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FoodResQ, A Mobile Application to Reduce Food Wastage

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Abstract: ***Food waste has emerged as a significant global issue, and its severity continues to escalate daily. It poses a dual challenge: not only does it contribute to environmental harm through excessive food production and disposal, but it also persists in a world where 800 million individuals suffer from hunger. This problem is exacerbated as both the economy and population grow, leading to increased food wastage. A major portion of this waste originates from hotels and restaurants. To tackle this problem, we are harnessing mobile technology as a solution, facilitating businesses to redistribute surplus food to those who require it, thereby reducing food waste. Hence, we are in the process of creating a mobile application that will allow users to request food donations. Subsequently, local volunteers will step in to collect and distribute the food to those in need within the community.***

Keywords: Food wastage, saving food, sustainable solution, environmental crisis, Android application, Food waste reduction, Google Firebase.

I. INTRODUCTION

Of all the problems our world is facing today, food wastage is a crucial one, that has an indirect adverse effect on the environment, the global economy, and emerging societies. Initially, food is cultivated on farms or harvested from water bodies. This is followed by various stages of handling, preparation, distribution, and consumption. Throughout these stages, whether on a large or small scale, substantial food wastage occurs regularly, encompassing storage, processing, and disposal activities in distribution centers, hotels, restaurants, and households. Roughly 1.6 billion tons of food go to waste each year, which accounts for a third of the world's entire food output. This wastage also translates into substantial financial losses, with an estimated total cost of USD 2.6 trillion. The most effective strategy to curtail food waste primarily focuses on production and distribution stages, although it's important to acknowledge that food wastage still occurs at the household level, especially in places like restaurants and hotels.

The goal of developing this system is to minimize food loss at restaurants and hotels that serve edible food while addressing the issue of hunger faced by individuals who do not have access to the recommended three daily meals. Our application aims to connect these needy families with restaurants and hotels by enlisting volunteers who will proactively collect surplus food from these establishments and deliver it to those in need. To facilitate this process, restaurants must log in and provide details about the excess edible food to ensure a continuous flow of food from the establishments to those who can benefit from it.

To combat food waste, we are in the process of creating an app designed to distribute surplus food to those who require it. This app serves not only as a tool for addressing the problem but also as an educational resource, enlightening users about the issue at hand and offering them a practical solution. By using this application, individuals will witness how even a small investment of time and effort can make a significant positive impact.

A. Contribution of the Paper

1) We list the various systems developed to reduce food wastage.
2) We compare these systems and note down the drawbacks.
3) Propose our system.
4) Show the working of our system.
5) Results of our system and future scope.

II. RELATED WORK

To design the most optimal system we considered several contemporary methods and technologies: In Paper [1] the main objective is to connect the organizations or individuals that want to donate excess food to the community, who then deliver this food to needy people. In this system, the community keeps track of all efficient donors and then contacts the donors whenever needed.[2]The study focuses on investigating household food waste using proper technology.

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FoodTrek is an Android app developed for this purpose that will give alerts to people regarding the expiry dates of food items at their homes. Greeting reminders before the food items expiry will make people aware and thus reduce food waste. [3]This paper gives information about how much food is wasted every year and the various factors responsible for its generation. The main sources of waste generation are food and beverage industries as well as households. The aim of this study is to find where most waste is generated and how it can be reduced.The paper points out the best food waste management techniques that would reduce the generation of food waste and will give alternatives for recycling food waste.[4]In this paper, they have studied the implementation of inventory control over the food supply chain. This paper depicts a digital retailer, responsible for supplying the stock to reduce the dead stock of food. [5] In this paper, they have studied the information available on the increase in food wastage at the global level, national level, and community level. Different techniques were also mentioned which may lead to a reduction of food waste and managing the same at the global level. Excess usage of food materials is responsible for food loss and is the main reason being highlighted in the paper. [6]The system studies the amount of waste created, how is the waste created and the waste accumulator of each and every cafeteria and then conveys them to limit the amount of waste and keep the details about how they control the food waste. This system will also record the waste indicators i.e. the greater part of the waste of each cafeteria.[7] The increase in wastage of food, clothes, books, etc makes the charity in need of donations. Helping Hands creates a platform where people can donate food, books, etc. to the NGO.[8]The research paper showcases the applications used in different countries and the working of the actual application that was developed for the reduction of food wastage in detail.[9]This research paper deals with the analytics and statistics of the global scenario of food wastage (for eg, the amount of leftovers in guest plates {in kg} per capita per day). It also states the ongoing actions and regulations regarding food wastage in different countries.

III. COMPARATIVE ANALYSIS

Table I. ANALYSIS

App/ Website	Volunteers involved	Community involved	Notification Feature	Quality Check
Roti Bank	Yes	No	Yes	No
Gocopia	Yes	Yes	No	No
Karma	Yes	Yes	Yes	No
OLIO	Yes	No	No	No
Akshaya Patra	Yes	No	Yes	No

After reviewing various technical papers we found that these applications could be more useful if volunteers are involved. There are many people who like to do social work. Also, it is not possible for committee members to reach everywhere and collect food. Also doing surveys and informing people about various techniques to solve waste management problems is not enough. People need easy and convenient ways. After studying the above similar websites and apps, we found that quality check is not mentioned and there is no feature to make it convenient for the volunteers to find needy people in their locality.

IV. METHODOLOGY

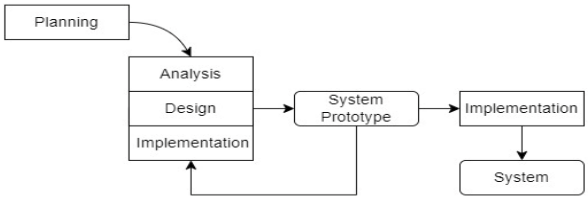


Fig. 1**:** Prototype development stage

For developing the most efficient system we have used the prototyping model. This model in turn reduces the implementation time as well as the number of trials. The process is clearly depicted in Fig.1.

A. Analysis

For analysis we did a literature survey of 9 existing systems as well as observed some existing apps and websites used for similar purposes. There were 5 websites we studied they are Roti Bank, Gocopia, Karma, OLIO, and Akshaya Patra. These websites work as mediators and supply food, goods, and money to needy people donated by people. These websites function in different ways but have the same objective. They all work to provide quality life to the needy. We analyzed these websites so we can create a system that can have features these websites lack. Also, we performed an analysis to see how small communities work and to develop an application that will be helpful to these communities as well. The literature study shown above was conducted to get an overview of existing systems and to find loopholes in them.

After analysis, we found out that an essential feature is not included in these systems, i.e. tracking the location of needy people. If donors can search for needy people near them, they can directly go and donate food without involving any third party.

B. Design

There are two major modules in this system i.e. Donors module and the volunteers module. The donors module is for people who work at hotels and catering services. These people will use this app to know where the needy people are and search for the needy people near them.The second module is volunteers it is for people who are ready to volunteer and help needy people but don't know how. Here we develop a design to include the above-mentioned features, which will help develop the application prototype.

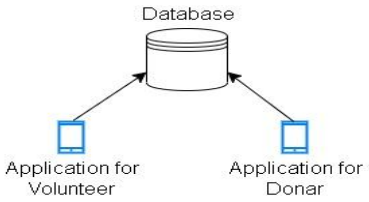


Fig. 2**:** Proposed Design

C. Develop Prototyping

We developed the prototype as discussed in the design stage. Including both the modules and the discussed features. This Android application is made using Flutter and Dart programming languages. While Google Firebase is used for the backend.

D. User Evaluation

Here we test the interface and see if there are any improvements that need to be done. We gave some teachers to use our application and depending on their feedback made a lot of changes. The UI Design was changed and made more convenient for the user to use. The below table clearly depicts the initial features and design and then Stage 2 is the improved system.

Table II. Stages of the system

Stages	User	
	Donors	Volunteers
Stage 1	• Registration • Login • Fill the form for donation of food item	• Registration • Login • Search for Donors • Search for needy people
Stage 2	• Registration • Login • Add donation • View donation • Add location of needy people • Form for quality check of the food item	• Registration • Login • Search for Donors • Search for needy people • Add location of the need people. • Add donation

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E. Implementation

At this stage the system is completely developed and working. We have used Dart programming language for interfaces and Google Firebase for storage purposes.

Our project consists of three modules:

1) Donors

In this module a donor will log in first after he has logged in he will be redirected to the donor home page, where he will get the following options:-

a) Add Donation - If you want to donate food you have to fill the following details:- 1. Adding food description 2. Adding location After clicking on submit your donation will be placed.

b) View Donation - This page will allow you to view your donations.

c) Add Location of Needy- Whenever people see needy people in their locality or anywhere they will click on 'add location of needy people', which will redirect them to a new page where they can add the location of the needy people.

2) Volunteer

Volunteers will have to log in first and after they have logged in they will get the following options:-

a) Search for Donations

- View donors- After logging in a new screen will be opened with a search bar on the top where the volunteer will have to specify the area, which will give him a whole list of donors in his locality.
- Confirm pickup- Then he can choose the closest donor and click on view donor, which will give him the exact location of the hotel and then he clicks on "Selected" to confirm that he has selected that donor.
- Quality check- After the volunteer goes to the donor and picks up the food, he will have to open the app and fill out a quality check form which has certain parameters like smell, and will have to rate the food. If the rating is appropriate then only he can take the food otherwise that food will be rejected. 10 4. Mark done- If the food is not rejected then the volunteer will supply the food to the needy people and click on the 'Done' button.

b) Search for needy people this page will allow you to search for needy people near you.

c) Add the location of needy people On this page you can add the location of needy people.

d) Add your Donation Here you can place a donation

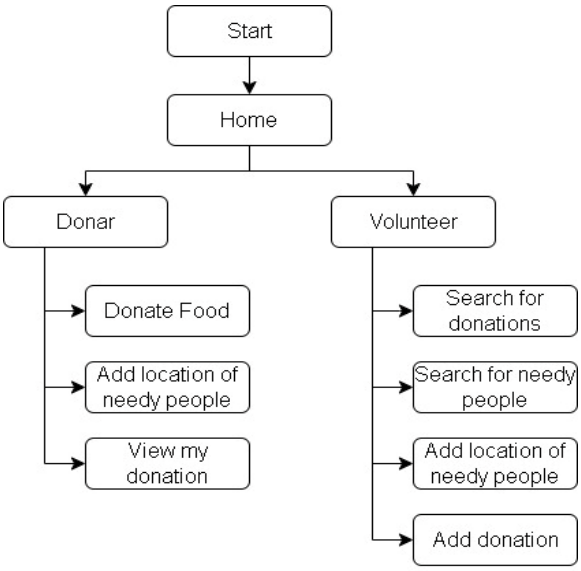


Fig. 3**:** Flow Diagram

Figure 3 shows the above-mentioned steps in a diagrammatic format

V. RESULT

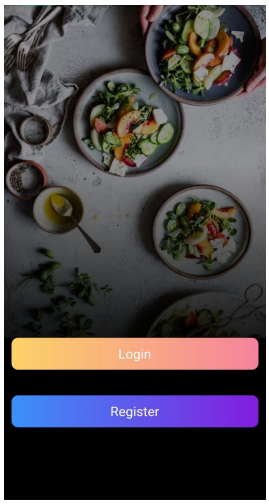


Fig. 4: Login and Registration

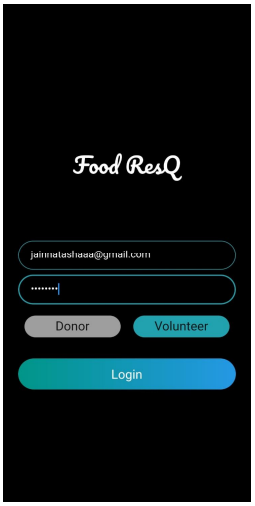


Fig.5: Login

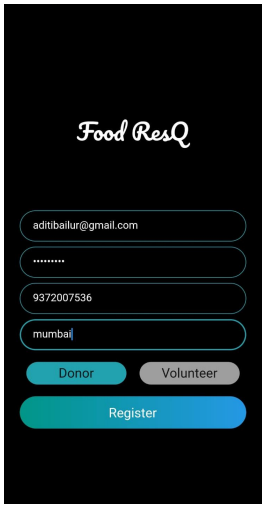


Fig.6: Registration

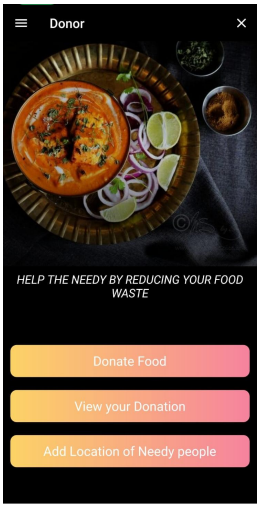


Fig.7: Donor's Dashboard

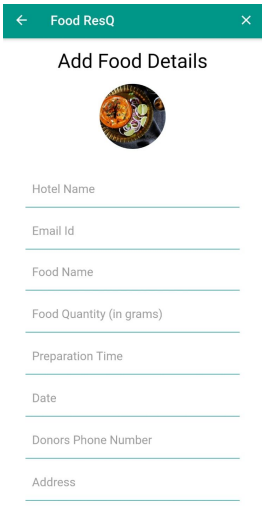


Fig.8**:** Donate Food page

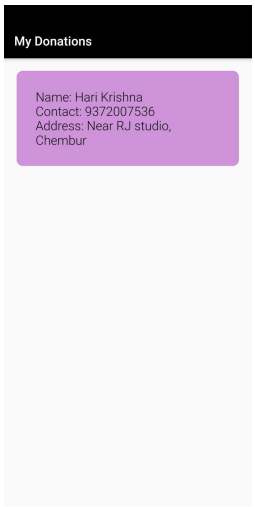


Fig. 9: View Donation page

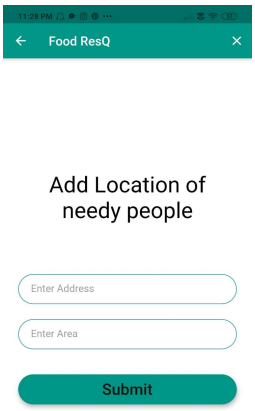


Fig. 10: Add the location

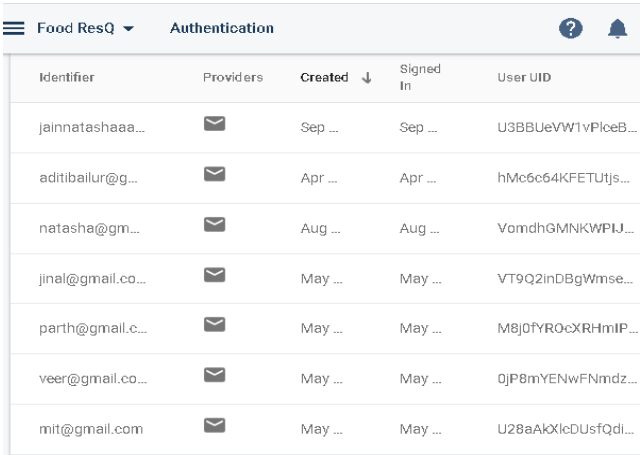
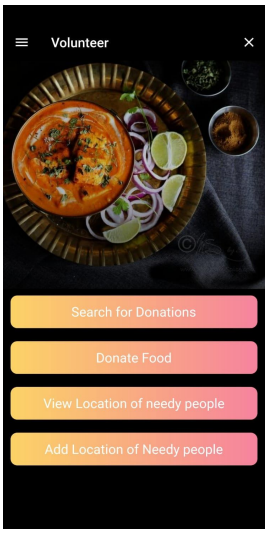
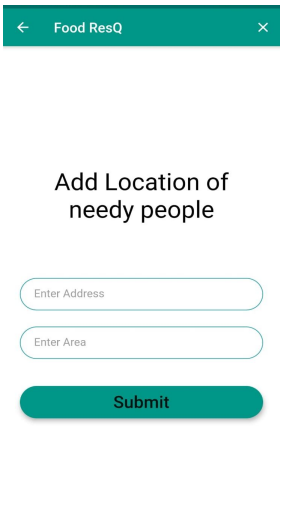


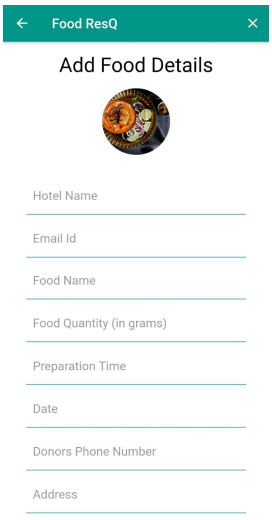
Fig. 11: User Authentication

The First page that appears after you open the app is login and registration, as shown in Fig. 4. The user can log in and register as a donor or a volunteer, as shown in Fig. 5, Fig.6. If you have logged in as a donor, Donor's Dashboard appears, as shown in Fig. 7. Here there are 3 options if we select Donate food we are redirected to Add food details form, as shown in Fig.8. Once we submit this form our donation is registered on the app. Now if you click on View donation in the Donars dashboard you will be able to see your donation there, as shown in Fig. 9. We can also click on Add Location of Needy People and fill in the details, as shown in Fig.10.

Each user registers themselves on this app and their registration information is saved in the real-time databases.We have used the Firestores authentication system for saving user email and password, this system enables us to access each user with a unique ID assigned.







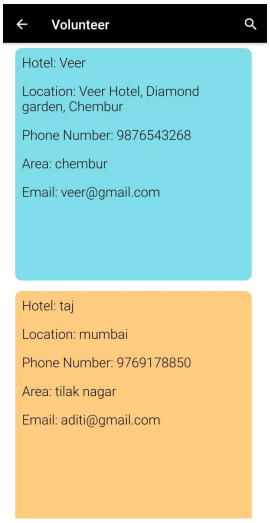


Fig. 12: Volunteers Dashboard Fig. 13: Add the location Fig. 14: Donate food page Fig. 15: List of the location of the needy

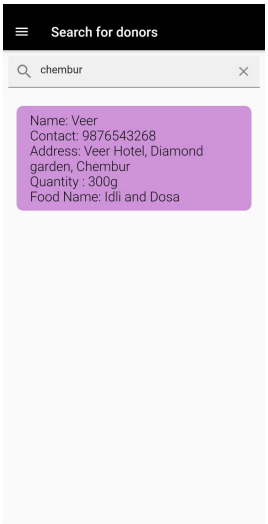




Fig. 16: Search for donors Fig. 17: View the location of the needy

Now we move on to the Volunteers section if you have logged in as a volunteer then the Volunteers dashboard as shown in Fig. 12 will appear. Users can add the location of the needy people near them in the Add location page, as shown in Fig 13. In the dashboard, you can click on donate food and fill in the details as shown in Fig. 14, and make your donation. If you click on Search for Donations, you will be redirected to a page containing a list of details entered by donors, as shown in Fig.15 .You can also search for donors near you by clicking on the search icon, as shown in Fig. 16. If you click on View location of needy people, we get a list of locations of needy people, as shown in Fig.17.

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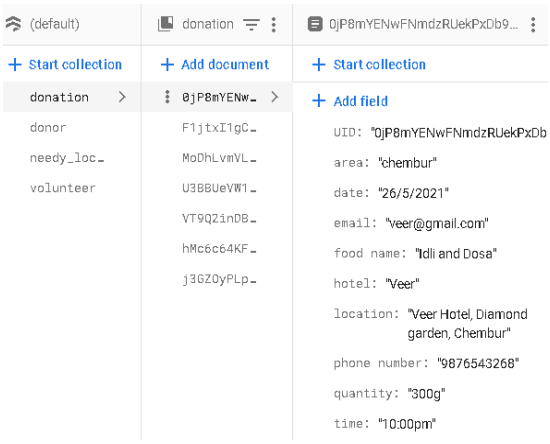


Fig. 18: Firestore Database of donation data

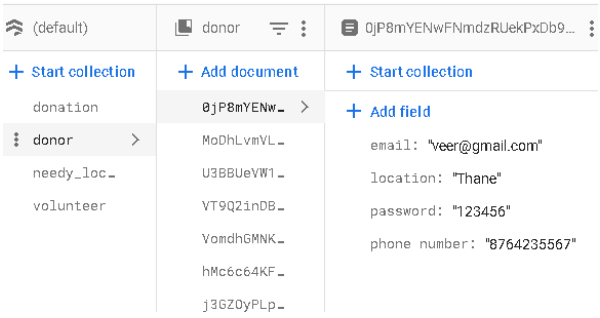


Fig. 19: Firestore Database of donors login details

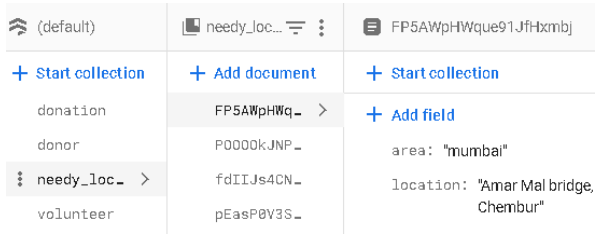


Fig. 20: Firestore Database of the location of needy people

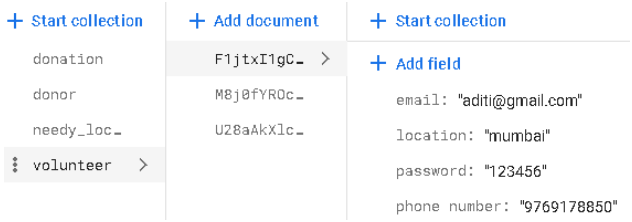


Fig. 21: Firestore Database of volunteers login details

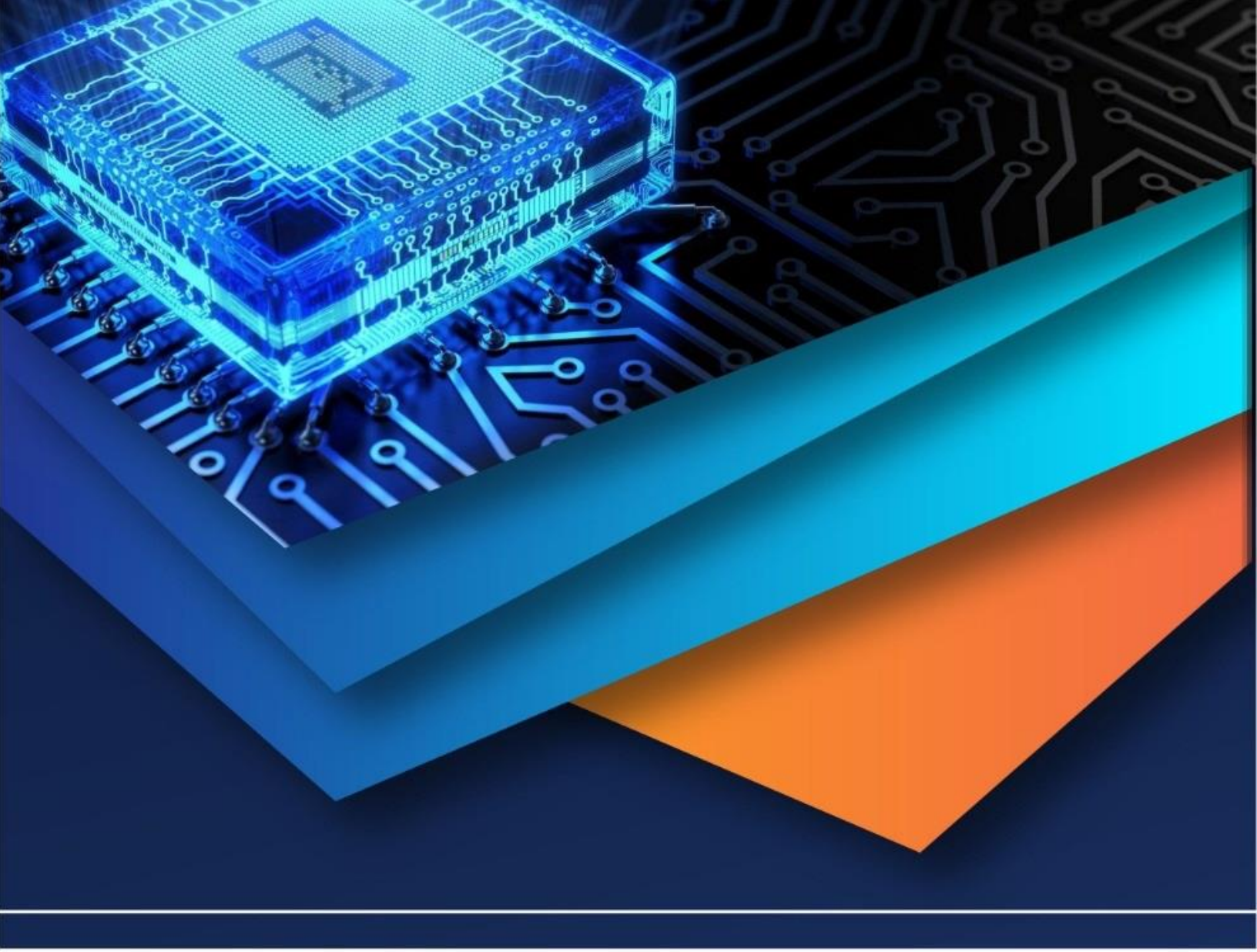
VI. CONCLUSIONS

While we've met all the necessary criteria and established connections between the application, food donors, charitable organizations, and individuals in need, there are still areas for improvement. It's essential to engage with experts in food safety to guarantee the safety of all donated food items. Additionally, partnering with local governments and other non-governmental organizations (NGOs) specializing in food donation is crucial. We can also introduce various methods into the system to inspire and incentivize both donors and volunteers. Also adding a GPS tracker system will increase the convenience.

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