Senior Design Project

Specification Document

Team No - Team Name: 2332 - Cyclops
Supervisor: Shervin Rahimzadeh Arashloo
Innovation Expert: Tuğrul Ünsal
Date: 16.10.2022

Kaan Kurçer - 21902348
Jankat Berslan Dinçer - 21902035
Osman Serhat Yılmaz - 21902903
Özgür Abi - 21902358
Ali Doğaç Urkaya - 21903213

Table of Contents

1. Introduction

Restaurants are visited by hundreds of customers every day. Different types of customers have different spending habits, visiting times, and preferences. The traffic of the restaurant also varies greatly for different hours of the day. Although restaurant owners already record the inside of their restaurants for security reasons, they are unable to collect and utilize the data produced by their customers. The information gained from monitoring the customers' count and preferences could be used to enhance both the user experience of the visitors and the profits of the restaurant owners[1]. Cyclops aims to analyze the security feed of the restaurant to collect this information and provide it to the restaurant owner along with tips on how to improve their restaurant using said information.

1.1. Description

The first thing we want to do is to use a security camera facing towards the entrance to keep track of the customers while they are visiting the restaurant. The camera will use facial recognition technology to create an internal profile for each customer. Through this system the restaurant owner will be able to know exactly how many customers are in their restaurant at a given time. They will be able to look at a heatmap of how crowded their restaurant is at any given hour, and they will be able to use this information to promote customers to visit their restaurant more at less popular hours through discounts or special offers only available at those hours. We will also provide the information on how crowded a restaurant is to the customers through a mobile application, so that they can plan their visits accordingly.

The customer profiles created by our facial recognition system will also be able to identify extra information about customers such as age and gender. This will allow restaurant owners to get a better idea of their user base. They can use this information to transform their restaurant to better fit the needs of their primary demographic, or to adhere to the preferences of customer types who don't usually visit the restaurant to make their restaurant more popular for different types of customers. The program will also count the number of people who sit together at a table and recognize them as a group. Similarly to the previous feature, the program will allow restaurant owners to know which types of groups of people visit their restaurants more regularly. These group types would include people with children, young friend groups, or people on dates, among others.

The customer profiles will not be deleted after the customers leave and will instead be kept in a database. This will allow restaurants to remember repeat customers. If the name of the customer was learned through some way by the waiters or payment systems, the restaurant staff will be able to input the name of the customer to the system and associate it with the profile. If the customer visits the restaurant again in the future, the waiters will be able to greet them by name or even give them recommendations on

what to buy based on their previous activity in the restaurant. This will provide a personalized experience for the customers and make it more likely for them to have a positive, memorable experience in the restaurant, making it more likely that they visit again in the future.

These features will better utilize the data already collected by the restaurant to improve dining experience, bringing incremental innovation to the dining sector. Overall this project will mainly focus on two types of innovation. A service innovation by improving existing systems for customer management in restaurants and product system innovation by bringing together a variety of systems used in many restaurants and creating a new system.

All of these features will allow restaurant owners to optimize their restaurants in order to provide their customers with a personalized experience and a restaurant that fits their preferences. It would also let them get more customers during less busy hours through promotions or discounts. This way they can increase both the satisfaction and the number of their customers, which would lead to increased profits.

1.2. Constraints

1.2.1. Implementation Constraints

- Git and Github will be used as tools for version control [2].
- Github pages will be used to upload and display project reports. [3]
- Face recognition algorithms will be used to detect and save the facial features of the customers.
- Computer vision and image processing technologies will be used to detect the amount of customers in the restaurant.
- ASP.NET will be used as the framework of choice for the backend development.
- React will be used as the framework of choice for the frontend development.

1.2.2. Economic Constraints

- The frameworks and libraries that will be used during the development of the project will be free.
- Certain fees might be required to run the application online(database, website etc.)
- The application will be subscription based, the restaurant owners will have to pay monthly to continue using our service.

1.2.3. Language Constraints

- The only language that the application will support will be English, however other languages might be added depending on the success of the publishing of the application.

1.2.4. Ethical Constraints
- The footage that will be obtained won't be shared with any 3rd parties.
- The footage that will be obtained will only be used for analyzation purposes.
- All the data obtained will be handled according to KVKK.

1.3. Professional and Ethical Issues

Our project aims to work with the camera feed captured every day in restaurants. We also plan to keep information on repeat customers and make profiles of customer types, visiting times, and spending habits. The information we gather isn't private data, we will only be using the publicly available information that is already regularly gathered in restaurants for security. We will use this information to enhance the service the restaurant provides for its customers. The data we collect will not be shared with 3rd parties and will be provided to the restaurant owner to use in improving their restaurant along with tips on how it might be used from the program.

2. Requirements
2.1. Functional Requirements
- The customers and restaurant owner can view the number of people in the restaurant.

- The customers and restaurant owner will be able to view which tables are empty.

- The customers will be profiled by the security cameras (their age and gender will be determined for now) and the resulting data will be presented to the restaurant owner.

- The customers will be recognized by security cameras by using facial recognition algorithms, and new customers will be saved to the database. Optionally, the name of the customer and other information can be obtained by the restaurant owner and saved to the database.

- The data collected by all above processes will be accessible to the restaurant owner. The data will be classified and several charts will be made for the restaurant owner to view (At which hours the restaurant is crowded, at what time male customers visit, which tables are usually preferred etc.).

2.2. Non Functional Requirements

2.2.1. User Friendliness

The user interface that will be designed will be easy to use and simple. The data will be presented in a way that will make it easy to understand the results of our analysis. The ultimate goal of our interface design is to create an interface where people who aren't that familiar with web applications will have minimal issue navigating the application.

2.2.2. Scalability

The application will be able to be used by both small restaurants and bigger restaurants, given that the required footage is provided by the restaurant.

2.2.3. Security

The data gathered by the analysis of security camera footage will be secured by the program to prevent it from reaching third party platforms and establishments.

2.2.4. Reliability

Cyclops will have a very low downtime due to hardware issues, as the data is obtained through the restaurant's own security cameras. The data will be accessible to restaurant owners at any time so the software will run consistently with minimum crashes.

2.2.5. Extensibility

Aside from the features that will come by default, extra features which are asked by the restaurant owners will be added to the application.

3. References

[1] R. Carriere, "Is it time for facial recognition in restaurants?," *QSR magazine*, 21-Jan-2022. [Online]. Available: https://www.qsrmagazine.com/outside-insights/it-time-facial-recognition-restaurants. [Accessed: 16-Oct-2022].

[2]https://git-scm.com/about

[3]https://pages.github.com/