A Food Wastage Reduction Mobile Application

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***Abstract*—** Wasting food is a common problem in our society. Food waste management is crucial since it can improve our environmental and economic sustainability. We have identified the use of mobile technology to reduce food waste management and built an android mobile application that allows restaurants to donate and share their foods and leftovers with people in need. This app will enable users to register, login, view items, add items, add items to cart, remove an item from the cart, and log out. This app is using the firebase storage and real-time database. Any user in need can see all the food images donated by different users and add it to his or her cart.

***Keywords*—** *Food Wastage; Mobile App; Firebase; Authentication; Storage; database*

I. INTRODUCTION

Mobile phone applications have seen wide use in recent years [1, 2]. It's known that Android is the most popular platform for mobile, right now android is used on over 190 countries in the world on millions of mobile devices. Android is the most installed platform for mobile, and the number is increasing rapidly since almost 1 million users every day purchase new Android devices and use it immediately to get digital content such as games, application, and many other services [3]. Due to that, we developed an android application *"FoodReduction App"* using android studio because it will reach a wider range of audience since most people nowadays use android phones. To improve the performance of the image processing algorithms, noise estimation can be used to adapt the detection step [4].

The purpose of this development is to limit the wastage of food in the United Arab Emirates. Many restaurants tend to throw the leftover food at the end of the day even though the food is perfectly fine to be eaten, which means that huge amounts of food are wasted. While all that food is being wasted, some families can barely afford proper meals with their limited money. They don't get enough nutrition due to the lack of having three meals in a day. Therefore, we decided to create our application to link the restaurant with the unfortunate people, so instead of throwing the food, the unfortunate will be able to pick it up from the restaurant at the end of the day. The application allows the restaurants to log in, and upload an image of the meals they have as leftovers along with a description of that meal, and the location where to pick it up. The users then, can log in and choose the meal suitable to their choice and can pick it up once they send a request to the application.

II. LITERATURE REVIEW

According to [5], food waste is a significant issue around the world. It is predicted through a survey that more than 58 percent of food that people produce for consumption is wasted every day. Whereas, more than 60 percent of people in the third world countries are dying in malnutrition without proper food for a living. Therefore, the technologically developed countries are emphasizing more on this issue. Therefore, that less food can be wasted and can be distributed to the needy people. According to [6] in the age of modern era, where we are developed through artificial intelligence, people are more dependent on the smartphone. There are various applications, which are developed to control the huge wastage of food, and it provides the opportunity to send that extra food to the people who need it. There are multiple applications, which control food waste. The most useful food waste application for android and apple are discussed below:

A. Food waste application of Singapore (11th Hour)

Tan Jun Yuan who is a food stall hawker from Singapore felt very bad noticing that people waste so much food in every year. He saw many vendors with leftover foods in a day. The quantity was 10 to 15 bowl of pork ribs served including other foods that he served the customers per day. He also saw that more than 35 percent of food he made every day was left as extra. Therefore, he created the application named 11Th Hour. This application provides the left and unused foods at the half of their original price before the restaurants are closed. After the creation of this application, there were almost 20000 downloads of this application [7].

B. Food waste reduction application from Netherlands (NoFoodWasted)

August de Vocht, a citizen of Netherlands developed this application to reduce the amount of food waste. This application makes collaboration with the supermarket so that people can be aware of the foods that will be expired very soon. According to [8], it helps the users to upload their grocery items, which will expire soon so that people who are in need of food can buy them at a reduced price and use them. It helps to stop the wastage of excessive foods. More than 20000 people have found this application useful, and it has reduced the amount of food wastage in the Netherlands.

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C. *An application to control food waste by UK and Ireland (FoodCloud)*

This application has been declared as one of the useful food wastage application in the United Kingdom as well as Ireland. This application notifies the supermarkets about their surplus food so that the charitable societies can collect them and reduce the chances of food wastage. This application works as an intermediate that provides the type of foods and arranges the pick-up for the charities. It also collects and stores the food so that the charitable societies can collect the food according to their requirements. According to [9] more than 1200 business hubs and 3000 charitable societies work under this application to provide excess foods to the homeless people.

D. *Food wastage Reduction Application from Africa (Cheetah)*

Some researchers from the University of Twente have developed this application to reduce the number of food wastages in Africa. It is seen that various fruits and vegetables lose their ability to be consumed due to poor road circumstances, less refrigeration in Africa. This application is created to gather those food items before they get rotten and distribute it to the needy malnutrition people of Africa. Dutch Ministry of Foreign Affairs helped the researchers in the development of this application. Mostly, farmers, the food transporters use this application, and it also helped them to reduce the chances of food bribing in Africa. It is expected that the public version of this application will be released within May, next year [10].

E. *Indian Food Wastage Reduction Application (No Food Waste)*

No Food waste is an application from India that allows the restaurants, food stalls and parties to inform about their excessive leftover foods so that needy people can collect them for their usage. This application collects those foods and distributes those among the homeless people, slum dwellers and orphanages as well as nursing homes. According to [11], the users can also notify them by showing hunger points, and they will distribute the foods to there. The only requirement is they take foods only if it is prepared two hours before.

These applications have changed the use of artificial intelligence by providing food to the needy people. It is considered one of the best uses of software development. However, food wastage is still a bad habit. According to [12], people need to be more careful while preparing or ordering food because many people around the world do not get to eat. Food wastage reduction has decreased a lot due to the usage of this application, but people need to be more sensitive and careful so that a better world can be created where no food is wasted.

III. Proposed Solution

The proposed solution "Food waste reduction app" comprises of two logins; user login and restaurant login.

Fig. 1. User login-in types

The user can register, login, logout, view food with image, title, and description, add food to the cart, and empty the cart. This app allows the user to have his/her account in the app using firebase email and password authentication. Both restaurant and users who need the food must register using the login page. During registration, some information about the users is saved to the real-time database such as age, name and gender under the unique user id generated by the firebase. So, each user profile information is saved into the database and when a user login we can get access to that user profile using its unique user id.

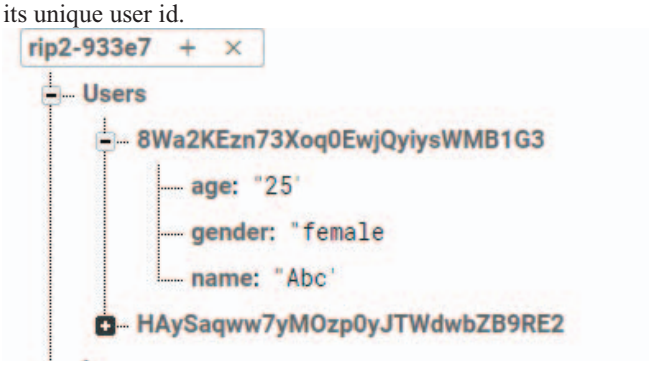
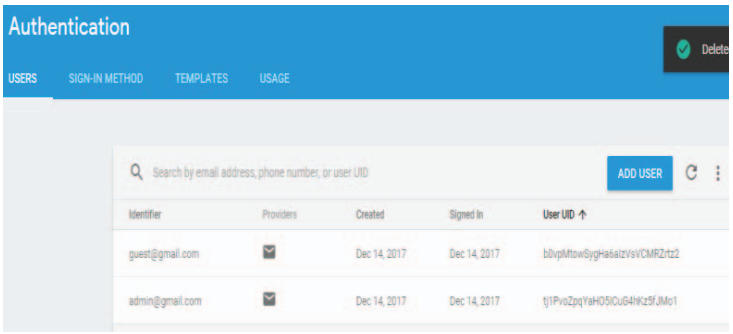


Fig. 2. User information saved in firebase real-time database

Credentials of restaurant and user will be authenticated in firebase authentication.



First, the app user chose to log in as a restaurant user who is donating food or as a user who needs to receive the food.

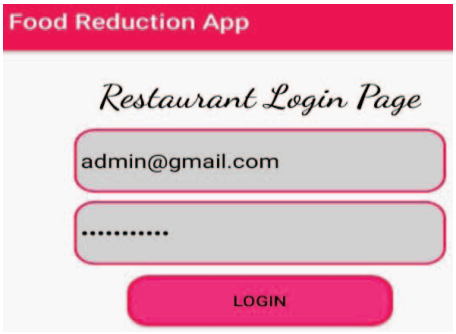


Fig. 3. Restaurant login

If the restaurant is not registered with this app, need to register.

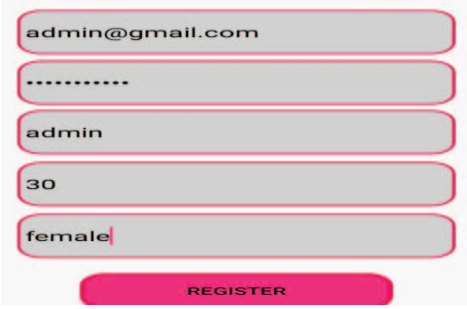


Fig. 4. Restaurant register

The image below indicates that the user has logged in successfully. And the corresponding images to that app user has displayed accordingly from the firebase.

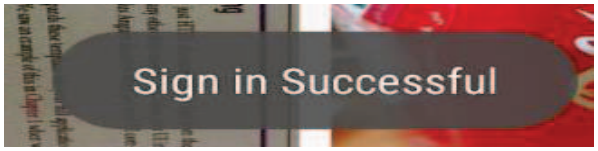


Fig. 5. Sign in successful message

Image tab shows all items in the firebase along with item title, description, and image by restaurant login.

Fig. 6. Restaurant items saved in the firebase

Each item saved in the firebase can be viewed by clicking on it.

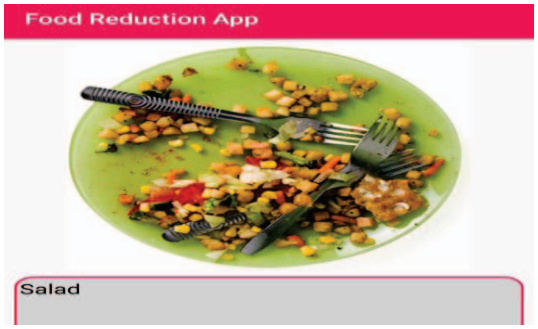


Fig. 7. View item saved in the firebase

The restaurant user can add new data by selecting new data. On this screen, the user can add image, title, and description.

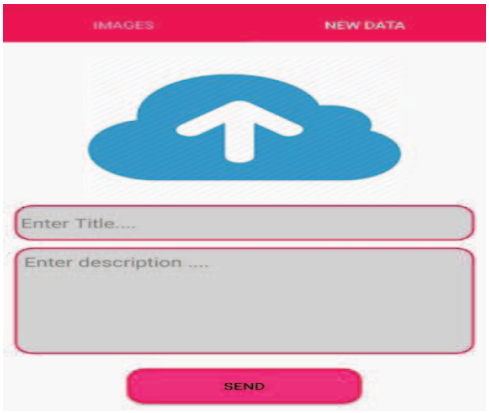


Fig. 8. Add data

Restaurant user can also add new data to the list by either selecting image from phone gallery or by taking a picture through the camera.

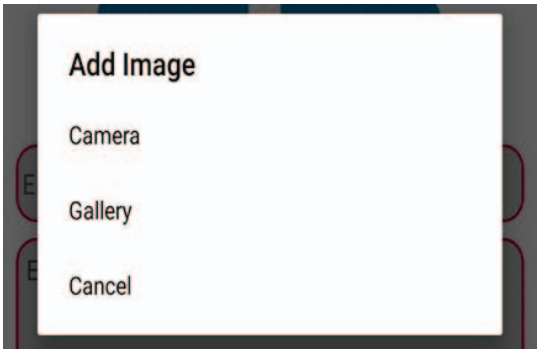


Fig. 9. Add image

If restaurant user selects camera option. The restaurant user will allow the application to access phone camera and allow restaurant user to take an image. After capturing an image, a user can add title and description of food uploaded and then click send button.

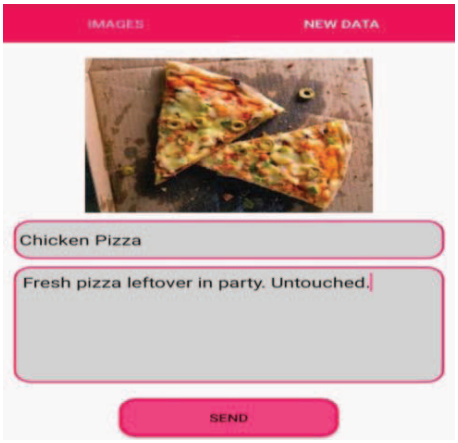


Fig. 10. Add an image using Camera

Once restaurant click on send button, if data is saved user successfully will receive a successful message.

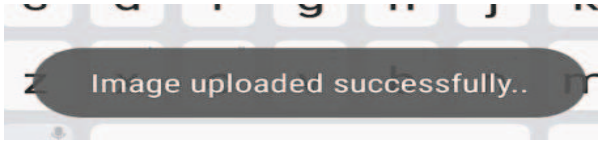


Fig. 11. Image upload successful message

After sending data, an image will be uploaded in firebase storage as shown in Fig. 13 and other details will be stored in firebase real-time database as shown in Fig. 12.

Fig. 12. New data stored in firebase real-time database

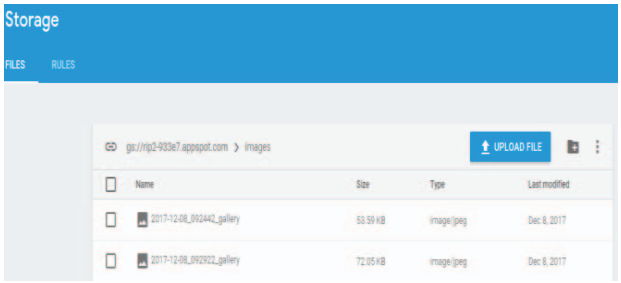


Fig. 13. New data stored in firebase real-time database

Also. A restaurant user can view new data uploaded in image tab of the application.

Fig. 14. After adding the firebase will update new data image tab.

Also, a user can select an image from the gallery of a phone. By selecting gallery option, a user will grant the app access to their phone gallery from where a user can select an image to be uploaded to the list of items.

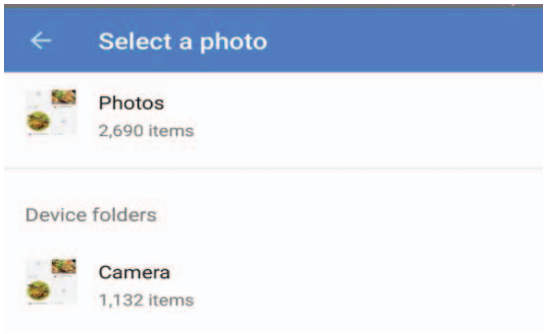


Fig. 15. Add image from Phone Gallery

Then, in the end, a restaurant user can log out.

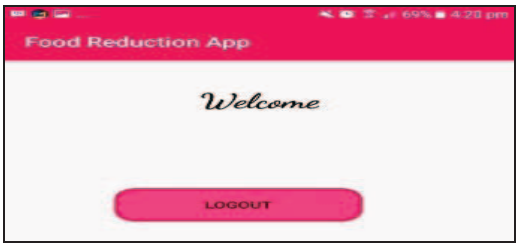


Fig. 16. Restaurant user logout

Likewise, restaurant user, another user can register, login, and log out. After login

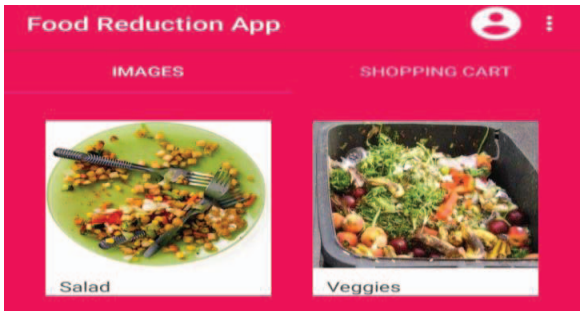


Fig. 17. List of items

After the user logs into the application, a list of meals will appear to him. This list is downloaded from firebase to the application. The images of the meal are saved in the storage inside firebase, and the link of that image in the storage saved in the database in firebase along with the description of the meal and its title. Ergo, the images of the meal are downloaded to the application from firebase with the detail and displayed in a grid form for the user to pick any meal they want as shown in Fig. 17.

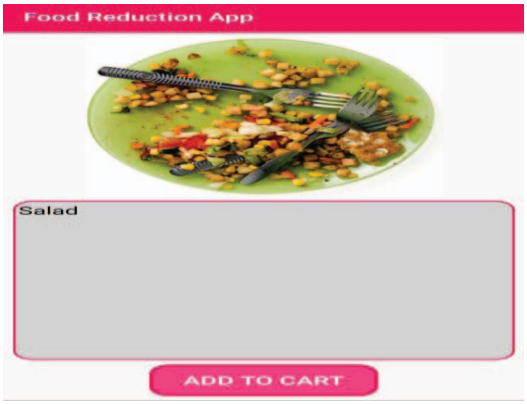


Fig. 18. Add Cart

The user then clicks on the meal wanted. The image of the meal will enlarge, and it will show the full details given by the restaurant, which were uploaded to firebase. The user will be able to add the meal to the cart using the “Add to Cart" button shown. The button will allow the users to add the meal to the shopping cart, and the user can add multiple meals depending on their need, as shown in Fig. 18.

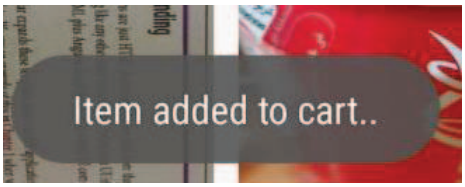


Fig. 19. Item added message

After the meal is added to the shopping cart by the user, an alert will show on the screen for the user to know that the item was added to the shopping cart, as shown in Fig. 19. The user then can check the cart for further actions.

Fig. 20. Item added to the cart

After the user chooses to enter the shopping cart, a list of the meals added will be shown in the shopping cart. The user has two actions to do, either empty the shopping using the "Empty Cart" button in case the user wasn't sure of the choice made or proceed to checkout using the "Proceed to Checkout” button, as shown in Fig. 20.

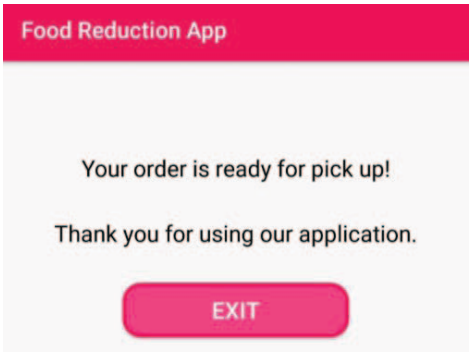


Fig. 21. Proceed to checkout

After the user proceeds to check out, a message will appear to show that the order of the meal chosen is ready for pick up from the restaurant as shown in Fig. 21. The user then can exit the process, and they can order another meal or log out.

Fig. 22. Cart empty message

In case the user clicks on “Proceed to Checkout” button without having meals in the cart. An alert will appear for the user saying the “Cart is empty”, and won’t allow the user to proceed to checkout. Therefore, the user will only move to the next page when having meals in the shopping cart only, as shown in Fig. 22.

IV. Conclusion and Future Work

Our study has investigated the problem of food waste that has many serious side effects economically and socially. However, the wastage of the food can be prevented or at least decreased using political rules and technology. Mobile application technology is beneficial for food waste management. The app aims to encourage better food management. Our proposed solution should reduce food wastage by facilitating food sharing in UAE community using mobile technology. This work is an initial step towards designing a better system to reduce daily food waste. In future, this app could be enhanced more by adding the following features:

- Extending our app to have many types of donating users either from organizations such as restaurants, or a family or a single user
- Adding the location (GPS) facility to our apps. The donating user should specify the location of the shared food.
- Adding the time and date of each meal shared by users
- Making the app supports multiple platforms (cross-platform app)

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