

University at Buffalo
Department of Computer Science and Engineering
CSE 473/573 - Computer Vision and Image Processing
Project #3

Visual Welcome Center

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1.Introduction:

In this project, we will interact with visitors to the Department of Computer Science and Engineering at UB. The project aims to provide a new person with an experience of Computer vision advancement in UB by completely automating the visiting process by providing welcome message and steps to fulfill his purpose of visit if he enrolled in the system.

It also welcomes people who didn't schedule visit and provides with registration process and based on their requirement provides steps to complete it.

2. Requirements:

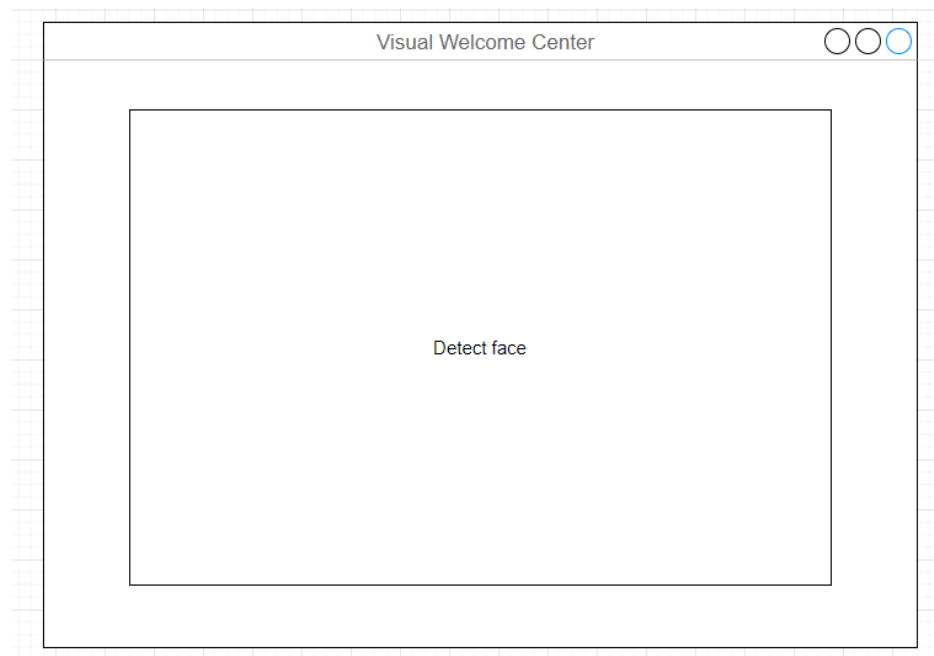
The system is able to recognize a face closer to the screen in real time even when there are multiple people present in the area. If the user data is already available in the system it should recognize the person and display the welcome message and their purpose of visit.

If the person data is not available then it displays the user as unknown and redirects the user to register by providing web link through QR code. During the registration the user can enter the basic details and upload their photo. Once the user confirms the details the database stores it. We can retrieve the user face and appointment history through logs.

3. Project Flow Diagram:

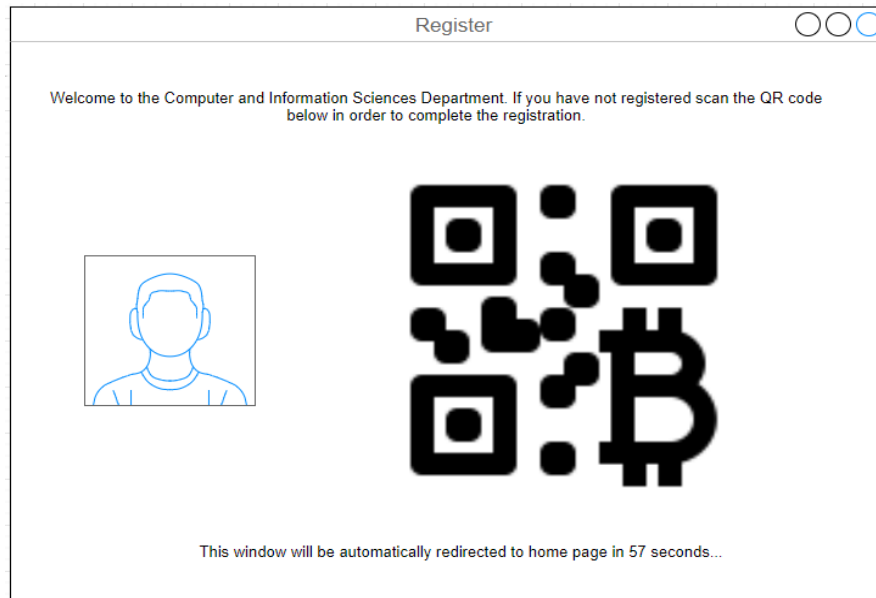
Step 1:

The camera of the system will detect the face of a person when he/she is nearer to the camera by some distance.



Step 2:

If the system didn't recognize the face of the person it displays the welcome message to the person as unknown and provides QR code.



Step 3:

When the user scans the QR code it will direct it to the website where it asks for the basic information of that person. The website screen is as shown below.

Name

Email address

Appointment Date

May 2020						
Mo	Tu	We	Th	Fr	Sa	Su
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	1	2	3	4
5	6	7	8	9	10	11

Upload your photo

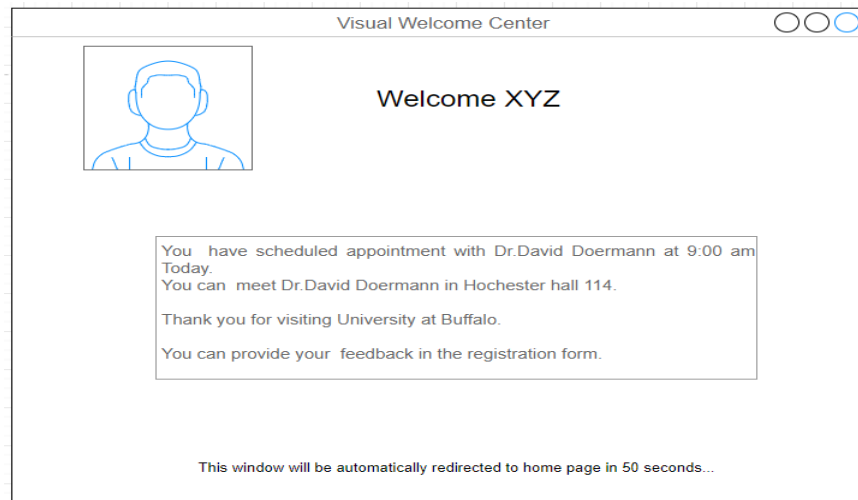
Choose File No file chosen

Visiting Purpose

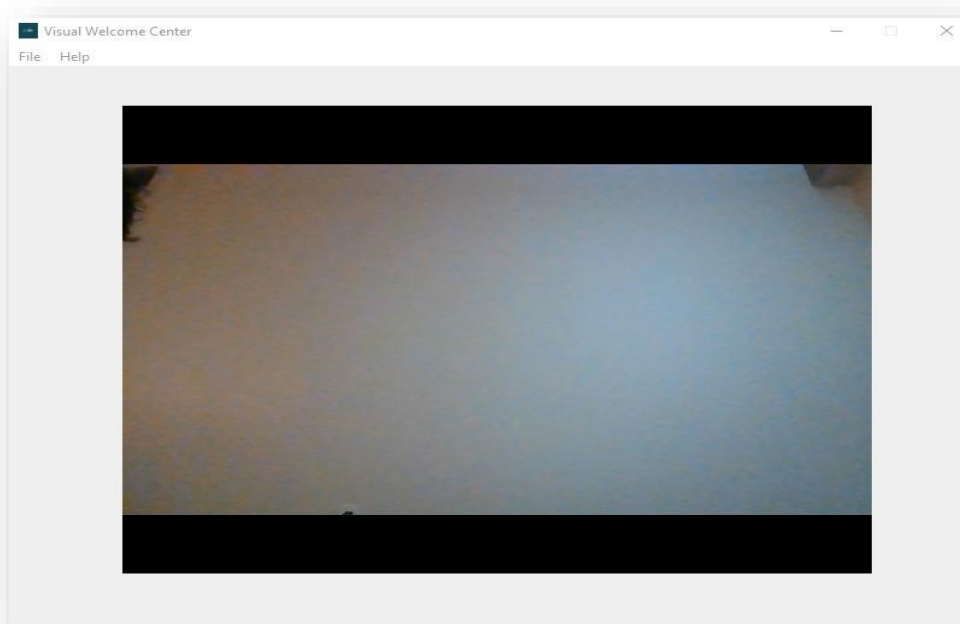
Register

Step 4:

Once the user gets registered in the system Database then the camera will recognize the person and displays the welcome message and purpose of visit.

**4. System Design:****4.1 Image Capture:**

The camera in video capturing mode will find people in its focus area. The system reads the frames at 25% of original frame speed. When Camera finds the person from certain distance it captures the face information of the person using face detection module running in the system.

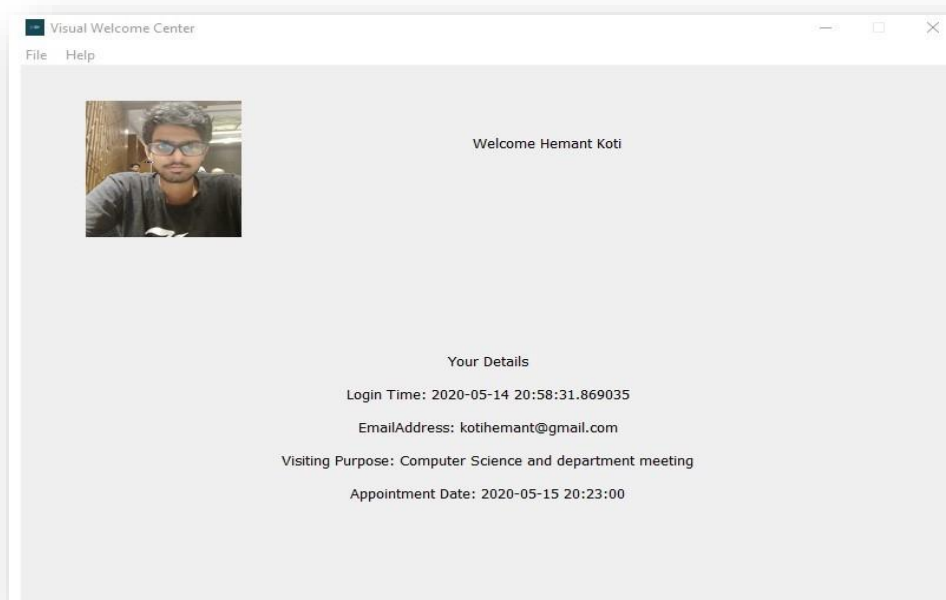


4.2 Face Detection:

We use face recognition module which uses deep learning to find face locations in an image. First, we run the face detector on an image and extract a copy that has 150x150 pixels in size and rotate it to make it centered. Then we try to recognize the face from existing faces in the database.

4.3 Face Recognition:

We use k nearest neighbors' algorithm to determine the face based on available data. We use deep neural network to encode each face into 128 Dimension vector. The images of same person are closer in this encoded space. We run KNN to find the face of similar person. We decide if the image given by the camera is nearer to the encoded face data in database. We send these results to the main screen.

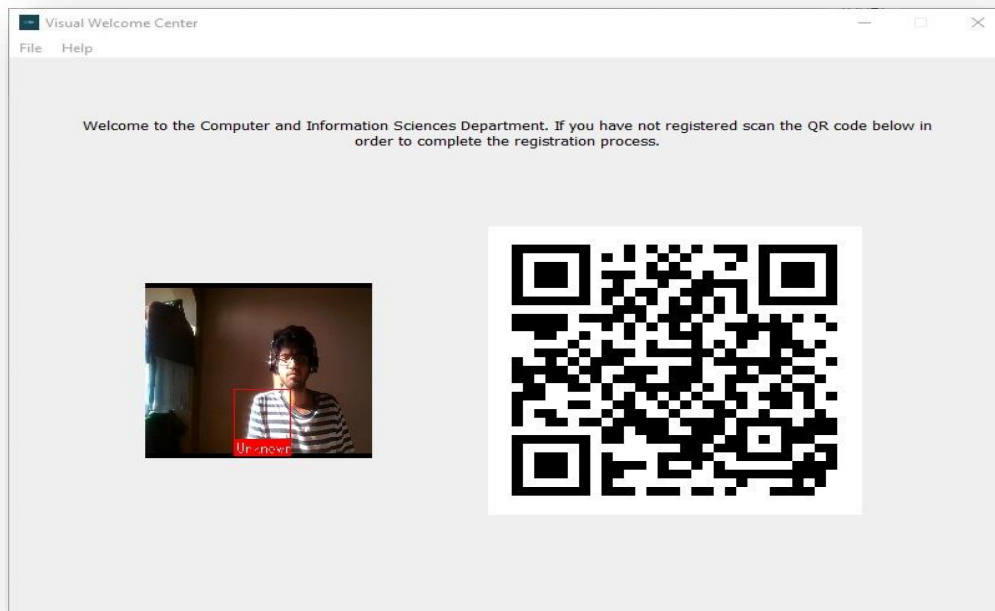


4.4 Purpose of visit:

Based on Face Recognition result if the face is found then we display welcome message with the name of person. We provide directions to the person based on his scheduled appointment.

4.5 QR code:

If we didn't find the information of the existing person we display face as unknown and ask the user to enroll. By providing with him a QR code. Once the visitor scans the QR code he receives the link (<https://visualwelcomecenter.azurewebsites.net/>.) for registration form in which he has to provide basic details and upload his image. Once the visitor completes this process the data gets updated in database. The system recognizes the person and display the welcome message for the user. We also provide him with the directions in order to complete his requirement.



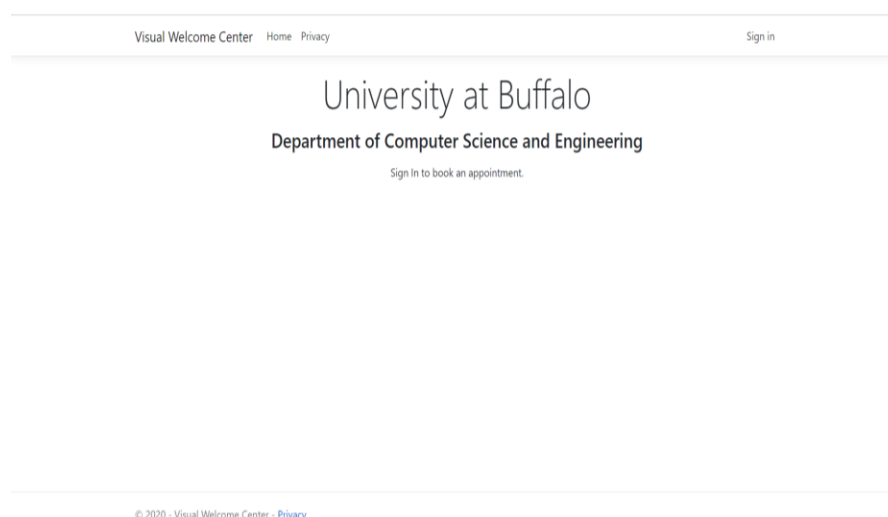
4.6 Appointment History:

The system will store the visit history of a person each time when he visits the campus. Each time user logs in, it stores the data and tracks the usage and appointment details of the user.

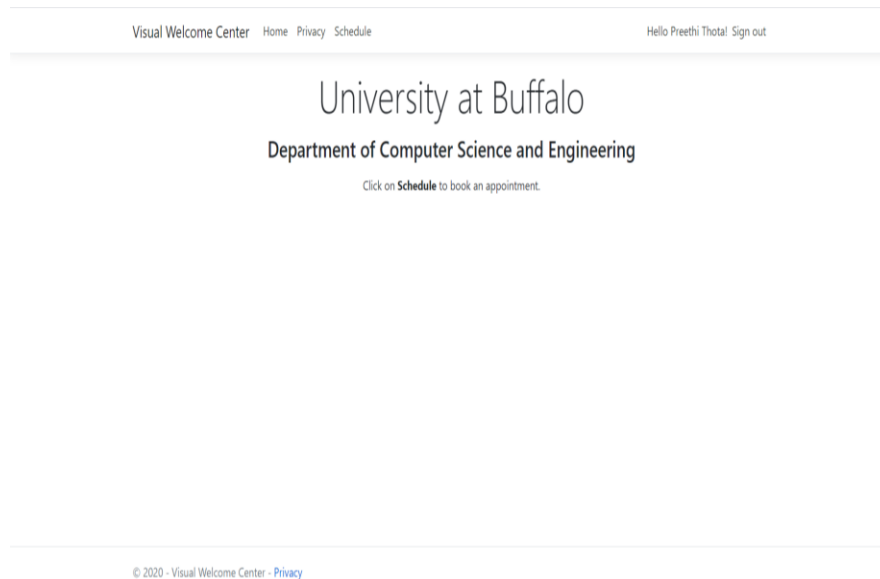
5. Enrollment Process:

Initially, the visitors would be asked to register for an appointment in <https://visualwelcomecenter.azurewebsites.net/>.

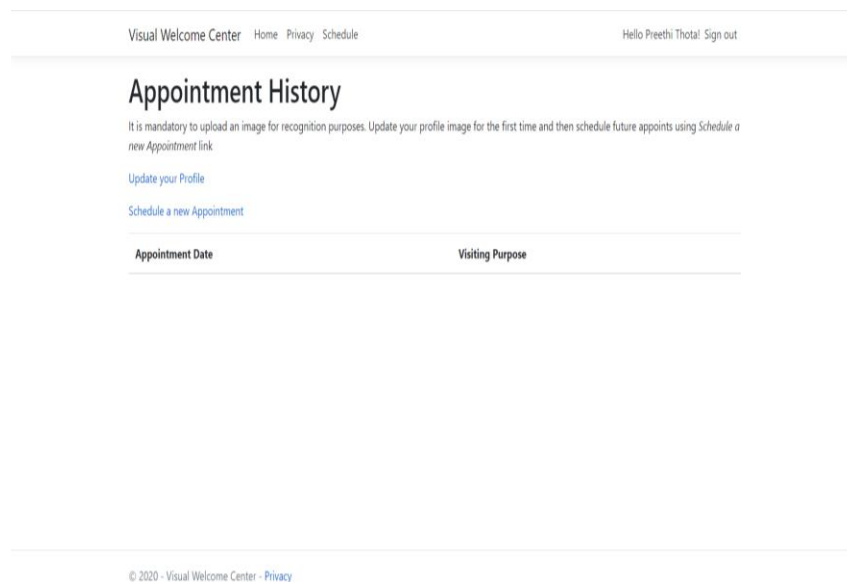
1. The following web page will pop up when we click the above link.



2. In the above step we are supposed to sign-in in order to make an appointment, then the following page will appear.



3. Now click on schedule, then the below page will appear where first we have to update the profile of the person.



4. In this update profile the person email address and their picture will be taken as input and will be updated to data base once clicked on update.

Visual Welcome Center Home Privacy Schedule Hello Preethi Thotal Sign out

Update your Profile

Email Address

Upload your image

Choose File No file chosen

Update

[Back](#)

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5. Then by clicking back, you will be asked to schedule an appointment where the following page appears when you click on schedule a new appointment.

Visual Welcome Center Home Privacy Schedule Hello Preethi Thotal Sign out

Schedule an appointment

Date

Purpose of Visit

Create

[Back](#)

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The screenshot shows a web interface for scheduling an appointment. At the top, there is a navigation bar with links: 'Visual Welcome Center', 'Home', 'Privacy', and 'Schedule'. On the right side of the navigation bar, it says 'Hello Preethi Thotal' and 'Sign out'. The main heading is 'Schedule an appointment'. Below this, there is a form with two input fields: 'Date' (containing '05/13/2020 07:05 AM') and 'Purpose of Visit'. Below the 'Purpose of Visit' field is a blue 'Create' button and a 'Back' link. At the bottom of the page, there is a footer that reads '© 2020 - Visual Welcome Center - Privacy'.

Hence by choosing appropriate date and time for an appointment and by stating the purpose of visit, the following data will be mapped to the profile in the data base once clicked on create.

6. Major Challenges:

Seamless integration of the system, Extracting face encodings, Database integration.

7. After the project:

This is an automation process to interact with a visitor. The system contains only essential features required to capture face data of a user and display the purpose of visit.

- **What went well:**

The system is able to capture the face data and process information with cloud database in real time. The system able to recognize face and display the purpose of visit.

- **What can be done:**

The system doesn't have the voice recognition capability which can improve the interaction with user and system. The system can also be integrated with capability of hand gestures to get feedback from the user on the person details and data displayed. The performance of the system can be improved in real time as there are some glitches in the system.

8. References:

[1] <http://dlib.net/>