

# Smart Storage with the Internet of Things and Voice Recognition

B. Muthu Senthil, V. Dhanakoti, Sabarish. J, Sonali. S



**Abstract:** *In the era of automation ruling the world by coming into each and every field, now it has entered into the field of Storage. Automation has reduced the time complexity and the manual power in the entire field it has intruded. And likewise it will reduce the time complexity and tracking of the stored items and retrieving the same from the storage. This model of storage can be done with the help of Internet of Things, Cloud computing and machine learning. Cloud computing plays a major role due to its robustness and its portability which does give an extra edge in the business. To survive in business today you need to make smart choices. Storage can be a small business savior. This model can be used in many fields like medicine, business etc. Tracking and retrieving in these large amounts of storage can be made easier with the help of database.*

**Index Terms:** *Automation, Storage, Internet of Things, Machine learning, Cloud Computing & Datasets.*

## I.INTRODUCTION

The evolution of internet of things and the machine learning has given a huge way for development in every possible field. IOT is measured by sensors and translated into process able data, these data has to be translated into commands to be executed by actuators [1]. With the concept of the internet of things, internet becomes more favorable to have a smart life in every aspect [2]. Storing of large quantity of items or products and retrieving them is a hectic task. This task can be simplified with the help of the automation. A smart grid is related to the information and control and developed to have a smart energy management [3]. The model that is described in the paper is one of the ways in which the storage can be automated and made easier. The model uses the voice recognition mechanism to make the way of input for the retrieving process to initialize which makes it more user-friendly and also reduces the time complexity of giving input in other ways. This front end of the model is made as an application which tells the system what operation has to done. This application is also connect to the database in which we store what products are stored in which locations in

the grid. So in this model the application works as both the front end and the middleware of the system. This makes the storage and retrieving more easier and effective in each and every field in which it has been used.

## II.RELATED WORK

SomayyaMadakam et.al [4] proposes about the Internet of Things. Well explained about the time series, requirements needed for successful implementation, architectures, internet protocols and other components in IOT but fail to say about the standard protocols for better global governance. Palak P. Parikh et.al [5] proposes about the opportunities and challenges of wireless communication for smart grid application but fails to say about the difficulties and the most efficient way to do. JasminGuth et.al [1] proposes the architectures and detail analysis of IOT but fails to say about the uniqueness of them which makes them profitable. Zeinab Kamal AldeinMohammeda et.al [2] proposes about Internet of Things applications, challenges and related future technologies but fails to say about the way to overcome the challenges and the way to deal with it.

David J.White et.al [6] proposes about the voice recognition technology as a tool for behavioural research but fails to say about the way to auto correct the errors without any annual help. Jennifer L. Matheson et.al [7] proposes about the voice transcription technique: use of voice recognition software to transcribe digital interview data in qualitative research but fails to say about the challenges in those software. Ye Yan et.al [3] proposes about the survey on smart grid communication infrastructures: motivations, requirements and challenges but fails to say their option and ideas on the case study. P.Griffiths Selinger et.al [8] proposes about the access path selection in a relational database management system but he fails to say about the basics in access path selection in RDBM. Vandana Sharma et.al [9] propose about the IOT &It's smart applications but fails to say about the advantages more than disadvantage.

Padilla syamala et.al [10] says about IOT based appliances control for smart homes but fails to say about its ill effects and lags. Ms. Swapna G. Kadam et.al [11] says about Internet of Things (IOT) but fails to say about the future scope and its field to apply. Ms.Pradnya.A. Hukeri et.al [12] reviews about IOT based technology but fails to say about the use in household and other places except industry. Mr. RohithPrakash et.al [13] says about smart grid technology for intelligent power use but fails to say about the other benefits of smart grid technology. Ravi Kishore Kodali et.al [14] says about IOT based control of Appliances but fails to say about its disadvantages.

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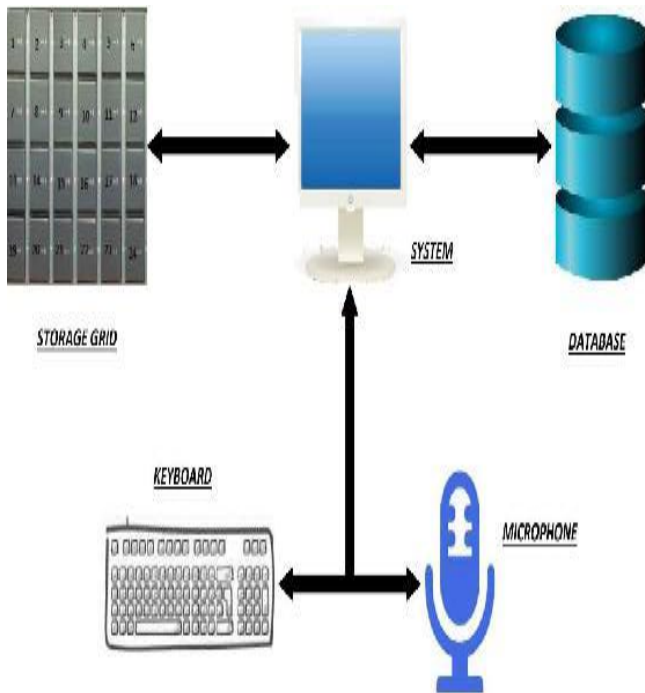
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## III.SYSTEM ARCHITECTURE

Fig. 1 shows the way in which the model works. It can obtain input from the keyboard or microphone and the input is checked with the database. From the database the grid number is obtained and the respective box in the grid will be allowed to access.



**Fig. 1 Mathematical model diagram**

### A. System Design

This model can be seen in three different stages which are,

- i. Front end
- ii. Database
- iii. Hardware

#### i. Front end

It uses java programming language which is a general purpose computer programming language. It is intended to let application developers “write once, run anywhere”. It uses applet frame by which application can be created. In front end perform the following steps of this model

- a) Initialization of grid
- b) Insertion of data
- c) Modification in grid
- d) Retrieving of data

#### a) Initialization of grid

The number of rows and columns are been obtained from the user and according to the number of rows and columns the grids are created to store the data which is obtained from the user. Here the data are stored in each grid with the respective value for each grid from 1 to  $n*m$  ( $n$ - number of rows,  $m$ -number of columns). These values help in accessing the needed grid and its data.

#### b) Insertion of data

The data are stored in the grids which are created by the number of rows and columns provided by the user. These data are provided by the user and stored in particular grid. The number of data in each grid is always been counted and

incremented by one whenever the data is added to the same grid. By having the count of the data in particular grid we can know whether the stock is in perfect amount or need to be inserted more.

**Fig. 2 Obtaining the number of rows and columns**

**Fig. 3 Displaying the Grids**

**Fig. 4 Obtaining the values for each Grid**

#### c) Modification in grid

The number of values in each grid gets modified whenever a data is inserted or retrieved from the grid. The user can modify the complete data in the grids too. The grids can be refreshed and reloaded with new data again. Even the changes in the data which are stored in a particular grid can be made and the mistakes can be rectified.

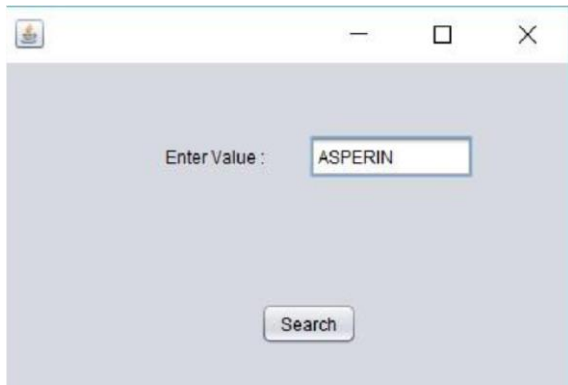


Fig. 5 Obtaining the value to be retrieved

d)Retrieving of data

The data stored in each grid can be retrieved. The data can be retrieved either in a group or a single data. The group of data in a particular grid can be retrieved by providing the value of grid and the number of data. Each time when the retrieving takes place the number of data in a particular grid is decremented by the number of data retrieved. If there is no data to be retrieved from a particular grid then an alert will be provided to the user before the last data in the particular grid gets retrieved.

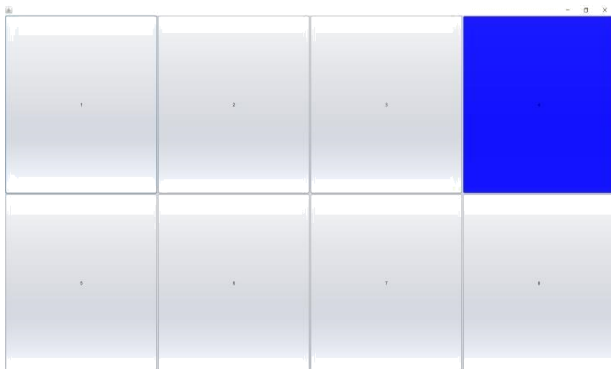


Fig. 6 Searching and highlighting the particular Grid

ii. Database

The application is a real time so it needs to have be working so there is break between session. Hence there is need of database to store the implications from the previous session on the storage. This can be applied to various application so that as the middleware. In this model we have used the Oracle database for the application’s database.

As JAVA is used to develop the front end of the model, here is a model of the Java Database Connectivity (JDBC) connected to the front end of the database. This hold the most important process as the data in the database holds of the information of the stored products and it information. The database model is made with the 5 tuples storage grid address, the product id, product name, date of stored, Quantity. The database model would as like the given below.

The product ID is reserved as the primary key of the database model with its unique character. And the address of the storage will be reserved as the candidate are all unique.

The product Id and the address can also be used as the foreign key of any other table in the required application.

| Address | Product Id | Product Name | Date stored | Quantity |
|---------|------------|--------------|-------------|----------|
| B1      | XY2        | XYZ          | dd-mm-yyyy  | X        |
|         |            |              |             |          |
|         |            |              |             |          |
|         |            |              |             |          |

Candidate Key
Primary Key

Fig. 7 Structure of the Database

iii. Hardware

This part consists of the physical part of the storage. Here the box is done with appropriate parameter such that the items inside the box isn't affected or doesn't change from external and the internal factor.

These grids of boxes are attached to the moderator which makes the box to open and close on given commands from the arduino board. The arduino board is given with the box id. The arduino board then instructs the particular moderator to open the box.

B. Entities

1. Input

The user can enter the information during the process of retrieving or storing the data in the database with the Audio, Keyboard or OCR. Any one of the following can be used by the user or the database administrator to manipulate the values that are present in the database. This can also be used in the input or the user end where the retriever enter the item that as to be retrieved.

The audio input is then converted to information with help of various Application Interface and thus the information is found. The OCR comprises of a scanner that scans the list that consists of items to be retrieved and hence the scanned imaged is then made into the format of data and then used.

2. Database

The database is the one that stores the various items and their addresses. The schema and the structure is controlled by the database administrator. The administrator can have full access to the whole database and the dataset in the database.

3. The Administrator

The administrator is the user of the model who can see the whole of the database and the details of the stored items and the amount of the items that is retrieved or sold in the case of a business. The administrator uses the analyzed report of the transactions of items loaded and unloaded.

4. The Retriever

The retriever is the user who takes away or unloads the required items. He uses various input ways to tell the system what are all the items it has to retrieve. These retrieved details are also stored in the database for the later use of analyses report.

5. The Loader

The loader is the user who loads the details of the items into the database. The loader is the person who sees the stocks of the items to refill and this is done with the help of display option which is done in the application.

C. Use case

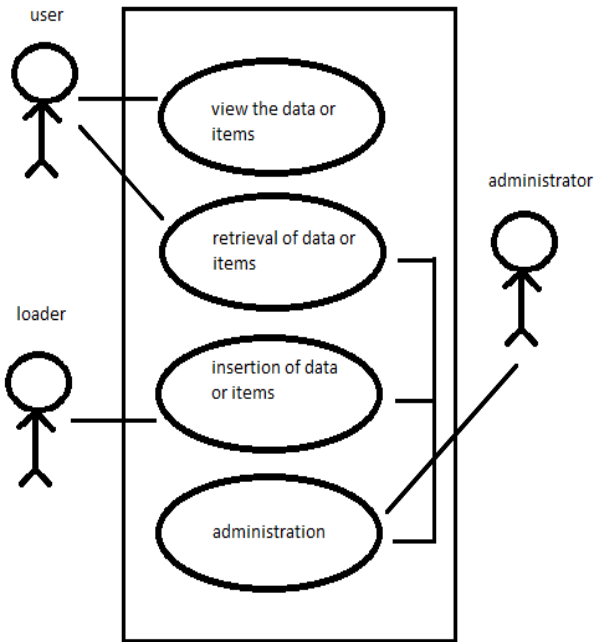


Fig. 8 Use case diagram

D. Pseudo code

```

Input : n //grid value
a// number of data or items
Output : data retrieved or inserted
//Insertion
While( grid value==n)
If (grid== no data)
Then x=0
If (grid== x data)
Then x=a+x
Else
grid value= grid value+1
// retrieval
While( grid value ==n)
If (grid== no data)
Then return 0
If (grid== x data)
Then x=x-a
Else
gid value=grid value+1
    
```

IV.CLOUD ARCHITECTURE

The system is currently with the simpler LAN network. Cloud Computing can be added to the system for using the system remotely and with efficient network over the system. With the cloud network coming into the system the cloud server is connected to the IOT boards that analyze and push out the required box out the hardware grid.

The system work in the following steps:

- i. First the user inputs the unit needed.

- ii. The variable is sent to the cloud database to see the grid number.
- iii. Once grid number is seen cloud gives a push out request to the respective IOT device.
- iv. IOT on receiving the request pushes out the grid and then acknowledges the request.
- v. Then the system is ready for the next input.

The cloud that is to be used should be capable of both the database storing and the one which can provide some services such as the request and data analysis. There are several cloud servers which provide the above mentioned services like: Adafruit, AWS, Azure. On implementing these the analysis part of the system and the administration part of the system is got at ease. As the administrator can get access to the data and the information remotely form any of the place with just a login in the cloud server.

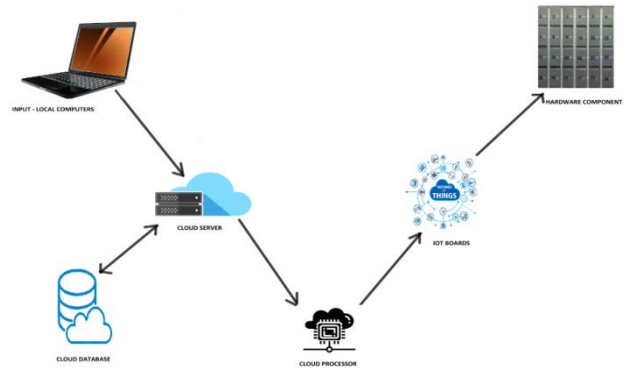


Fig. 9 Cloud Architecture

V.APPLICATION

A. Medical

In storage of medicine, this can be very useful. This can provide the feature of alarm which would provide the time of consumption of drugs and even provide the info like out of stock or drugs nearing to the expiry date.

B. Warehouse

In warehouse, this can be used to maintain the stock storage and this can reduce the labor work. This can make a notification of when the stock is last updated and it makes search easy where people need not search each box rather, can view the needed in a monitor.

C. Shops

In shops, this will be useful such that the customer need not wait when the shop is crowded. Instead can make use of the systems which makes the search faster than manual search and can make the bill and payment by no time.

VI.CONCLUSION

The Internet of Things has now given a smart way of storing and retrieving things. This would make things easier and reduces the time complexity in larger storage fields.



This model also uses the voice recognition technology henceforth it is easy to handle. Thus making the storage easier and user friendly.

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