DYMMO

Realtime Face Recognition System

Content

- Intro&Overview
- Aim of the project
- Benefits
- Requirements
- Structure of Dymmo
- Features
- Referances

Intro&Overview

- Dymmo is a final project of CSScholars under supervision of Dr: Wael Zakaria
- CSScholars :
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  - Omar Mahmoud
  - Yasmine Ahmed
  - Mohamed Ahmed
  - Dina Mohamed

Definition

- Facial Recognition System that can identify people via cameras
- Dymmo uses Facial Recognition to identify workers entering place and see if they are valid to enter this place or not

Why are we creating this?

- There are some places that don't allow anyone to enter or prevent some workers from entering any region so we created a simple AI program that take care of every one and his permissions and inform the security agents if anyone tried to break the rules of his permissions and enter an un allowed region

Aim of project

- This project secures any place by subdividing this place into several regions
- For each region there's an entering and exiting area which is observed by camera
- This cameras see whether the entering person is valid to enter this region at this time or not based on some knowledge
- It also save entering and exiting time for every known person
- And if the entering person is NOT known then we alert the region security

Benefits

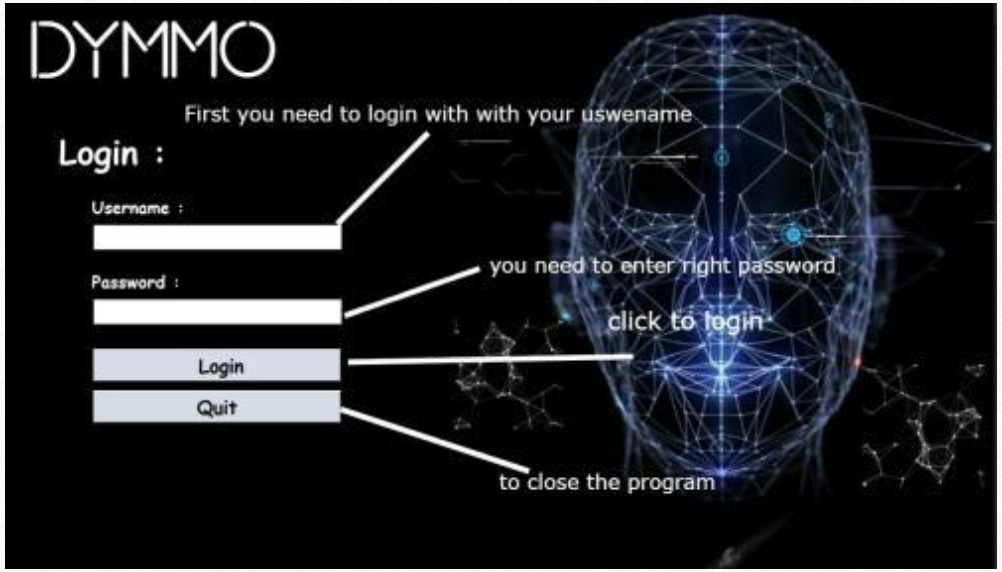
- Secure the place and subdivide people giving them different permissions to access the region of the place
- Disallow anyone to leave the work before working time
- Reduce ability of anyone to enter non-public regions

Structure

- The Program comes with a database contains admin user with initial zone
- When you login for the first time the program take you to configuration panel to state some settings like current zone for this pc and connection to the server (Next Term)
- Also when you add anyone to the database the program share the model or the dataset to all PCs connected to the program network

Login Panel

- When you enter username or password (if you have), the program tests your current permission –because admin may be change it- and if you are an admin you will be able to use all panels else if you are a security agent you will use the camera contol panel only

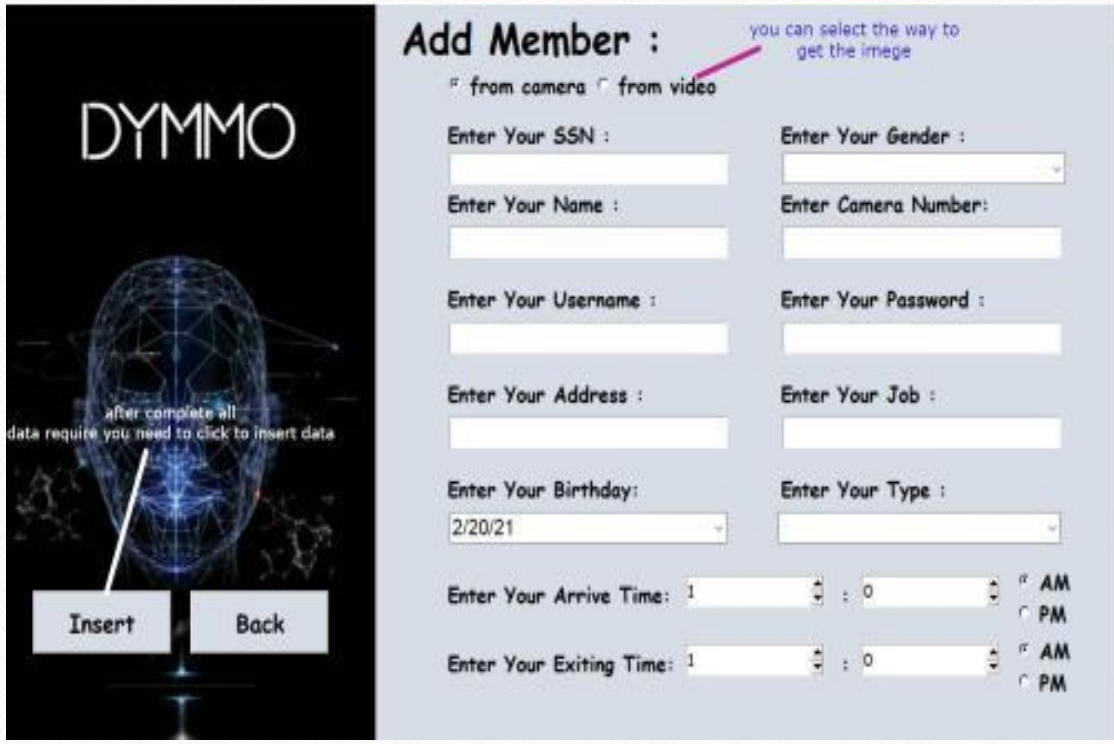


Main Panel

- The Option Menu appears only for admins after login and allow them to control the program features

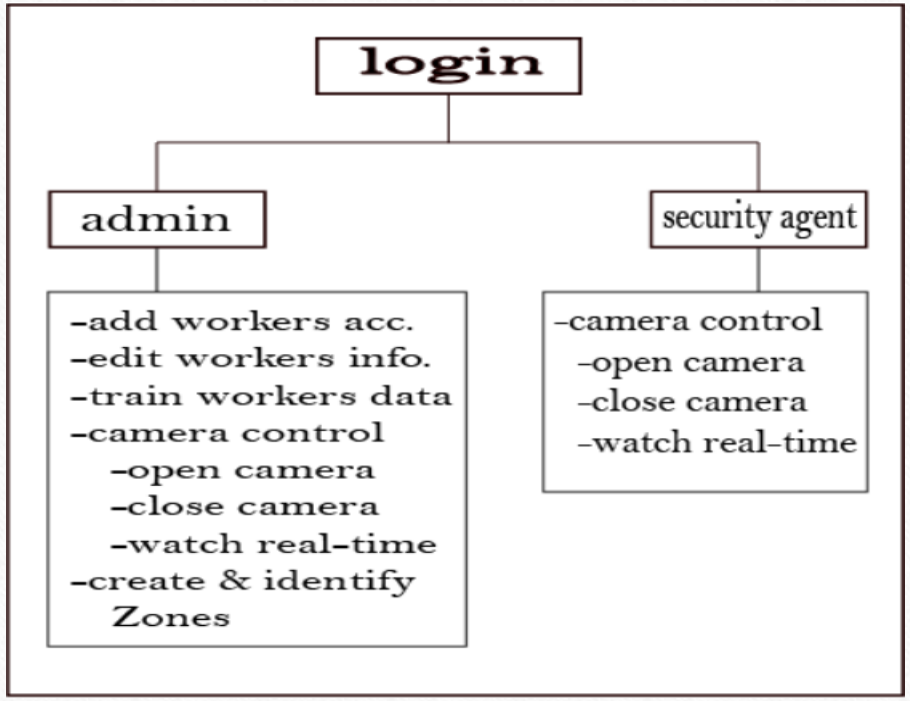
Add Member Panel

- The Add Member Panel allows the admin to add member to known members in the database and create a dataset to you from a specific camera you specify of from a video for this person
- Also it allows the admin to specify the type or permission for the member



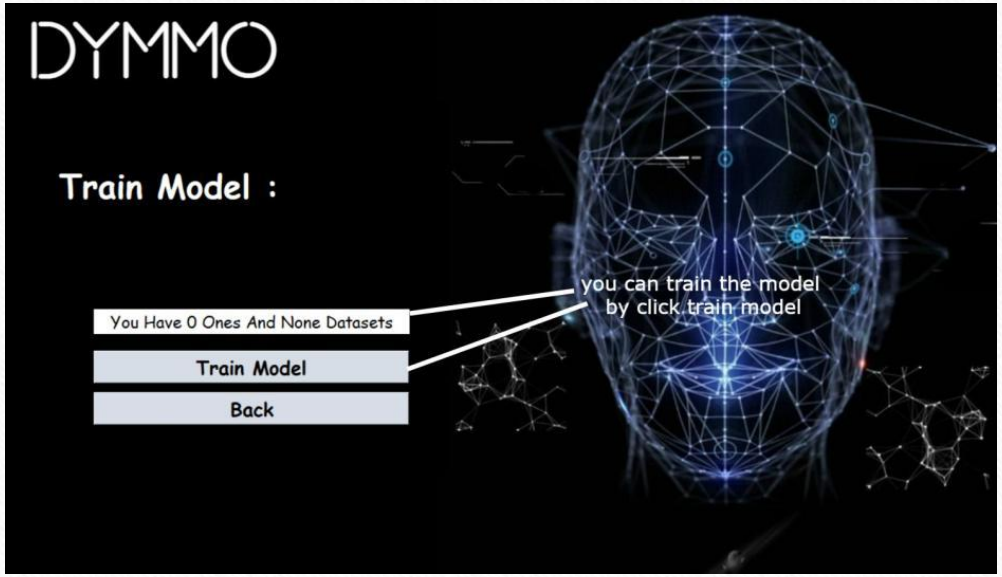
Permissions

- There are 4 permissions :
  1. Admin : Can Control all settings in the program
  2. Security Agent : Can Only Control Cameras and if he want he can stay and see what happens through camera
  3. Supervisor : can receive notifications about all members under his supervision behavior (Not Ready Yet)
  4. Worker : Someone known



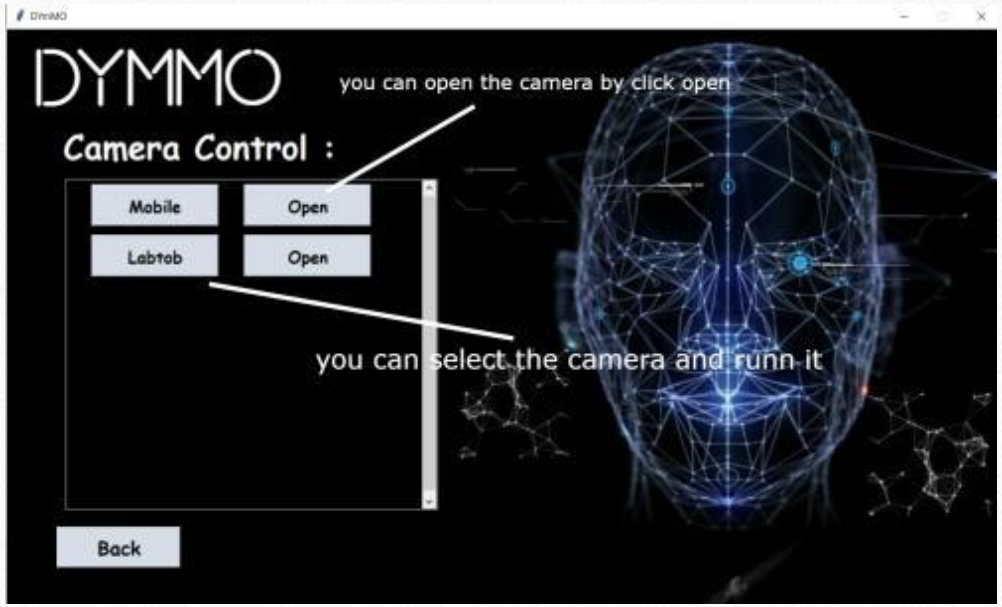
Train Model Panel

- Training panel allows the user to tell the program that he entered someone to the database so the program should identify this member as known person



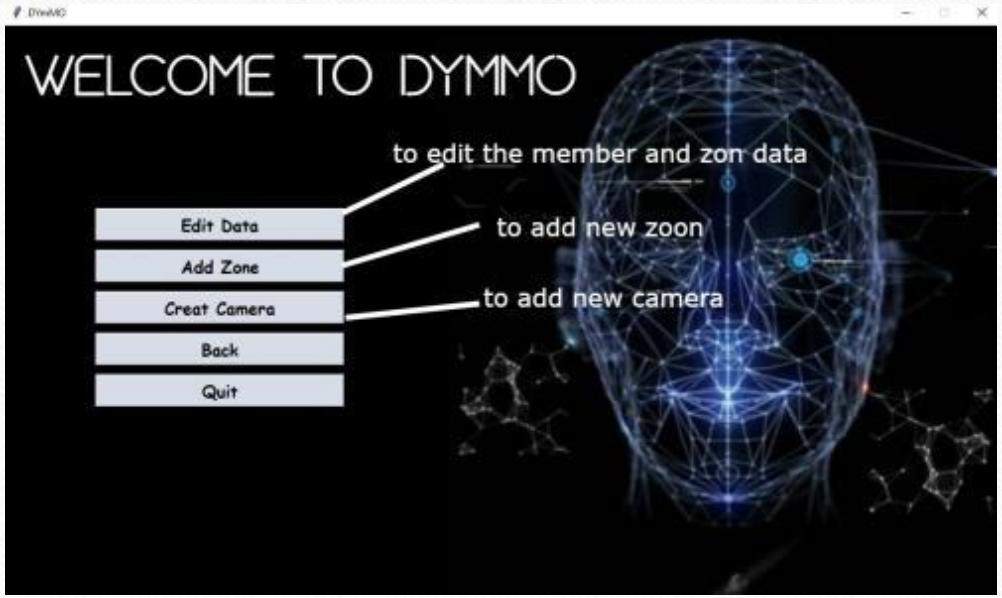
Camera Control Panel

- This Panel Display all cameras in this zone
- The first button open and close the camera in the back ground
- The second program display the camera as a video to be able to see what the camera see



More Options Panel

- Contains more options and utilities for usage

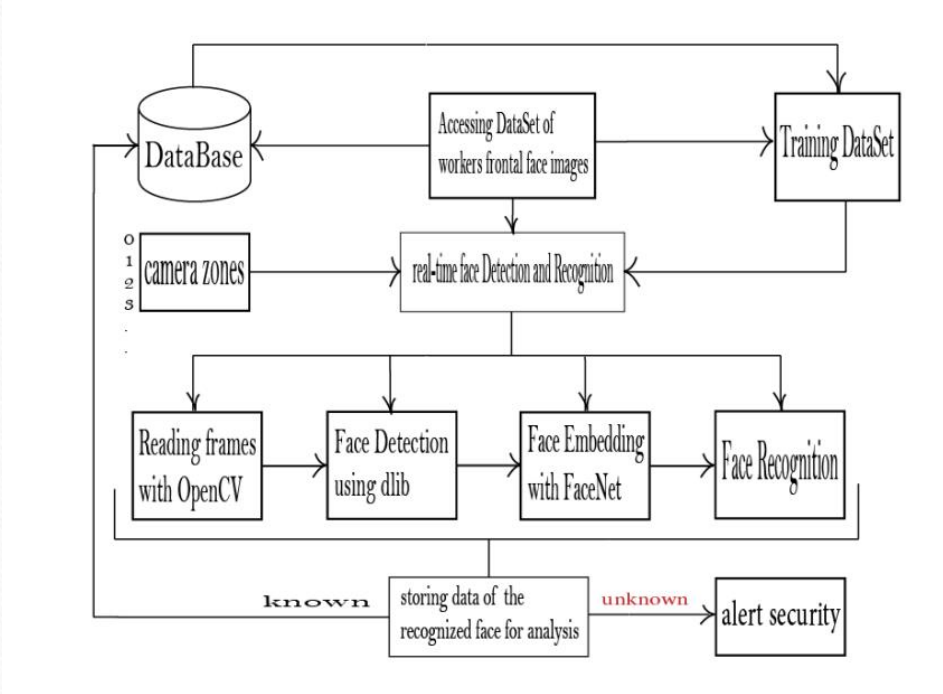


Structure

- By OpenCV and Python We can open cameras and get videos from each one and python provided some parallel stuff for running multiple processes at the same time to make the ability to open multiple cameras at the same time

Structure

- After Getting Video from camera we search the video to get each frontal face appear in it
- If Dymmo found any face it start the analysis process to extract the descriptors of this face and try to fine the nearest descriptor for it



Structure

- Dlib library provided a very powerful frontal face detector that takes small time to detect faces in image and it was very easy to use with OpenCV

Structure

- The FaceNet system used to extract high-quality features from faces,called face embeddings, that can then be used to train a face identification system.
  The model is a deep convolutional neural network trained via a triplet loss function. The focus on training a model to create embeddings directly (rather than extracting them from an intermediate layer of a model) was an important innovation in this work.

Model

- We can see that the model indeed expects square color images as input with the shape 160×160, and will output a face embedding as a 128 element vector.
  Train these face embeddings with their labels by using savez function from Numpy "Save several arrays into a single file in uncompressed .npz format."
  And we managed to train new people when admin add new worker to our trained model instead of training everyone from scratch

Enhancement For Recognition

- In recognition step will normalize vectors, that means scaling the values
until the length or magnitude of the vectors is 1 or unit length.
to be able compare using Euclidean distance to get min distance in
prediction function to identify the person if not return unknown.
- we wanted to have some control over the environment and the
poor lighting: so came to use CLAHE (Contrast Limited Adaptive Histogram Equalization)

Structure

- After getting the required person we insert a new record in the database that has some information such as the time he came/gone , the date of this action and who is this member

Features

- Easy GUI to ease the usage of the program
- Creating dataset for recognition by camera or by video
- Trying to recognize the face in case its NOT complete or someone trying to hide it (Next Term)
- Assign as many as cameras by regions as available for the place
- For each person there're permission to the ability of entering regions
- Each camera can record an entering or exiting date for each known person
- Save entering and exiting time from each person
- There're admins who can control the permission of each person to increase the security

Features

- Calculate the absence of each person according to his work time to be informed about the times which he is not in the place
- Alarm system to notify the security agents about any thing wrong
- Notify the supervisors and allow them to be able to know who attended from his supervisees
- Save a picture of any entering person as an evidence of his entering and exiting at this time
- Ability to search the history by time and see the a full report about some day
- Saving every unknown person entering a place and special notify the security agents if this one visit concurrently or in suspicious way

- Command line that allows user to generate some mini scripts based on some predefined functions like detecting full body or some body parts ,controlling the system ,make some exceptions for some people or detecting the emotions (Just to make an area of customization for the user)[Future Work]
- Generate full report for the status of some person and this report contains all his data and the history of his actions
- Display a window for each recognized person and this window has some of his details

Future work in next term:

- Add Supervisor who has some permissions.
- The person cannot enter other than the place to which he is restricted to work.
- The data will not be updated when new is added.
- Alarm system.
- Entering the zone according to its time and when the person entered.
- The inability to insert any existing camera into the database
- Convert the program from one PC program to a network program that uses Server/Client Features

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