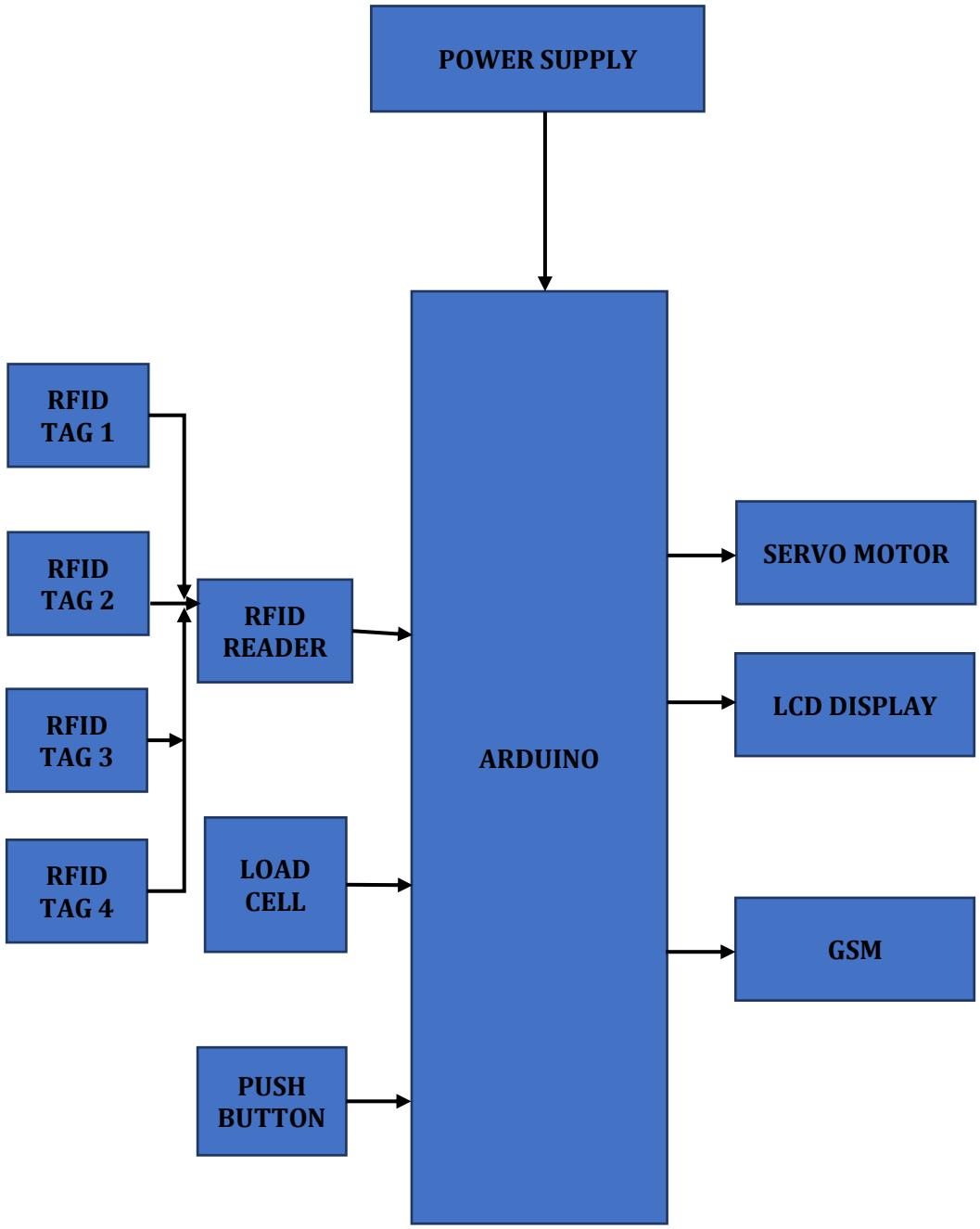
Shopping is really fascinating and alluring; at the same time, it involves getting tired due to standing in a long queue for the bill and payment process. Hence, it is proposed to design a smart trolley which can take care of shopping and billing. By this, the customer can walk straightaway into the 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.The proposed system we used a arduino ,transformer, RFID reader, RFID tag, LCD, servo motor, push button, load cell. This Electronic Product Code provides the information about the product i.e. its name and price.

When the customer puts the product in the Smart Trolley,the Radio Frequency ID reader scans the tag for the Product number and automatically bill generated. The load cell is used for the calculated the weight of the products and push button is used for needed weight (KGS) in the products.The name and price of the product obtained by the controller gets displayed on the LCD of the Smart Trolley, where client can see the item data.

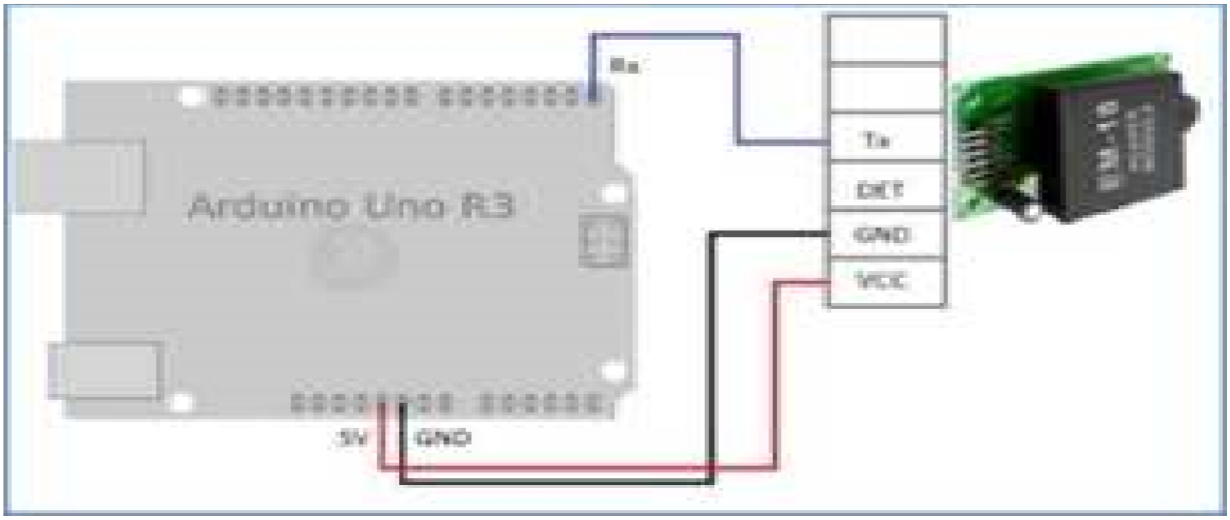
LCD is interfaced with microcontroller in 4bit mode. It is used to indicate the purchaser, the action taken by the purchaser that is inserting of an item, removal of an item, item’s price and total billing cost of items in the trolley.is used to indicate the purchaser, the action taken by the purchaser that is inserting of an item, removal of an item, item’s price and total billing cost of
items in the trolley. At the billing Counter, the total bill data will be transferred to Mobile through GSM module.

**Figure 1.1: Block diagram of Proposed System**



## VI. CONNECTING ARDUINO AND LCD

To connect the LCD display screen to the proposed automated trolley, it is recommended to soldier a header pin to pin number 14 or 16, as shown in Fig. 3. Some of the important connections are made as LCD LED, LCD R/W pin, LCD VSS pin to GND. LCD VCC is connected to + 5 V power supply. Furthermore, a 10 K variable resistance is connected between + 5 V and GND, and its variable arm is connected to pin 3 of the LCD display




The EM-18 Module is great because it is similar to the ID12 and ID-20 modules, and can also fit directly onto the breadboard without an adapter board! The process to generate the Arduino code is as follows. It downloads the library and opens a sample code, then the baud rate will be modified as per the module with 9600 as a default value. The connection to the module are made as per the wiring diagram. The sketch is loaded onto the Arduino. Finally serial communicator in the Arduino is launched using 57600 as the baud rate.

## VII. PIN CONNECTIONS FOR ESP8266 AND LED

Reader and the product details is displayed on LCD along with the price of the product. In case of adding the new items to the trolley or removing the already existed items in trolley, relative price adjustments are done instantly. The same is readily available to the customer for their reference. Because of adding a weight sensor, one can compare whether the sum of pre-determined weights is equal to the practical sum of the weights. If it is not then there is some error/mistake which indicates some extra products are present. When '#' is pressed in the keypad the shopping will end, one cannot add any further products. Then, In the web interface itself one can add the payment option through which customer can automatically pay the bill using UPI like apps. Finally, during the checkout, the total bill amount will be displayed. With the help of ESP8266 attached to cart, customer will be able to access the web interface where he can get billing and payment details. Here, 'Paytm' UPI link is added and also enabled QR scan feature to make payments easy.

## VIII. CONCLUSION

The Smart Trolley was designed to serve as a mobile tone- checkout system furnishing druggies the inflexibility to make deals from it within the retail store. It's designed to be largely effective and completely synchronised with the retailer's current system. The double diamond standard was used in the product idealisation phase which guided the platoon to choose the Smart Trolley idea among numerous other ideas presented by the platoon. By using the algorithm, it can identify the request eventuality of the Smart Trolley and the problematic areas, so that it can be presented with a successful business plan. A detailed request description and competitive analysis of the product request and its attributes were presented in this report. The target request linked was the big retailers; still consumers are the direct heirs. product will be veritably much appreciated by the public because of its unique features similar as the mobile tone- checkout and easy product hunt within the store. From the feedback responses attained from both the Functional Assessment and Strategic Assessment phases, the Smart Trolley will gain a veritably good request. This will attract mates and backing once the product is available in the request. For these reasons the product must be defended fairly. Security and legal protection must be given high consideration for this product; still, this isn't necessary at this moment because there's only donation of ideas and business plan with no prototype developed yet.

## IX. FUTURE SCOPE

In this paper, with the above discussed surveys in future we can proposed system likeThe shopping trolley has to be implemented by the products puts into the trolley the RFID is scanning the products and display the price and quantity. These are all displayed using LCD. Once the scanning process could be done then the products were moves to the next process of smart trolley. Thus, the strorage part can automatically open while the scanning process could be done.

## X. REFERENCE

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