Design And Development Of An Application For Database Maintenance In Inventory Management System Using Tkinter And Sqlite Platform

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Design And Development Of An Application For Database Maintenance In Inventory Management System Using Tkinter And Sqlite Platform

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Abstract: The challenges in classical way of inventory log are human mathematical ability, paper maintenance, untidy process of editing and chances of missing the data of invoice and outward. The proposed idea is to develop an inventory management application using Tkinter and SQLite platform that creates a way towards progressively from traditional applications to a fully connected and customized inventory management system. This application uses password encryption to ensure the data privacy between the administrators and other workers of the industry. The system utilizes the integration of Tkinter and SQLite for the effective Graphical User Interface interfaced with Relational Database Management System. This customized application enables the administrator to add a new employee or remove the existing employee, he can update the stock quantity, and can back up the invoice history. Due to the login feature, the details of the product outward such as who withdrew and when it was withdrawn are automatically stored in the database. This digitization of inventory management system increases flexibility, reliability, smart storage, resource utilization, easy access to product location and warehouse management. It would be one time investment no further investment needed if at all any problem or errors occur in the app by human mishandling. The application saves us a lot of time because it uses SQL in it which is structured language, the data can be retrieved soon without any time delay and the human errors are avoided due to its structured nature.

Keyword**:** Internet of things, Cloud computing, Cyber-physical systems, Structured Query Language (SQL)

Introduction

Warehouse management is the act of organising and controlling everything within your warehouse and making sure it all runs in the most optimal way possible. As one of the essential things in Industry 4.0, the smart factory utilizes the recent advanced technology such as Internet of things (IoT), Cloud computing, Cyber-physical systems and automated machines to real-time monitor of physical process, information storage, visualization through virtual system and optimal decision making to improve the production and quality. When it comes to a product manufacturing unit, the process should also deals with effective product part management in the warehouse with progressive view towards present and future demands.

In the smart factory, the resources should be effectively managed with the help of software based tools. Warehouse management systems support warehouse staff in performing all the processes required to handle all of the major and minor warehouse tasks such as receiving, inspection and acceptance, put-away, internal replenishment to picking positions, packing, and value added services, order assembly on the shipping dock, documentation and shipping.

A warehouse management system also helps in directing and validating each step such as capturing and recording all inventory movement and status changes to the data file. With the help of our python based Inventory system, we can effectively manage all the warehouse related tasks such as resource tracking, stock control, purchase order-log maintenance, admin-user specified task based commands most of all the manual inventory maintenance problems such as inaccuracy of data, protection of data books(inventory details) can be tackled out.

1.0 Literature Review

Aaditya Tirodkar, Amogh Singh, Nida Parkar and Vimal Negi stated that the inventory management application is a real-time relational database capable of dealing with huge warehouse of an industry. The application could be applied for the tracking of the inventory of a warehouse, or to control the distribution of inventory among several warehouse of a huge firm. Anyhow, the application restocks datum and enables warning message of below par inventory at any area at an accurate c programming language. The objective is to minimize the stress of monitoring preferred to address all shop upkeep. The inventory management application is completely computer based system developed on Python period on Tkinter GUI using Python shell. WAMPserver is a software of windows operating system mainly based on installation and configuratuion of structured query language database server, scripting language, php MyAdmin and SQLite.

The ultimate objective of the work is to broaden inventory control system software code in which every information realted to the the inventory of the employee can be recieved. This computer application is mainly based at the management of inventory of a user. The software consists of modern organisation profile, inward data, purchase data and the existing stock that are supplied within the industry.

Nasuha Lee Abdullah, Ooi Chun Wei and Rosnah Idrus proposed that across several industries including manufacturing industries, poor inventory management causes big issues. The problems may include product delivery delay and/or shortages, inventory overstock and/or stock-out, tied up cash flow, and other issues that risk the profitability of the firm. A sample named company which deals with wide range of product from handheld products such as multi-meter and thermal imager, RF measurement products such as power meter and power sensor, power supply, oscilloscope, spectrum analyzer, network analyzer, etc., which provide a total solution to wireless communication for aerospace, defense and

semiconductor market. In that company in order to handle each department a separate ERP has set up which takes care of The ERP is used mainly for supply chain management, finance, accounting, and asset management.

Lingyun Wei and Xueqing Yu proposed that the stock administration device is a real time stock database management system equipped for managing huge inventories of a company. The ultimate goal is to broaden the existing stock management system with a software in which all the facts concerning the inventory management is carried out. This software is clearly made to progress towards material management in the inventory. The aim is to reduce the strain of monitoring rather than to address all shop upkeep. The product Inventory control system is a standalone application designed using Tkinter which is a python's open source GUI (graphical User Interface) platform. All the data are processed and maintained using a private SQLite server. The application contains all the modern day inventory control features for product In-Out, Income information and also alerts when there is stock less than safer levels. Each new stock is uploaded to the software with the product's details such as supplier, price, stock entry date and time. Being a web-based app the login page is created in a way to manage and prevent the inventory from misuse and threads.

So there is a need for an inventory which handles large quantities of items which is complex to manage. In order to manage inventory, the company must predict the quantity of input foods at a previous time. Studies shows that data mining using sequential patter analysis is an effective approach to identify repeated pattern of input foods purchased. However the sequential pattern analysis should be involved in food based processing industries.

1.1 Problem Statement

The advanced development of automation provides automatic control of every process in a smart factory. The challenges in smart manufacturing system are lack of development in inventory since it is maintained manually through a logbook. In order to abide with a smart factory setup the inventory system should also be improved accordingly. The top level management cannot visually monitor the material available at the instant of time.

In the existing system the usage of mySQL heavily affects the processing speed of the process as it requires additional server for connection establishment with the database. The amount of memory required for processing is very large.

1.2 Proposed System

The proposed system is to create an app layout using python and User Interface development using Tkinter and to acquire real time physical information on the inventory materials, data processing and database management for prediction of future supply needs. It should be followed by the Interfacing Raspberry pi, setting up the working environment on Raspberry Pi. In order to improve the inventory, our proposed system suits well in all aspects for every level of the management to tackle out the problems till date.

2.0 Methodology

The python shell and SQLite are needed to be installed to the microcontroller. Once the installation process is completed, SQLite is needed to be interfaced with the python using the structured query language. The interfacing should be followed by the tkinter libraries should be accessed using python functions.

The beginning step of the project is to create a graphical user interface using the appropriate tkinter functions. In this project tkinter serves as the front end application. After the front end is completely developed, the back end process should be intiated. The queries in SQLlite should be used as per the requirement with the help of structured query language and python

2.1 Hardware Requirements

- Raspberry pi 3
- Power cable with adaptor
- Monitor

2.1.1 Raspberry pi

Figure 1. Raspberry pi

The raspberry Pi is a low cost computer that can easily suits with all generalized plug and play devices such as mouse, keyboard, HMI port etc. It is a capable device that can be programmed with the trending high level languages like python and R programming. It is capable of doing almost all the works that can be done with a computer.

2.1.2 Power Cable with Adaptor

Cables with adaptor are required for the powering up of the microcontroller, which operates at the voltage of 5v.

2.1.3 Monitor

In order to view the output of the controller a displaying device is needed. So a display monitor is connected to the HDMI port of the raspberry pi. Also to make the user friendly interface it is needed.

2.2 Software Requirements:

- SQLite
- Python Shell

2.2.1 SQLite

SQLite is a Simple, intuitive and fast software for simple implementing relational database management system. As always SQLite is an open source application and you could download it on SQLite web site for free. Unlike MySQL it doesn't require any addition sever connection to run. The latest version of SQLite is SQLite3.It almost requires no additional configurations as in other structured query languages as every configuration are already done in the system by default.

2.2.2 Python Shell

PowerShell is a task-based command-line shell and scripting language built on .NET. PowerShell helps system administrators and power-users rapidly automate tasks that manage operating systems (Linux, macOS, and Windows) and processes. PowerShell commands let you manage computers from the command line. PowerShell providers let you access data stores, such as the registry and certificate store, as easily as you access the file system. PowerShell includes a rich expression parser and a fully developed scripting language. Here it is used to run the python code.

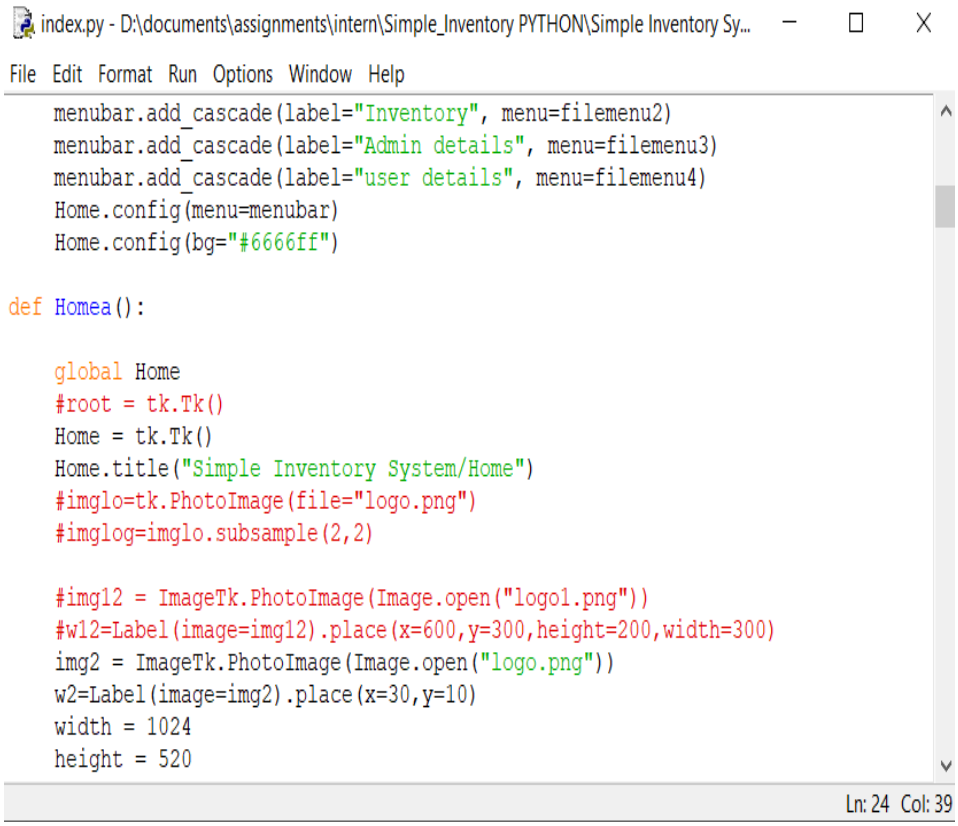

Figure 2. Python shell

3.0 Design and Implementation

Even in the small scale industries thousands of components are used every week, such that it becomes a difficult task for the store keeper to manage the inventory stock manually. Though there are some existing inventory management supplications, they are built with mySQL which requires complicated software setup as it involves in creation of additional servers for database connection establishment

For the purpose of overcoming the software complexities we have interfaced tkinter with SQLite, which results in the simple and elegant Graphical user interface enabling the customer to use it an easier way.

3.1 Block Diagram

The blocks depict the general warehouse management system. This diagram views on the entire warehouse rather than specific task based maintenance system such as information system, material In-Out section, loading and unloading.

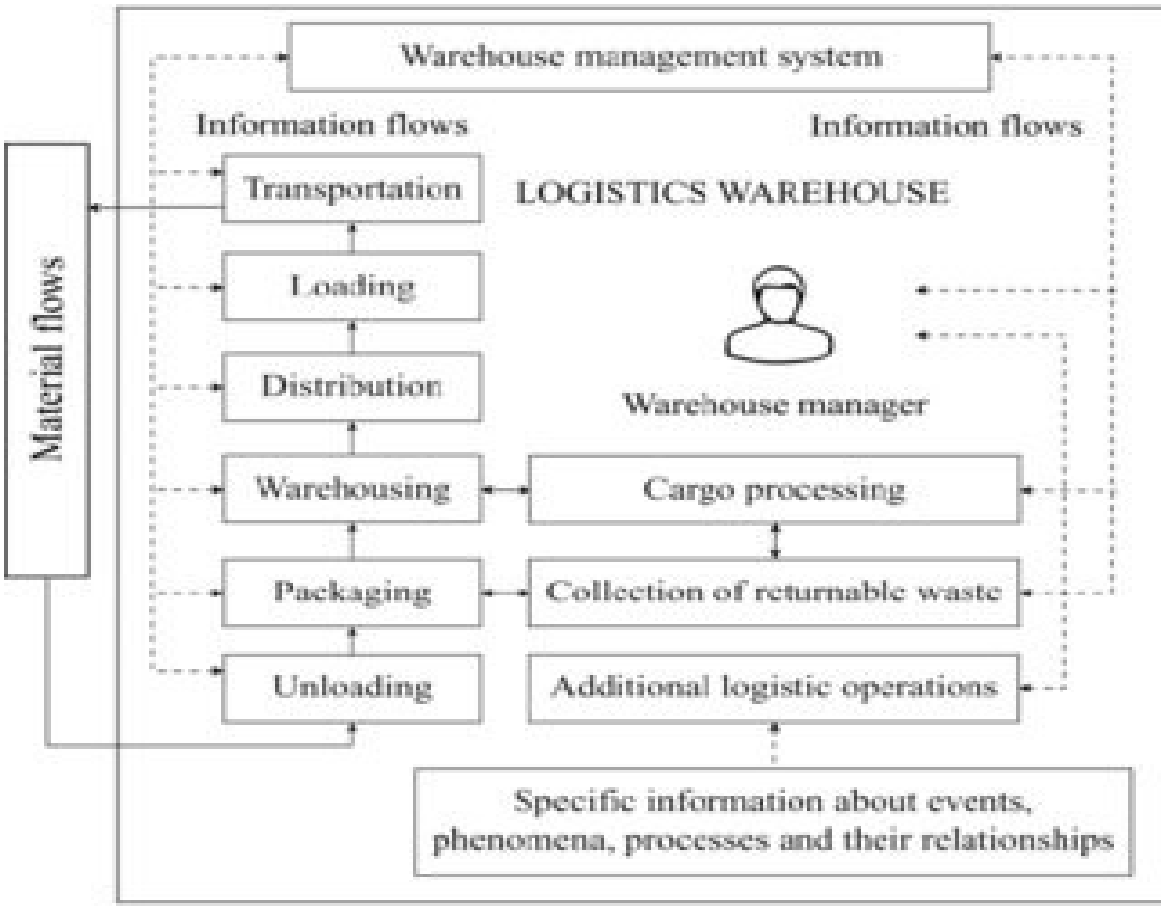

Figure 3. Block diagram

Our software works as a generalised platform which is highly customisable and suits with every maintenance mechanisms like 5S as the storage locations of the product is also mentioned in the product log. So the user can easily locate the location of components without any hazzle.

3.2 Working

The software mainly deals with all the possible ways to improve an inventory system in an industry where traditional system is followed which progress lesser productivity. Our product has individual features on the same software for different users. If the logged account is a user then the software shows only limited but highly required features. The features include making entry while taking out a product from inventory, checking for any product in the inventory, getting rank number and bin number of the product searched, making

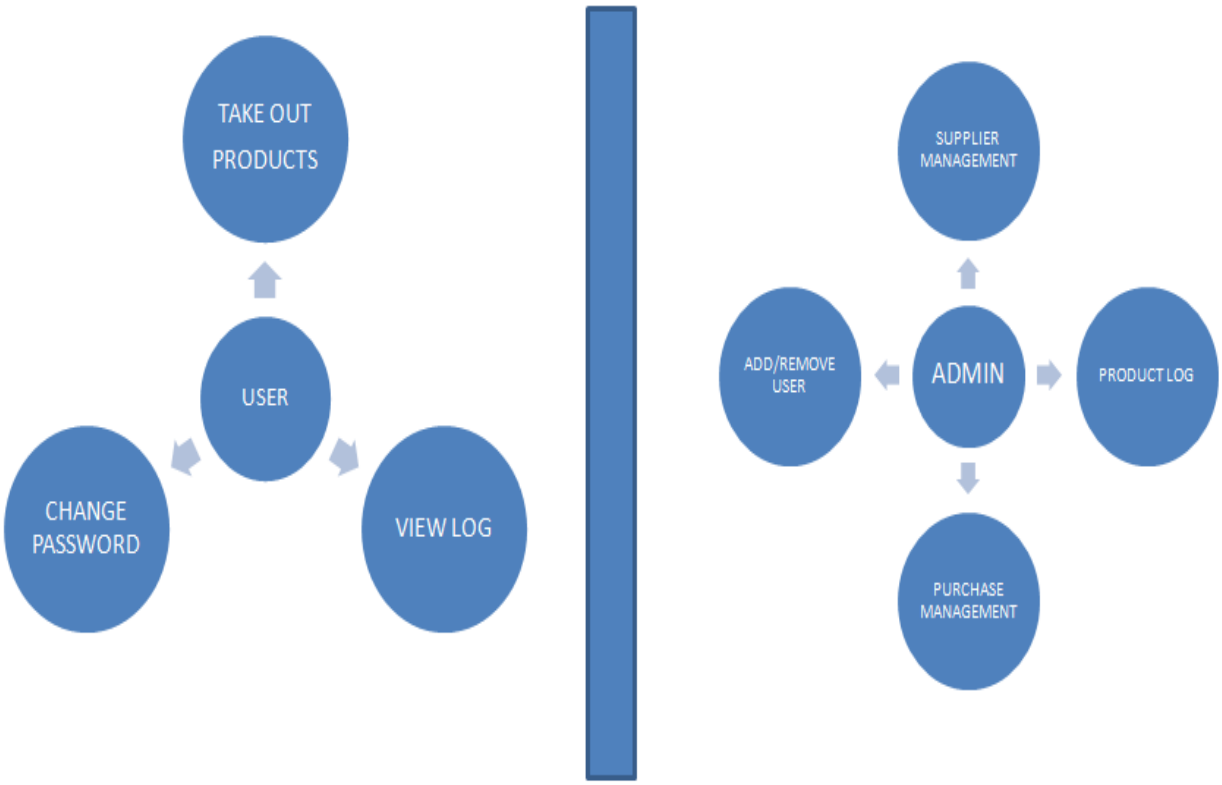

Figure 4. Admin/user accessibility

The software has twin dedicated login options, one is for the user and other is for the administrator. In our tkinter based framework user and admin can login with their own credentials which ensure hassle free login sessions.

On user's dashboard all the options are provided expect decision making which is made through top level management described as admins.

The Users can login with their provided user-id and password. They are provided with options for making entry which is must while taking a product in and out; also they can view the available list of items in the inventory. The admin has the ultimate power to add an admin and can able to add/remove items, made purchase decisions. While coming to products the system follows a dedicated private database Management system on SQLite. It ensures that when a product is taken from any rack by any user in the inventory, it deducts from the number of items in the stack. When the number of items reaches a low count the system automatically sends alert to managers of the inventory and the unit to ensure product availability.

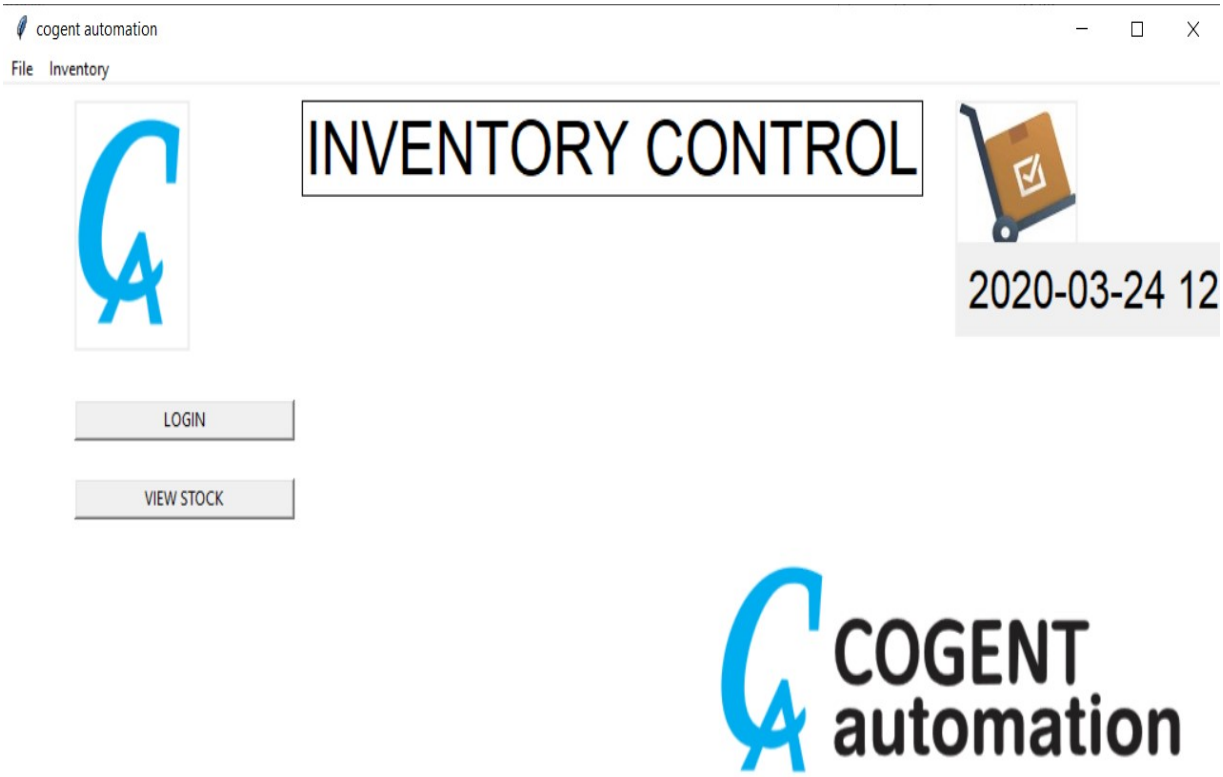

Figure 5. Application outlook

The admin can add a new admin/user or remove the existing one and he has the access to the invoice history dating back to last 10 years. He can add a stock when inward occurs and he also has the provision to make changes in the product location. The admin is allowed to access the whole database.

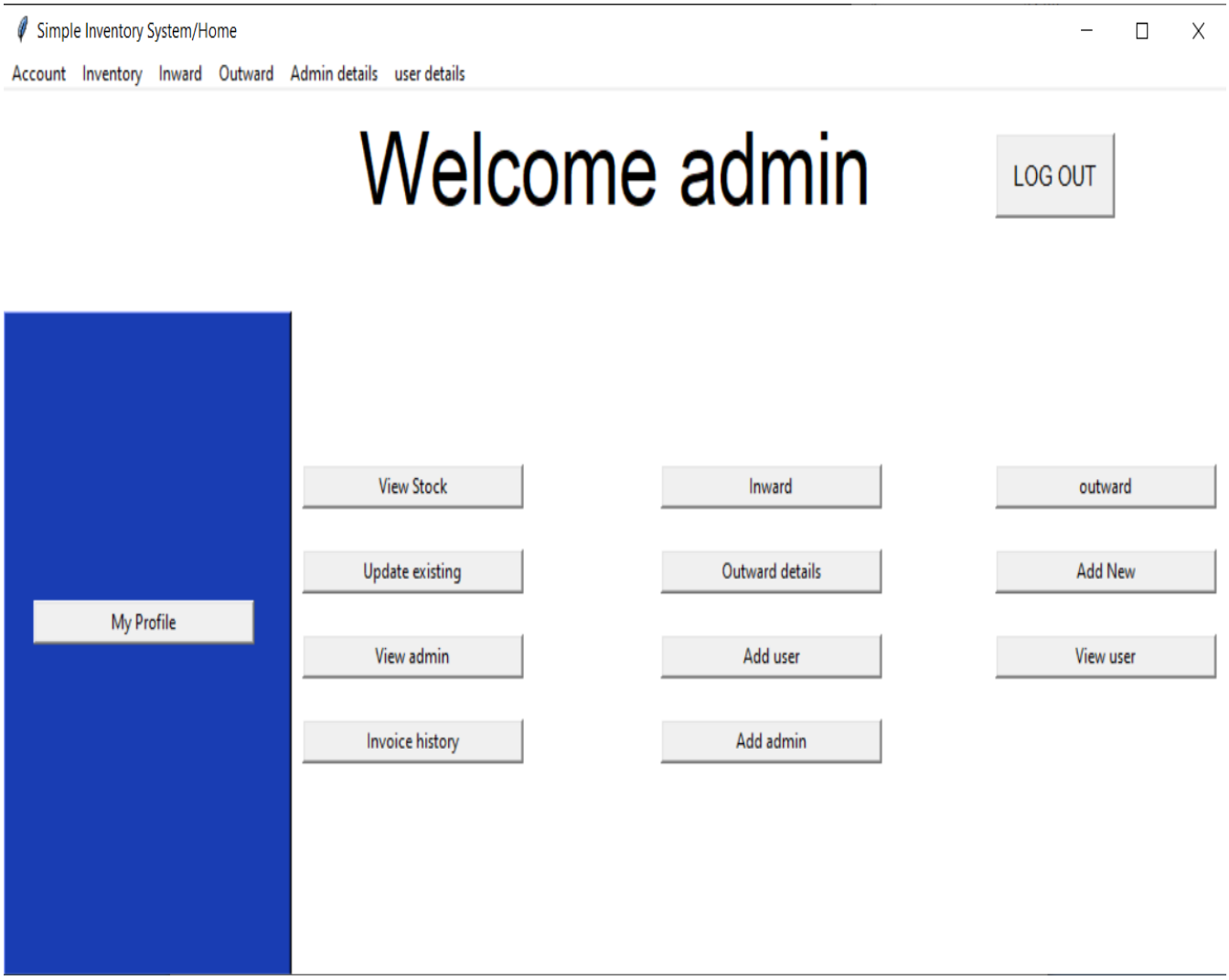

Figure 6. Admin dashboard

On the other side user can only fill outward details or check the existing stock in the warehouse. He is given with the provision to change his password.

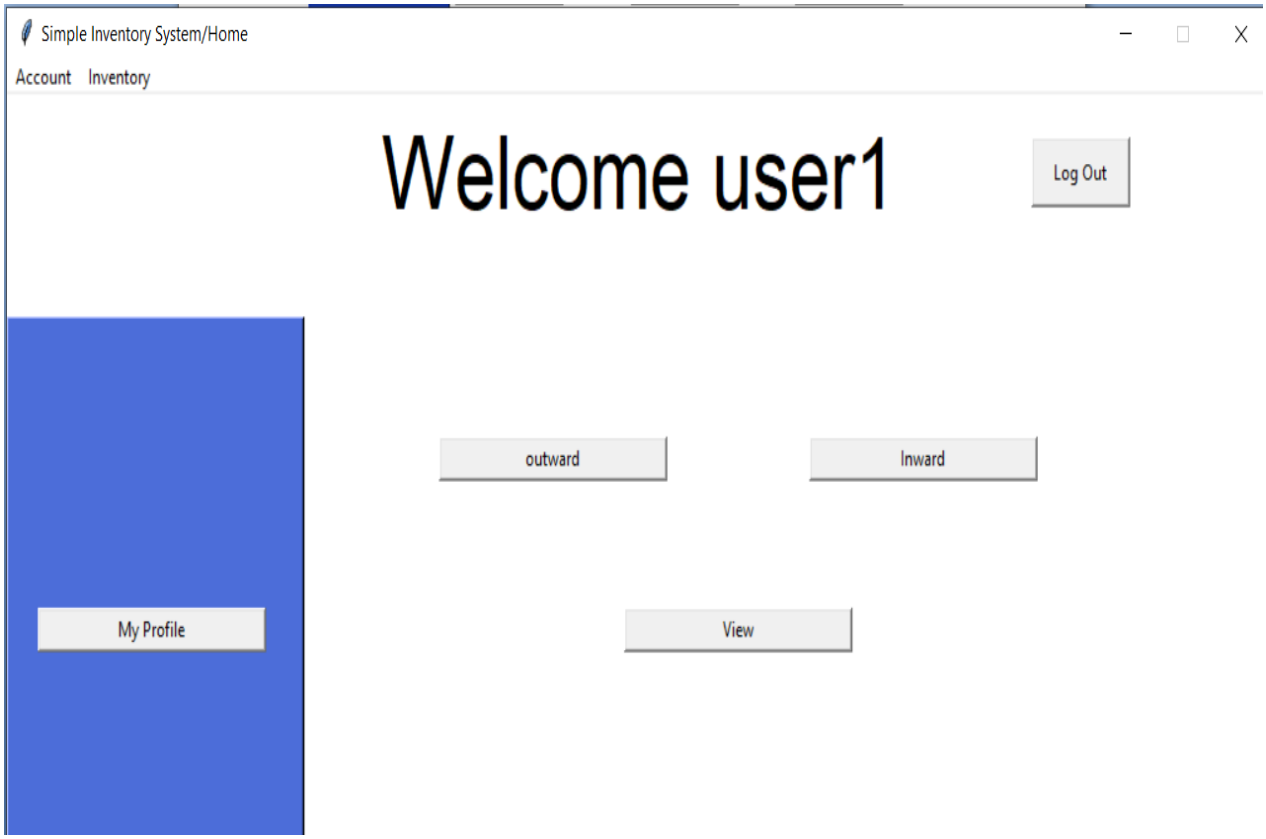

Figure 7. User dashboard

The outlook of the app is enhanced with the aesthetic feature available in tkinter such as inserting images, colours and fonts.

The "view **stock**" option can be used to view the components available in the warehouse and the exact storage location in warehouse as storage rack and bin numbers are also displayed. The user can also search for a particular product using the Search menu.

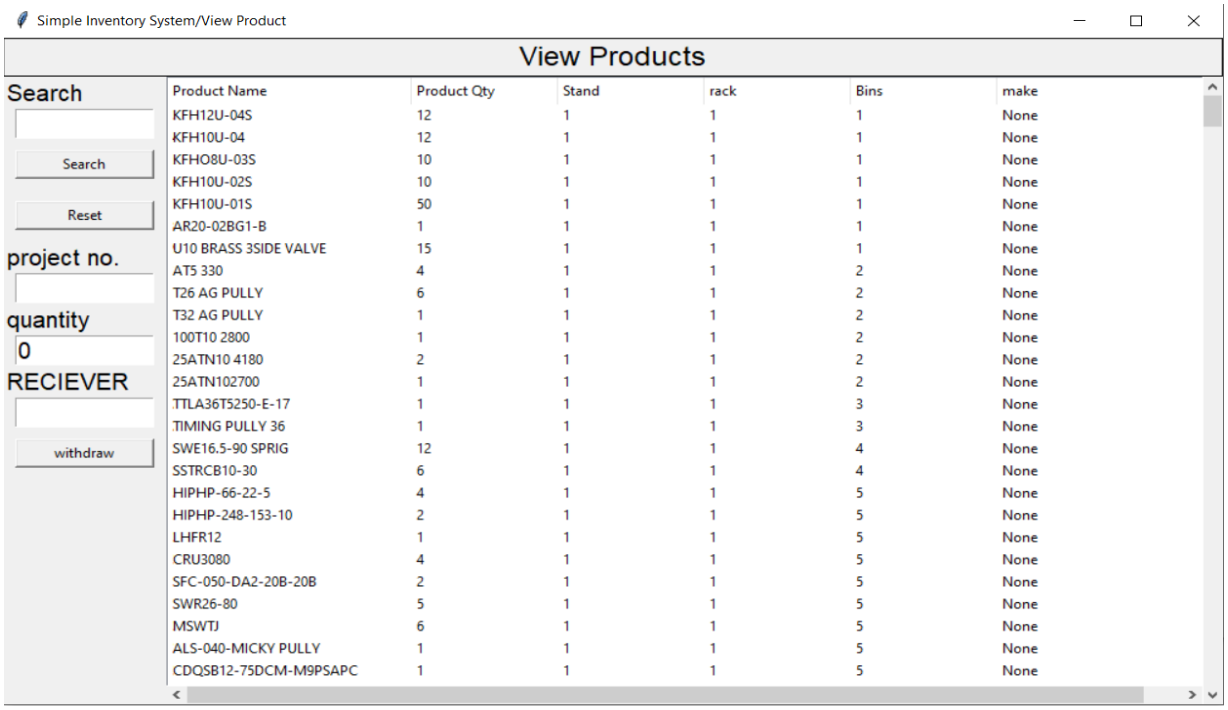

Figure 8. Product view

The store keeper can add the additional products upon purchasing with the help of the “add new” option.

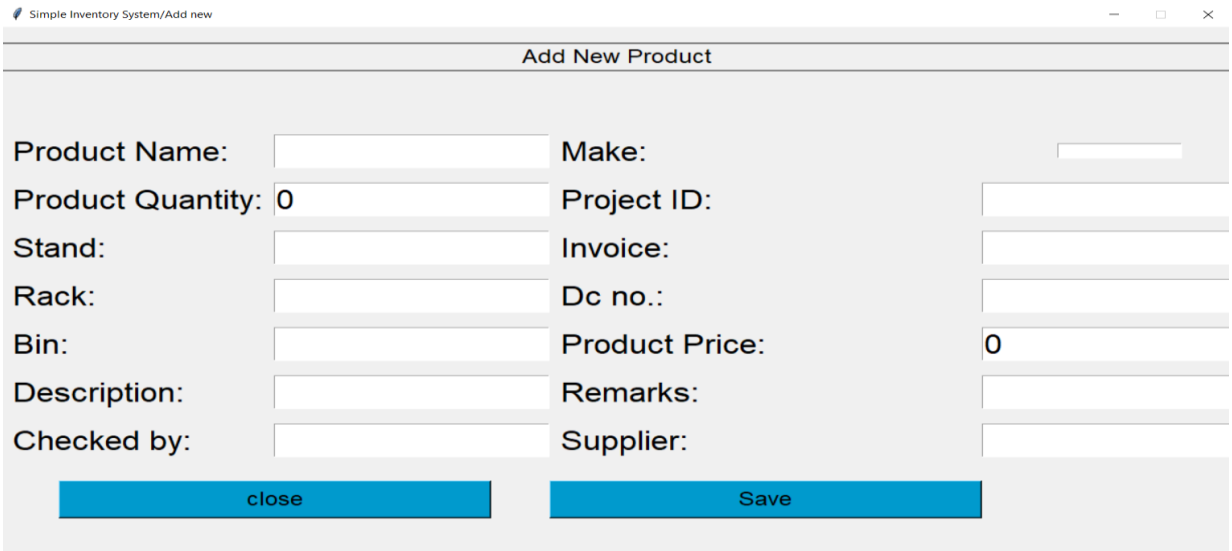

Figure 9. Updating products

If the admin is in the need of adding new user or new admin, he can use the “add user” or “add admin” option respectively.

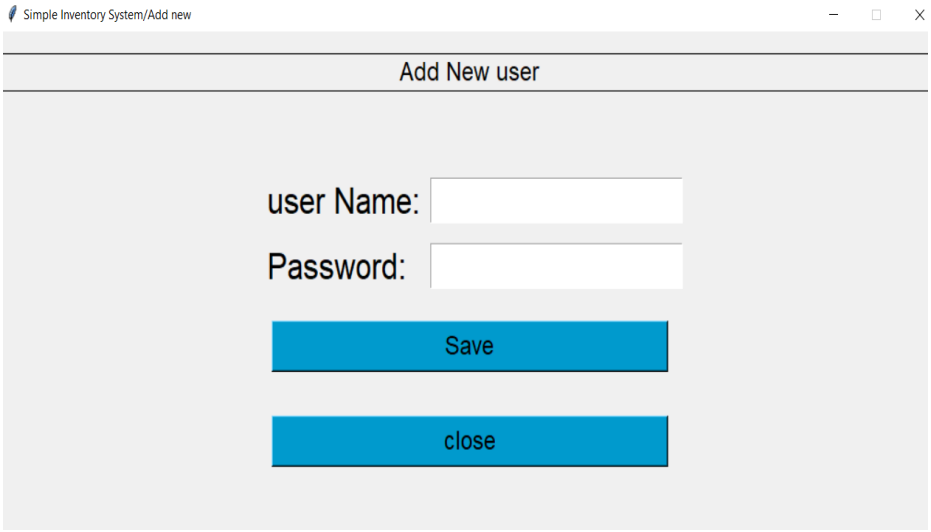

Figure 10. Adding user

To search for a particular user or admin, the option “view user” or “view admin” can be clicked.

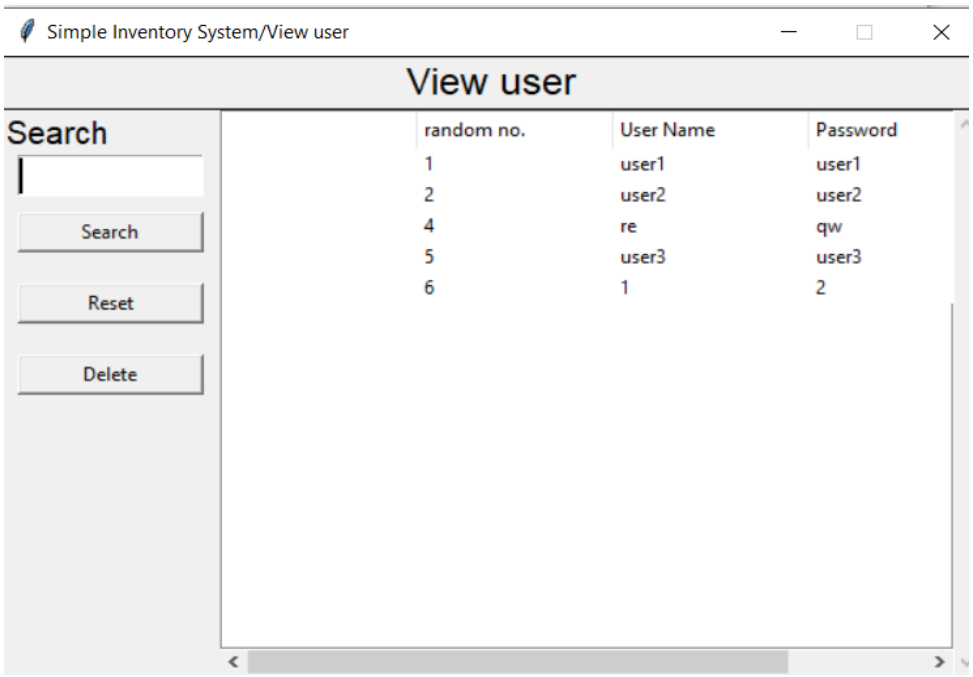

Figure 11. Viewing user

In case the store keeper wants to know the particulars of person who has withdrawn the components, the "outward details" option would help him. It delivers the details such as person name, time, date and quantity withdrawn.

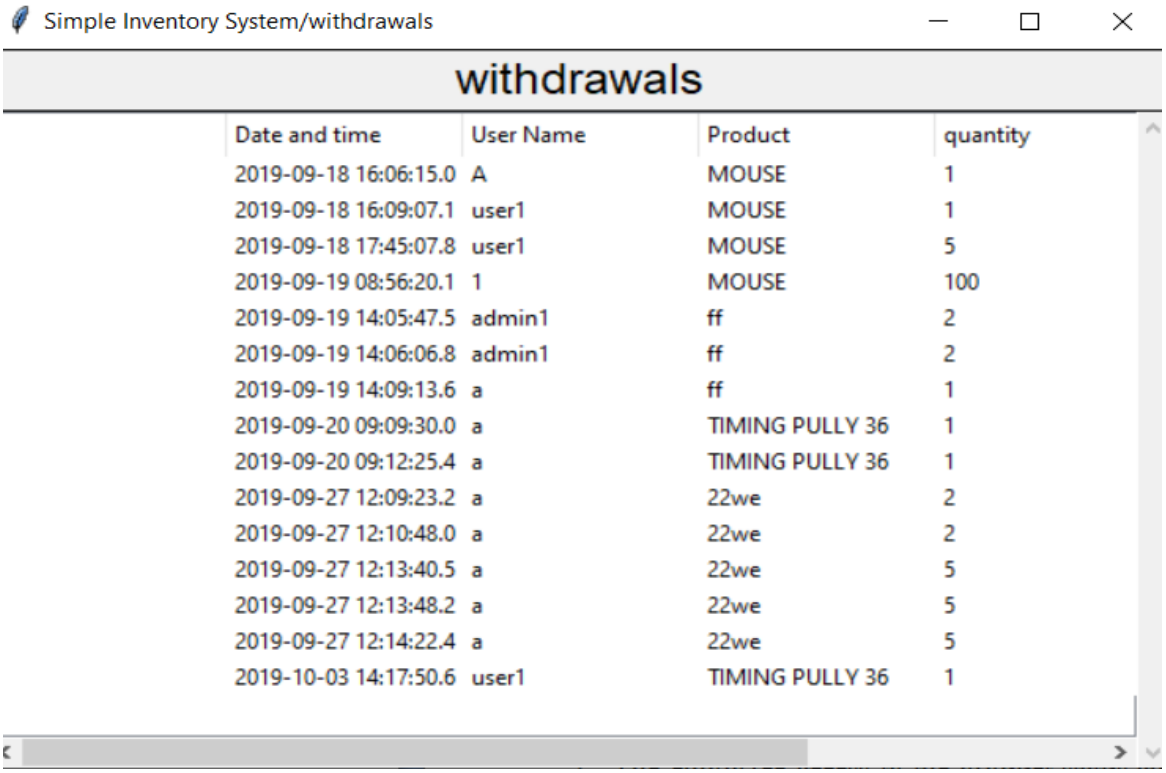

Figure 12. Withdrawals

Encryption is the most wanted thing in the digital world, so we have an option "change password" under the "my profile" menu to change one's password when they are logged in.

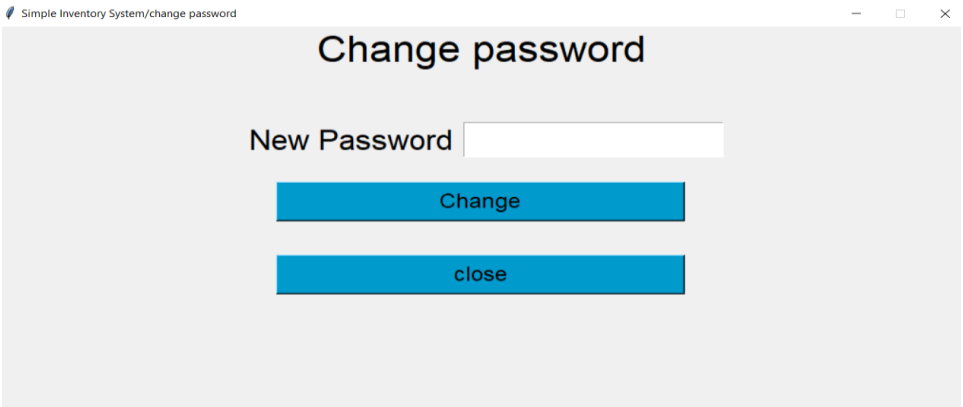

Figure 13. Changing password

On completing your task, the “log out” option is provided for switching the user or to end ones ongoing process and exit.

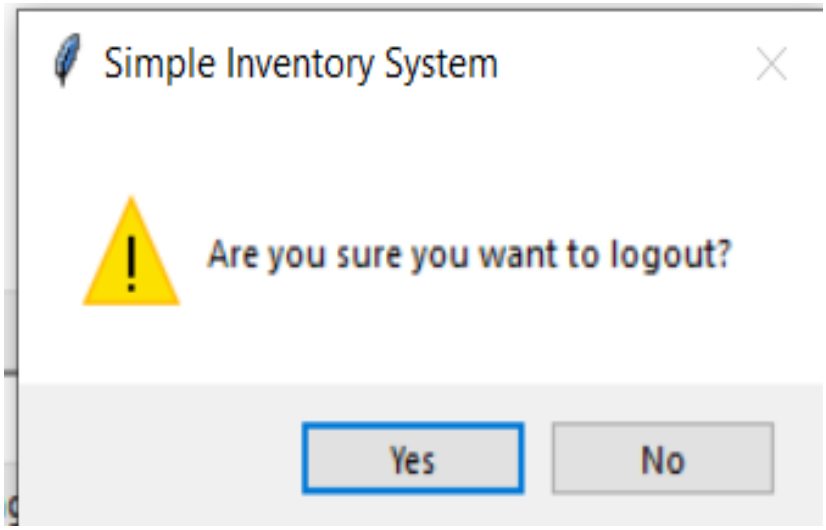

Figure 14. Log out window

4.0 Conclusion and Future Scope

4.1 Conclusion

The development of the application is effectively designed and implemented. This system will be helpful for the large scale warehouse management. It can save the time and reduce errors by the relational database management system. As an addition benefit the implementation of internet of things (IoT) is also implemented in our project such that utmost authority of the company can access the inventory status right from his mobile from anywhere around the world.

4.2 Future Scope

The proposed application can be further added with enhanced security features with the interfacing of RFID scanner and fingerprint sensor; so that even the username and password is known other account can’t be accessed. Further an additional feature that enables the store keeper to receive an email if a product quantity goes below the pre-set value. Such that deficiency in store supply never happens which saves the halt time. Upon adding these two features, this application would attract the app market for sure.

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