SMART WARDROBE – IOT BASED APPLICATION

Jay Dalal[1], Anshul Dalmia[2], Jaimin Desai[3], Mrs. Hetal Amrutia[4]

[1,2,3]Student, Department of Information Technology, Thakur college of Engineering and Technology, Mumbai, India

[4]Assistant Professor, Department of Information Technology, Thakur college of Engineering and Technology, Mumbai, India

---

ABSTRACT: *Every individual faces a problem of what to wear, almost every day. The problem isn't that you don't have enough outfits to wear, but fact that you have no track of the clothes you keep wearing again and again and those you haven't touched for a long time. A smart wardrobe not only helps you track your clothes but also get suggestions on what to wear according to the events of your calendar. The system generates statistical reports of the frequency of usage of the clothes which helps you decide the ones you could sell or donate. You can also manage your clothes from anywhere with a mobile application. In this thesis project, our goal is to put together a set of technologies into a system that could be used to aid the user in the planning of their clothes. In order to achieve this goal, we need to be able to identify which clothes are worn very often and those which are seldom used. We need to categorize our clothes like Casual, Formal, Dinner Party, Business Party, and Social Function and so on. The application will provide statistics to show the clothes that are being worn frequently and those that haven't been touched for a long time. Application can further suggest the user to sell the unwanted clothes or donate them to charity. Smart Wardrobe is a fairly new area of research and literature on the subject is not readily available or accessible, whatever that exists is mainly conference proceedings or reports on projects most of which have not been progressively developed or didn't get to be marketed commercially. The components include an Raspberry Pi 3 Model B, Arduino UNO, RFID system and Microsoft Azure Cloud assisted by a middleware application working together to give the user a new experience on how they interact with their wardrobe and at the same time enable the wardrobe to support the user in selecting their clothes to be wear in different occasion thereby saving their time they would have spent in the manual Selection and at the same time reducing on the stress associated with the activity. In the future, this project can be extended to provide suggestions to the user according to the weather forecast. Weather detecting sensors can be embedded into the system to detect the weather and suggest appropriate clothes. The app will also give more detailed analysis of the statistical data and machine learning will be used to provide better suggestions.*

I. Introduction

Today, individuals have access to an array of smart applications like smartphones, laptops, smart televisions, refrigerators, microwave ovens, etc. However, there aren't many smart devices for the bedroom department of the house. One prominent and important feature that exists in the bedroom is a wardrobe or closet. In fact, over 80% of the respondents we surveyed agreed to have access to a wardrobe. Smart wardrobe helps users manage their clothes inside their wardrobe. Besides having an attached screen to show the status of each cloth, it can also push all data into a cloud and further sync up data with a mobile application. User can get suggestions on what to wear today from their phone app based on the events in their calendar and the weather. In this thesis project, our goal is to put together a set of technologies into a system that could be used to aid the user in the planning of their clothes. In order to achieve this goal, we need to be able to identify which clothes are worn very often and those which are seldom used. We need to categorize our clothes like Casual, Formal, Dinner Party, Business Party, and Social Function and so on. The application will provide statistics to show the clothes that are being worn frequently and those that haven't been touched for a long time. Application can further suggest the user to sell the unwanted clothes or donate them to charity.

Existing Systems

Smart Wardrobe is a fairly new area of research and literature on the subject is not readily available or accessible, whatever that exists is mainly conference proceedings or reports on projects most of which have not been progressively developed or didn't get to be marketed commercially. We did a survey of current technologies on the market and at the end of the day; we made a selection of the most appropriate ones. These included an Raspberry Pi 3 Model B, Arduino UNO, RFID system and Microsoft Azure Cloud assisted by a middleware application working together to give the user a new experience on how they interact with their wardrobe and at the same time enable the wardrobe to support the user in selecting their clothes to be wear in different occasion thereby saving their time they would have spent in the manual Selection and at the same time reducing on the stress associated with the activity. As is,

the system may require quite somechanges to realize a user experience that would be acceptable but at least we have provided a basis for future research.

II. Material and Methods

Materials:-

1) Hardware components:

i) Raspberry Pi 2 Model B

ii) EM-18 Reader Module

iii) RFID Tags

iv) Jumper cables

2) Software apps and online services:

i) Microsoft Windows 10 IoT Core

ii) Microsoft Azure

iii) Service Bus, Web Apps, SQL DB

iv) Arduino IDE

v) Microsoft Visual Studio 2015

vi) Android studio

3) Hand tools and fabrication machines:

i) Microsoft PC running Windows10 with Visual studio 2015 installed

ii) Android Phone

iii) Raspberry Pi USB Wi-Fi dongle

Features of the project

In this project, our goal is to put together a set of technologies into a system that will aid the user in the managing of his clothes. The smart wardrobe can be used by the customer in various ways depending on his liking. Here are some of its features:

1 Live tracking of every cloth detailing the number of times it has been worn.
2 Adding an event and assigning an outfit specific to that event.
3 Registration of new clothes on the go using the mobile app.
4 Filtering all the outfits according to their colour, name and category.

Parallel profiles to help every member in the family manage their clothes

Proposed Work

Every individual faces a problem of what to wear, almost every day. The problem isn't that you don't have enough outfits to wear, but fact that you have no track of the clothes you keep wearing again and again and those you haven't touched for a long time. A smart wardrobe not only helps you track your clothes but also get suggestions on what to wear according to the events of your calendar. The system generates statistical reports of the frequency of usage of the clothes which helps you decide the ones you could sell or donate. You can also manage your clothes from anywhere with a mobile application.

Feasibility Study
Technical Feasibility:

Here one has to test, whether the proposed system can be developed using existing technology or not. It is evident that the necessary hardware and software are available for development and implementation of the proposed system. Hence, the solution is technically feasible.

Economic Feasibility:

As part of this, the costs and benefits associated with the proposed system compared and the project is economically feasible only if tangible or intangible benefits outweigh costs. The system development costs will be significant. So the proposed system is economically feasible.

Table 1: Cost description of components

Description	Cost
Raspberry Pi 3 B Module	Rs.3700
EM-18 Reader Module	Rs.400
RFID Tags(x10)	Rs.200
HDMI Cable	Rs.100
Samsung EVO Plus Class 10 64GB MicroSD Memory Card	Rs.900
Breadboard Jumper Cable	Rs.100
Cost of Labour(App Development)	Rs.4600
Total Cost	Rs.10000

Methodology:-

Phase I:

1) Planning: Applying agile methodology for Smart Wardrobe for better usage of resources and time with great performance.

2) Analysis: Prepare a detailed analysis on Smart Wardrobe system and overcoming its limitation in our system.

3) Design: Integration of data and designing of system.

4) Coding: Writing the code for RFID module and taking help of open source.

5) Implementation: For first time registration, user will need to let RFID reader read the tag and a push notification will be shown inside user's mobile phone application. User will need to key in further details about his cloths for example color, type, name, etc. Once record is created, system will automatically track the item taking out or putting in from wardrobe. After consolidating data, a report will be generated and give user better idea of which cloth is most preferred or which is most unwanted.

Phase II:

1) Testing: Doing the various tests on smart wardrobe system like unit testing, integration testing, and system testing etc. of test case data to check if the integrated system functions are as desired by the client.

2) Deployment: Conduct beta testing for identifying any further errors, bugs and improvements that can be performed. After the testing and approval, deploy the proposed system.

Workflow:-

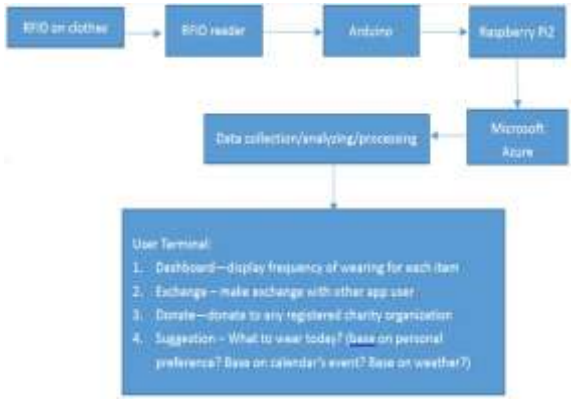

Fig1: Workflow of project

The project will consist of 4 main components: user terminal (phone, pc, and tablet), Raspberry Pi2, RFID reader, and Microsoft Azure. For first time registration, user will need to let RFID reader read the tag and a push notification will be shown inside user's mobile phone application. User will need to key in further details about this clothes for example colour, type, name, etc.

All clothes stored inside wardrobe has a RFID tag attached to it. Whenever the clothes are put in or taken out from wardrobe, they will be tracked by RFID reader and arduino board. The sensor data will then send over to Raspberry pi 2. After processing the data, Raspberry Pi2 will then send the data to Azure SQL database.

Once wardrobe data is sync up with universal app, the app will further show user which cloth is most frequently chose and which one has the least frequency.

III. Result

Expected Outcome:-

-Phase I:

This system will be instrumental into keep tracking of wearing frequency of cloths in wardrobe. It will also suggest a garment on basis of least recent used phenomenon. This system will store usage data and log data on Azure Cloud, this will furnish user to access data from anywhere anytime.

-Phase II:

Any bugs later found will be dealt with and new features like suggestions through weather tracking will be implemented.

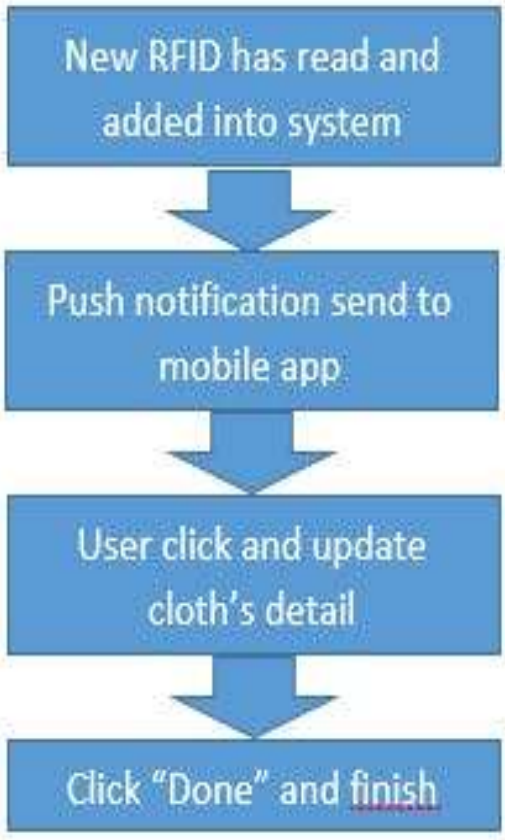

Fig2: Flowchart for cloth detection

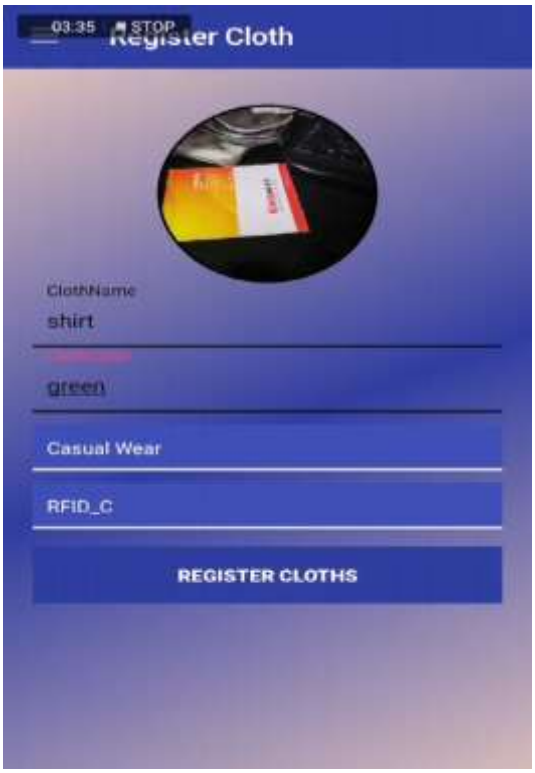

Fig3: Register a new cloth to app

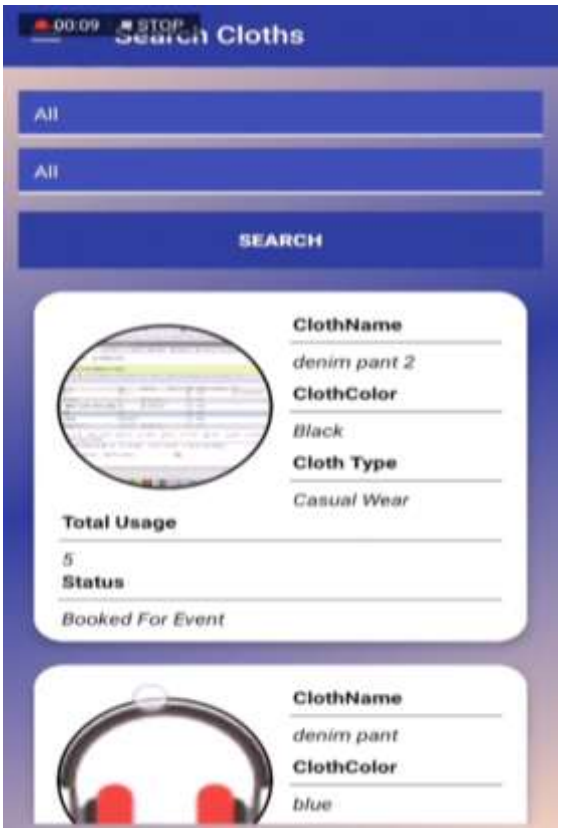

Fig4: Cloth details, Frequency of usage

IV. Discussion

In the future, this project can be extended to provide suggestions to the user according to the weather forecast. Weather detecting sensors can be embedded into the system to detect the weather and suggest appropriate clothes. During rain, the system may remind the user to carry an umbrella and avoid wearing white, while on the other hand, during a sunny day, the app suggests the user to wear light colored clothes. The app will also give more detailed analysis of the statistical data and machine learning will be used to provide better suggestions. The hangers could be equipped with LED lights that illuminate at the search of a particular cloth making it easier for the user to locate it in the wardrobe. One of the most important thing aspects to consider in the future is to reduce the effective cost of the system so that everyone can affordit.

V. Conclusion

Thus by this we conclude that the proposed system for smart wardrobe can be used effectively by fashion bloggers, organization etc. Not only an organizer but a normal person can use the system as it is simple to understand. As is, the system may require quite some changes to realize a user experience that would be acceptable but at least we have provided a basis for future research. We have identified challenges and future enhancement.

References

I] Paper references:

[1]Adomavicius, G. and Tuzhilin, A. (2001) 'Using data mining methods to build customer profiles', Computer, Vol. 34, No. 2, pp.74–82.

[2]Amato, G. and Straccia, U. (1999) 'User profile modeling and applications to digital libraries', Proceedings 3rd European Conf. Research and Advanced Technology for Digital Libraries, Springer-Verlag, pp.184–197.

[3]Balabanović, M. and Shoham, Y. (1997) 'Fab: content-based, collaborative recommendation', Communications of the ACM, Vol. 40, No. 3, pp.66–72.

[4]Chen, H.C. and Chen, A. (2001) 'A music recommendation system based on music data grouping and user interests', Proceedings of the 10th International Conference on Information and Knowledge Management, ACM Press, Atlanta, pp.231–238.

II] Web references:

1) www.hackster.io/seeyouu/smart-wardrobe

2)www.digitaltrends.com/home/threadrobe-smart-wardrobe