

QR CODE BASED INVENTORY MANAGEMENT SYSTEM WITH PREDICTIVE MAINTENANCE

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ABSTRACT: The project Inventory Management System is a Web application and aim of the project is to develop a software in which all the information regarding the stock of the organization will be verified and presented. The application contains general stock details and there is also provision for updating and deleting the inventory as and when required. While operating on mobile users can also scan QR code for more ease of use. In order to keep maintenance of inventories within an institute the system will provide predictive maintenance alerting users from the damage of the object. After successfully verifying the stock in an organization one can easily generate the inventory report.

Key Words: QR Code, ML, Inventory, Multiple Linear Regression

I. INTRODUCTION

The main motivation behind this project is to design and develop a simple easy to use and functional QR code-based Inventory management system that will be useful in small business organizations and educational institutes to keep track of current inventory and identify the current location of inventory items, to achieve this each item will have a unique ID in the form of a QR code on it. This project will be helpful in educational institutes and small business organizations to keep track of departmental inventory and if an item is misplaced it can be easily identified to which department it belongs to just by scanning it is QR code. This project also aims to automate the annual inventory report by generating a report that clearly states a list of items in inventory along with their quantities and missing items along with their quantities. One other important feature of this project is to incorporate machine learning-based predictive maintenance which will alert the administrator of possible maintenance of system or components based on historical data of the given component. Thus, this project helps in a significant reduction of human effort and human resources and achieves a high level of automation which in turn reduces time and effort previously needed to perform inventory management manually. To develop an application that is capable of inventory management within an organization using web development and machine learning. The application should scan QR code using image processing to uniquely identify the objects and predictive maintenance will be provided for the inventories using machine learning algorithms.

2. LITERATURE SURVEY

Products are the business resources for an organization. This includes appropriately managing the product and reviewing any time as per the requirement. Therefore, it is essential to have an Inventory Management System,

which is capable of generating reports and also can keep track of the stock in the inventory. Before developing this application, we studied the Inventory Management System existing in the market, which helped us gain the knowledge for the development of our project. The application software that are currently in the market are only used by the large companies and the main focus is to reduce the shelf life of the inventory to prevent the inventory to become deadstock but what about small organizations where we just have to focus on inventory management but not on deadstock so we came up with the application which can be used by small companies and organizations. Hence, we have decided to build a QR code-based Inventory management system that is more reliable and feasible for small to medium size organizations. Where the main focus is on the upkeep and tracking of current inventory. This review is based on IEEE papers and certain other papers published in leading international journals.

This paper [1] depicts a QR code based inventory management system based which can be operated using a smartphone and the camera associated with the smartphone.

The paper [2] gives a general idea about how to design a web-based inventory management system.

The paper [3] explains in detail about QR codes and how to develop them and use them for educational purposes.

The paper [4] explains about design and development of web-based inventory management system using agent technology.

3. ALGORITHM

Algorithm 1 (QR Code Generation):

STEP 1: Start.

STEP 2: Import the source data.

STEP 3: Compress the data into the "result.zip" file.

STEP 4: Create an empty string data.

STEP 5: Convert "result.zip" into a Base64 encoded string and store it in "data".

STEP 6: Input the image format and resolution of the QR Code to be generated.

STEP 7: Input Error Correction Level.

STEP 8: Using OpenCVlibrary method to convert 'data' into a BitMatrix object 'bitmatrix'

STEP 9: Write bitmatrix to an image.

STEP 10: End.

Algorithm 2 (QR Code Detection and Decoding):

Step 1. Image Binarization: The main focus of process of binarization is using the window selected adaptively to divide the QR code image. Then, we will binarize the each piece of image using Otsu Method and then we will combine these pieces sequentially for reconstruction of the QR code.

Step 2. Tilt Correction: When the image is being scanned, the position of the QR code often occurs tilt and it needs rotating operation for correction.

Step 3. Geometric Correction: Geometric rectification refers to follow processing: when an image occurs geometric distortion, for example, because of unsuitable shooting angle, the QR Code appears as gradient. So, the image is corrected to a square.

Step 4. Image Normalization: Here, by using the Geometric Transformation, we can obtain the QR code image which is almost regular. Then it needs to be normalized. In the next part, we will be dividing the QR code into the models. These models are based on the Sobel edge detection and further deblurred based on Fourier transform, and all bitstream data correspond to the code are obtained in the end, which can be decoded using according to the National Standard Method of Quick Response Code.

Algorithm 3 (Multiple Linear Regression):

It refers to a statistical technique used to predict the outcome of a variable based on the value of two or more variables. It is also known simply as multiple regression. It is an extension of linear regression. Here, dependent variable is the variable that we want to predict while variables we use to predict the value of the dependent variable are known as independent or explanatory variables.

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_p x_{ip} + \epsilon$$

Where, for $i=n$ observations

y_i = dependent variable.

x_i = independent variable.

β_0 = the y-intercept, i.e., the value of y when both x_1 and x_2 are 0.

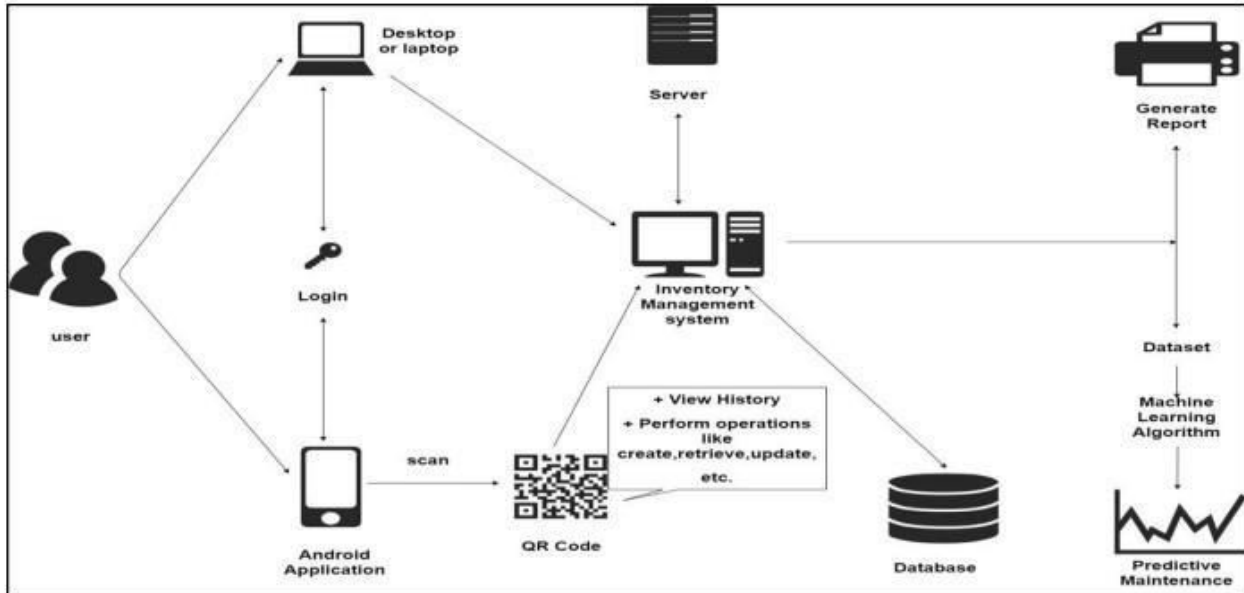
β_1 and β_2 = the regression coefficients.

β_p = the slope coefficient for each independent variable

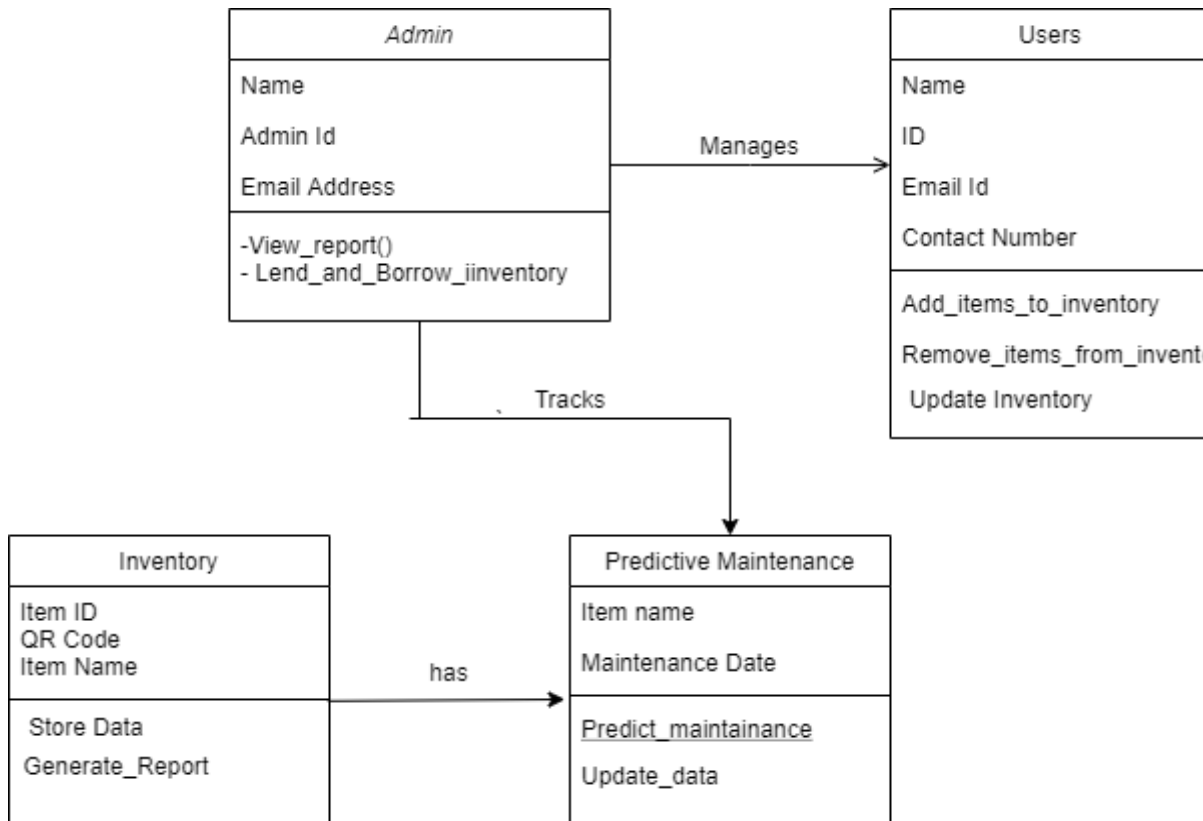
ϵ = the model's random error (residual) term.

4. FIGURES

1. System Architecture:



2. UML Class Diagram:



5. RESULTS AND DISCUSSIONS

In this paper, we have presented our findings about the QR Code Based Inventory Management System with Predictive Maintenance. The system effectively manages the inventory and we have used QR Code for fast verification and registration of items in the Inventory. The system is equipped with the predictive maintenance feature which helps to determine the maintenance schedule and usability of an inventory item. The system takes Total No of hours a machine is used, Average hours each day and number of days after last maintenance and then it will predict the next date of maintenance. The proposed system will reduce the manual work and inaccuracies and it will increase the productivity and data security. The system can be put to use in Supermarkets, schools, colleges and also in the small scale and large organizations.

6. CONCLUSION AND FUTURE SCOPE

After completing the Literature survey and feasibility study we found that the system is feasible to implement and has many practical applications. Requirements for the system are also realistic and so the system will be able to complete user's needs and help the user to manage and locate their inventory items easily. Also, the provided QR code system will help the user in quick processing and reduce the human work to a further extent and predictive maintenance will help the user in managing and prediction of maintenance dates for the items present in the inventory. Our system currently works on QR code-based method for quick locating and information fetching purpose but in the future, we can use RFID's or NFC to replace and improve the System performance and reliability also we can further extend the scope of our predictive maintenance and improve its accuracies by implementing various advanced algorithms and techniques and thus improve the overall effectiveness of the predictive maintenance feature also the system currently.

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