FORM 2

THE PATENTS ACT, 1970 (39 of 1970)

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THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

1. TITLE OF THE INVENTION

A System & Method for Inventory Control & Management System based on RFID, IoT & AI

2. APPLICANT(S)

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3. PREAMBLE TO DESCRIPTION

COMPLETE SPECIFICATION - The following specification particularly describes the invention and how it is to be performed.

A System & Method for Inventory Control & Management System based on RFID, IoT & AI

The technical field of invention:

The present invention is related to the RFID, sensor systems, and artificial intelligence algorithms for tracking store (inventory) items placed in storage space**.**

Background:

Inventory management has been essential for running a business smoothly. Traditional inventory management methods are often incapable of tracking inventory between outbound and inbound logistics operations and sometimes even within a single warehouse. This can lead to higher logistics costs, backorders and stockouts, inaccuracies, and lower customer satisfaction levels.

It is managing imports/exports as well as the flow of a considerable number of products. With the growing size of inventory, managing and controlling inventory effectively becomes a critical aspect for any business. Managing and taking into account thousands of products every day can easily be a tough task without implementing a proper and dedicated system.

To tackle this problem, businesses implement various calculations and techniques according to their needs which include cycle counts, inventory valuation, ABC analysis, par levels, contingency planning,

KPI analysis and numerous other techniques. Some of the prior work is listed herewith:

Prior Art:

U.S.7517/104610: discloses a robotic system that visually identifies products placed on the shelf of a retail store to track the inventory stock. However, such a robotic system can fail to track shelves located at heights that the robotics system is unable to reach. Such a robotic system can track products stored only in limited places that the robotic system can reach without human assistance. Such robotic systems can also interfere with humans working in the same area imposing a hindrance to their regular workflow. Further, such a system can only track one location at a time and will fail to provide data acquired by continuous tracking of any particular section at any instance.

U.S.15633467: disclosed a similar system incorporating movable but with multiple cameras mounted to observe the shelves. As with Bogolea et al. reference, such a system can track shelves which are placed only in limited places where the movable base can reach without human assistance.

U.S.16256904: discloses a system that uses deep learning to track inventory in real-time. Fisher's reference detects item take/put event by observing the hand movement of the customer picking items from the shelf. The system then detects the shelf closest to the customer's hand and the inventory data structure is updated accordingly by observing the shelf with a planogram. The item location is then

compared with planogram item data and if a mismatch is found, a notification is sent to the employees of the respective store. However, an inventory tracking device made by this reference is associated with several drawbacks. One problem with this approach is that this reference can easily result in false alarms if the customer makes hand gestures similar to that of picking items but doing so for some other purpose. The system will then update the inventory data structure according to the false hand gesture made by the customer, the inventory data structure is then compared with the planogram data structure and since the customer didn't pick or place the item on the shelf, a false alarm will be sent to employee due to data mismatch.

U.S.16195016: discloses an image-based item counting system. The system disclosed in Ren et al. reference incorporates cameras mounted on the roof which receive images of item stacks placed on shelves of retail stores, the program incorporated in the referenced system then identifies features and position of items in the images to finally get a total count of the items placed in that particular section of the shelf.

However, a major problem with this approach is that the system relies just on the images to get a count of the products placed on shelves, feature recognition of different products with different shapes can be computationally expensive. Plus, the system can

produce a miscalculated count of products in case the system fails to extract features due to some irregular shaped products.

Further such a system can fail to detect the proper count of items placed far behind on the shelves if the inner part of the shelves is deep enough to be escaped from the field of view of the cameras.

Groupings of alternative elements or embodiments of the invention disclosed herein are not to be construed as limitations.

Each group member can be referred to and claimed individually or in any combination with other members of the group or other elements found herein. One or more members of a group can be included in, or deleted from, a group for reasons of convenience and/or patentability.

When any such inclusion or deletion occurs, the specification is herein deemed to contain the group as modified thus fulfilling the written description of all Markush groups used in the appended claims.

As used in the description herein and throughout the claims that follow, the meaning of “a,” “an,” and “the” includes plural reference unless the context dictates otherwise. Also, as used in the description herein, the meaning of “in” includes “in” and “on” unless the context dictates otherwise.

The recitation of ranges of values herein is merely intended to serve as a shorthand method of referring individually to each separate value falling within the range.

Unless otherwise indicated herein, each value is incorporated into the specification as if it were individually recited herein.

All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context.

The use of any examples, or exemplary language (e.g., "such as") provided concerning certain embodiments herein is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention otherwise claimed.

No language in the specification should be construed as indicating any non-claimed element essential to the practice of the invention.

The above information disclosed in this Background section is only for enhancement of understanding of the background of the invention and therefore it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

The objective of the invention

The primary object of the present invention is the methodology for inventory management through the implementation of artificial intelligence and machine learning.

Summary of the invention:

Accordingly, the following invention is the methodology for inventory management through the implementation of artificial intelligence and machine learning.

According to an embodiment, this demonstrates an arrangement of the present system incorporating a connection between shelves with an inventory level indicator, inventory tracking engine, inventory management engine, user interface all connected through a cloud network.

Brief description of drawings

Further clarify various aspects of some example embodiments of the present invention, a more particular description of the invention will be rendered by reference to specific embodiments thereof which are illustrated in the appended drawings.

It is appreciated that these drawings depict only illustrated embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail through the use of the accompanying drawings.

So that the advantages of the present invention will be easily understood, a detailed description of the invention is discussed below in conjunction with the appended drawings, which, however, should not be considered to limit the scope of the invention to the accompanying drawings, in which: Figure 1 shows a block diagram representation of the system of methodology for inventory management through the implementation of artificial intelligence and machine learning according to the present invention.

A detailed description of the invention:

The following description includes the preferred best mode of one embodiment of the present invention.

It will be clear from this description of the invention that the invention is not limited to these illustrated embodiments but that the invention also includes a variety of modifications and embodiments thereto.

Therefore, the present description should be seen as illustrative and not limiting.

While the invention is susceptible to various modifications and alternative constructions, it should be understood, that there is no intention to limit the invention to the specific form disclosed, but, on the contrary, the invention is to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention as defined in the claims.

This invention relates to a methodology for inventory management through the implementation of artificial intelligence and machine learning. According to an embodiment, this demonstrates an arrangement of the present system incorporating a connection between shelves with inventory level indicator, inventory tracking engine, inventory management engine, user interface all connected through a cloud network.

In any embodiment described herein, the open-ended terms "comprising," "comprises,” and the like (which are synonymous with

"including," "having" and "characterized by") may be replaced by the respective partially closed phrases "consisting essentially of," consists essentially of," and the like or the respective closed phrases "consisting of," "consists of, the like. This invention analyses methodology for inventory management through the implementation of artificial intelligence and machine learning. The complete inventory management system has been described in Fig.1. This demonstrates an arrangement of the present system incorporating a connection between shelves with an inventory level indicator, inventory tracking engine, inventory management engine, user interface all connected through a cloud network. The network may represent any form of communication confirmation that allows incorporated components to exchange information in real-time. Shelf with inventory level indicator is directly linked to inventory tracking engine. The inventory tracking engine is directly exchanged information with the cloud network. However, an item is constantly tracked the by shelf with an inventory level indicator with the help of sensors and the respective information about the shelf is then exchanged with the inventory tracking engine. Every few seconds, the item counter apparatus determines the number of items placed on a shelf. If a change in item count is detected, a data log is created by the item counter apparatus which is sent to the Inventory tracking engine connected to the shelf with an inventory level indicator. The inventory tracking engine

identifies the shelf where the data has been created and stores that data in storage. New data is appended constantly whenever the inventory changes. This data is constantly read by the inventory management and analysis engine. The inventory analysis engine also determines the status of each shelf. If a shelf is under or overstocked, a signal is sent to the inventory level indicator. The inventory level indicator then interprets the received data and updates the status of self-displayed on the user interface display accordingly. Further, the inventory analysis engine also keeps track of routes followed by by-products in the inventory by comparing the number of products on different shelves which store the same kind of products. For instance, if a product is scheduled to move from shelf „P“ to shelf „Q“, then shelf „P“ and shelf „Q“, but the same product details. These two shelves will be constantly tracked by the item counter apparatus and the data will be constantly observed the by inventory management and analysis engine. For the product route following shelf „P“ to „Q“, the total number of productions in shelf „P“ and „Q“ must be the same, for instance, if shelf „P“ and „Q“ hold a and b number of products respectively, then a Total number of products in shelf „P“ and „Q“ = a + b If x number of products are transferred from shelf „P“ to „Q“ then, the total number of products in shelf „P“ = a – x the and a total number of products in shelf „Q“ = b + x This implies that after transferring products from shelf „P“ to shelf „Q“, the total

number of products remain same. In this manner, the route of products can be tracked and in case, and if the total number of products before transfer and after transfer doesn't match, lost products or an unauthorized dispatch can be detected by the inventory analysis module. Similarly, if x number of products are reduced from shelf „P" and the same number of products are increased in shelf „Q", the inventory management module can automatically comprehend this as a transfer of products from shelf „P" to shelf „Q". An inventory management user interface (UI) has also been incorporated to constantly keep track of inventory using mobile or desktop devices. Additional advantages and modifications will readily occur to those skilled in the art. Therefore, the invention in its broader aspect is not limited to specific details and representative embodiments shown and described herein. Accordingly, various modifications may be made without departing from the spirit or scope of the general inventive concept as defined by the appended claims and their equivalents. While the invention has been described and illustrated concerning certain particular embodiments thereof, those skilled in the art will appreciate that various adaptations, changes, modifications, substitutions, deletions, or additions of procedures and protocols may be made without departing from the spirit and scope of the invention.

Claims

We Claim:

1. Technical advancement in the existing inventory management methodology through present embodiment; System & Method for Inventory Control & Management System based on RFID, IoT & AI.

2. The system of claim 1 comprising of the followings:

- ❖ RFID tags & readers along with Sensors based on IoT
- ❖ ML & AI Algorithm
- ❖ Microcontroller for circuit operations
- ❖ Security protocols

3. The system of claim 4; can be successfully implemented in the following areas;

- ❖ Medical shops
- ❖ Libraries
- ❖ General stores
- ❖ Groceries
- ❖ Hypermarkets
- ❖ Cattle management
- ❖ Shoes & personal belongings management system at public gatherings

4. The system of claim 1; is an automatic inventory management system that can run without human intervention and can detect the fault as & when accrued.

5. The system of claim 1; demonstrates an arrangement of the present system incorporating a connection between shelves with an inventory level indicator, inventory tracking engine, inventory management engine, and user interface all connected through a cloud network.

Abstract

The present disclosure describes a system for tracking store items placed in storage space. With the growing size of inventory, managing and controlling inventory effectively becomes a critical aspect for any business. Managing and taking into account thousands of products every day can easily be a tough task without implementing a proper and dedicated system. This intelligent inventory management system and method, realize the accurate monitoring of inventory at an arbitrary position in go-downs & stores to improve the efficiency of stock retrieval and to monitor stock in a storeroom on a real-time basis. The system includes wireless RFID readers and IoT sensors. RFID is distributed within the storage space in such a manner that at least one store item, having an RFID tag attached, is within an interrogation range of at least one of the wireless RFID readers. The system further includes IoT and AI-based monitoring system, that is used to monitor the stored & stocked items in such a manner that the database is maintained in the stores about inventory robustly so that if there is any possibility of the missing article that can be detectable on a real-time basis without much difficulty. Inventory management has been essential for running a business smoothly.

Drawings

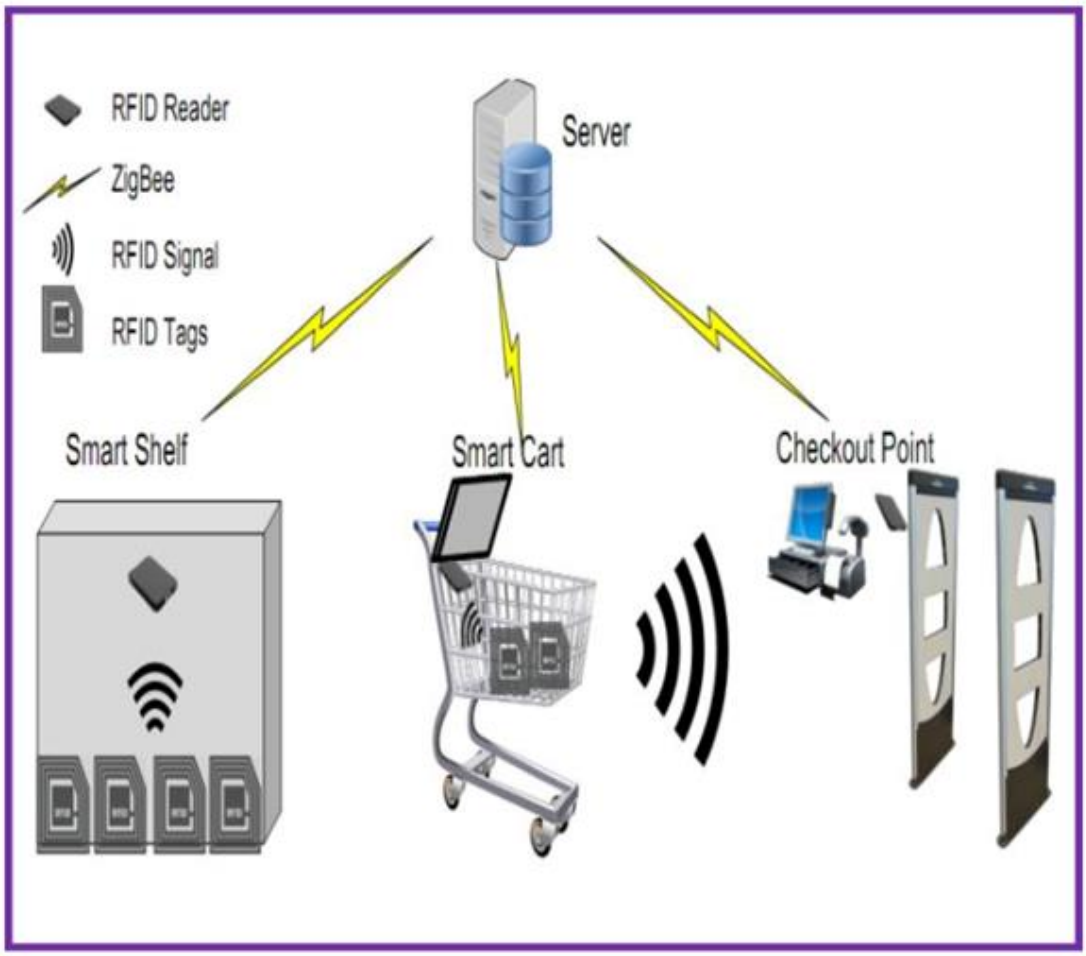

Figure 1

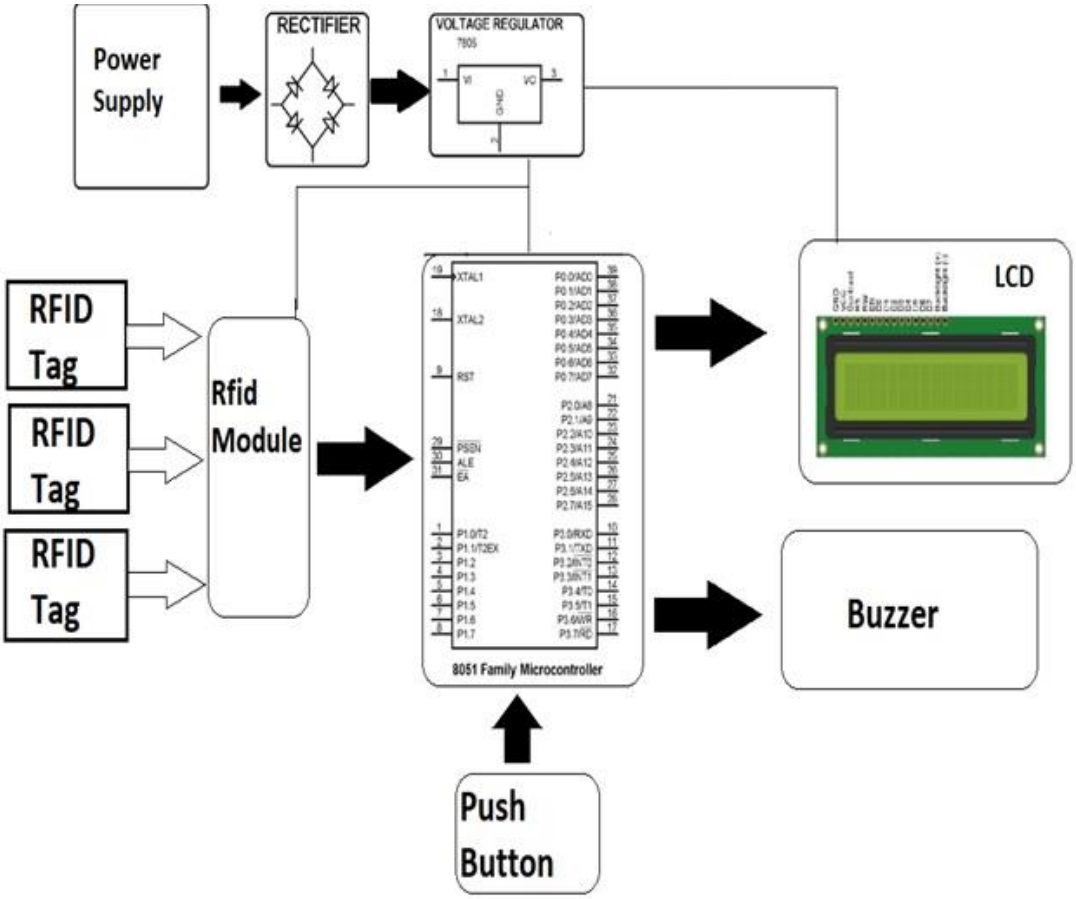

Figure 2

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