A Novel Framework for Home Based Grocery Replenishment Scheduling System Using Internet of Things

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Abstract

As there is tremendous growth in human life, social behavior and working culture of people there is no proper time to spend for maintaining the grocery at their homes. Even though there are so many innovations in home based automation systems but in the grocery stock maintaining in the home is becoming challenge for many of the people in their day-to-day life. The Internet of Thing (IoT) meets our needs at the right moment with the exact details, product or service we need. The rules are implemented in an automated way via a replenishment scheduling system that accumulates all the rules over time. This process is very efficient for maintaining grocery at our homes effectively. Visually disabled adults and older peoples are a rising part of our society. Social systems are still not often built with this category in mind, which makes it important to build improved online connectivity mechanisms to meet their everyday needs. The visually disabled community has been rendered more autonomous by technical changes. In recent years the processing and on-sensing capacities of mobile cloud systems have grown exponentially, rendering them an excellent candidate for the creation of efficient, varied applications.

Keywords: IoT, Grocery Replenishment scheduling System, Cloud Computing

1. Introduction

The Internet of Things (IoT), which is appropriate to the global population of people, has no clear meaning available. In fact, there are numerous teams of scholars, professionals, innovators, educators, developers and business people who described the concept, but Kevin Ashton, a specialist in digital engineering has been attributed its initial usage. The most important definition of IoT is “An open and comprehensive network of intelligent objects that have the capacity to auto-organize, share information, data, and resources, reacting and acting in face of situations and changes in the environment”[6]. Nowadays, the foodstuffs or items can be fitted with computer power and different communication capabilities that enable us to monitor artifacts from anywhere in the world. This breakthrough has introduced a revolution in manufacturing, financial and environmental processes, creating significant challenges in computing, wireless connectivity, and decision-making in real time [9]. As the IoT continues to expand, there are many opportunities and unique ways that retailers can integrate online interactions with in-store experiences. For starters, retailers can better understand shopping behavior within the store. There are various applications in mobiles to assist persons with visual impairment like in reading text, moving around in the home or remote places too, identifying the groceries which are there at their home. i.e where the blind people can hear the voice output for navigating through the menu’s or options in the mobile with the help of grocery replenishment system notifications. The present simulation of the approach is focused on multi-agent process preparation techniques. Agents who can define each IoT entity in an environment where there is a critical circumstance [1]. For many years ago, we have IoT-based smart home applications that are used for several approaches. Regardless of their category and their recommendations, current research articles focus on the challenges which prohibit the maximum usage of smart home IoT applications. Innovative frameworks like IoT and cloud are available for several resources like computing systems, sensors, etc. which are more and more intelligent systems able to face any complex situations [2]. A secure smart shopping technique which is utilized with Radio Frequency Identification (RFID) technology. It is used to enhance the shopping experiences and implement different security measures in the context of a smart shopping system [3]. The main goal of RFID implementations is to ensure correct artifacts do correct tasks during the network movement at the right times and in the right positions [10]. There is a
major crowd in the shopping malls during the sales as consumers invest a lot of time on the billing counter. The IoT based trolley which is used for shopping by the customers in order to achieve automatic billing. And that is useful for monetary and efficient purchasing [4]. Frugal Labs IoT Project (FLIP) uses Smart Home to create IoT powered Smart Home for different items like electricity, home appliances, laptops, surveillance camera, etc. In the Smart Home environment. All are linked to the internet and enable users to track and manage items regardless of their time and place [5]. The cloud and IoT platforms provide a broad variety of solutions for a network where all data collection and transmission take place beyond the user device. In the end, IoT and cloud computing's protection issues were tackled by utilizing two encryption algorithms i.e. AES and RSA encryption algorithms which were used to further combine IoT and cloud computing [7]. A robust IoT smart home automation device uses the revolutionary Triangle Based Security Algorithm (TBSA) that uses an effective key-generation process and very low power Wi-Fi in wireless sensor networks to provide energy efficient data protection [8]. The Message Authentication Codes (MAC) improve and include a lightweight, energy-efficient and secure contact mechanism for smart house systems with the device community, sensor community, main controller and user interface. Whereas, main management is now simpler, and the need for memory is therefore minimized [11]. In order to have evidence of the principle, applications should store vast amounts of data from different kinds of IoT sensors and topologies on a software-defined framework for Internet of Things (SDIoT), [12]. Development of an advanced, scalable IoT system utilizing multiple Unmanned Aerial Vehicle (UAV) and train networks that support the local fog servers with 5 G capabilities [13]. The different techniques and the usage of IoT in smart home automation system with some focusing on the data generated and few of the researchers working on the privacy preserving for the different IoT devices, based on these different parameters we can implement the novel framework for Grocery replenishment scheduling system with high accuracy and efficiency in the performance with at most measure taken in the security of the data.

This article has been organized accordingly. Part I discusses IoT and its connected home applications. In Section II, Problem Identification is explained. In Section III, the proposed framework with grocery replenishment system is described. In Section IV, the conclusion of this paper is presented.

2. Problem Identification

Nowadays, use of supermarkets are growing exponentially for the purchasing of products by the people. People purchase products and place them in their wagon. Upon shopping they head to the billing desk but because there are other people in line for billing purposes, Therefore, owing to existing bar code technologies, time is spent for billing the goods. This same process is continued for every time they visit to purchase any single grocery item and its also very tough to track the groceries which are about to finish at our home because we come to know once the particular item is bean used while cooking process.

3. Proposed System

In this proposed Grocery Replenishment Scheduling System, all the groceries are placed in the smart rack which is installed with a sensor, database and user webApp so that we can be able to track the different groceries present at home and if there are any items which are running out of stock, based on the threshold set for the items the notification is sent to the registered user and then the user can place an order through online and can easily get the products to their home without spending a lot of time in shopping malls.

A Grocery Replenishment Scheduling System intuitively brings the following benefits:

1) Stuff put in intelligent racks (with readability of the sensor) can be read automatically and their status changed in the database.
2) The smart racks that are equipped with sensors read corresponding stocked items and send item status updates to the database.
3) When items weights become less than the threshold (For example, let say some grocery item with name chana dal <= 250 grams) then the notification is given to the user in order to restock.
4) The various individuals and mainly elderly and physical impaired individuals will easily monitor their inventory, as all items can be interpreted and logged automatically.

The flow chart of the novel proposed grocery replenishment scheduling system is shown in Figure-1, which consists of user registration unit and grocery initialization and management unit and user notification unit.
Figure-1: Flow chart of Grocery Replenishment Scheduling System.

The fundamental guiding theory of IoT is the capacity to make choices dependent on the weight of usable foodstuffs. In order to make the correct choice in figure-2, the program must include a specialized range of resources to process obtained data.
A smart grocery replenishment scheduling system equipped with smart rack with sensors which is used for tracking the different groceries present in the rack and the scheduling for the replenishment of the grocery are run on the server on daily basis in order to verify the status of the grocery is shown in figure 3. If any item is running out of the given threshold value the system is going to notify the registered user for restoring the items into the specific rack.

This smart way of notifying the groceries which are running out of stock at the home will definitely reduce the overhead of missing any specific item and it also help us with inventory management. For this we can take sensors for each and every item in the rack and reader placed in the smart rack. When we place any specific grocery item in the smart rack with sensor reader reads according to item and its weight and then data send to the server. The main objective of this paper is to make the IoT
based development of smart grocery replenishment scheduling system in an electronic accessibility way in order to fulfill our daily needs.

Conclusion

The IoT based smart rack which is used for maintaining and tracking the groceries at our home, it is also used to send the notification to the user before the specific item is running out of stock. This creative and innovative model is a major shift to the consumer experience of consumers over the coming years. The integrated tools would undoubtedly allow smooth use of consumer knowledge to assist retailers and have higher connections and boost quality and increase revenue based on customer experience. The future scope of this will be a replenishment scheduling system equipped to the refrigerator in order to track vegetables, beverages, milk and fruits present at our home.

References