Abstract

College Name: Vivekanand Education Society's Institute of Technology (VESIT)

Team Details

Name	Member/Leader	Year
Archana Bhatia	Leader	Final
Mohini Bhave	Member	Final
Neelam Somai	Member	Final
Ria Dharmani	Member	Final

Problem Selection: Automation Society Security Task – ASST

Kindly elaborate on your understanding of the problem chosen?

a. Understanding of the Problem

- To automate the process of identifying regular visitors in housing societies
- Apart from this, check whether the visitor is healthy to visit the society, by recording his/her temperature along with a facial image
- Maintain visiting time and other related information of the visitors to generate a report at the end of the day by an authority.
- Flag visitors with high temperature
- Recording details of new users and proper identification of users with and without masks, helmets, goggles.

b. Most Challenging aspect of the problem

- Identifying visitors in cars/ wearing helmets or masks
- Recording temperature in real-time alongside facial recognition
- Maintenance of hardware equipment used
- Integration with existing CCTV systems

c. Reason for Choosing this problem

- The problem is multifaceted, but technology can provide a great solution for it.
- It requires face recognition along with object detection for recognizing objects like a mask, helmet, etc. Also, the specific regions of the face should be mapped for temperature recording.
- The past experience of individual team members with similar projects.

Kindly share how do you plan to approach the problem chosen?

a. Approach

- The system will comprise two parts, a hardware device, and a web application. The hardware device will have a camera for capturing facial images; thermal scanners and an optional digital display for showing temperature and other messages. The software application will be able to store and retrieve data from the database and helps in report generation.

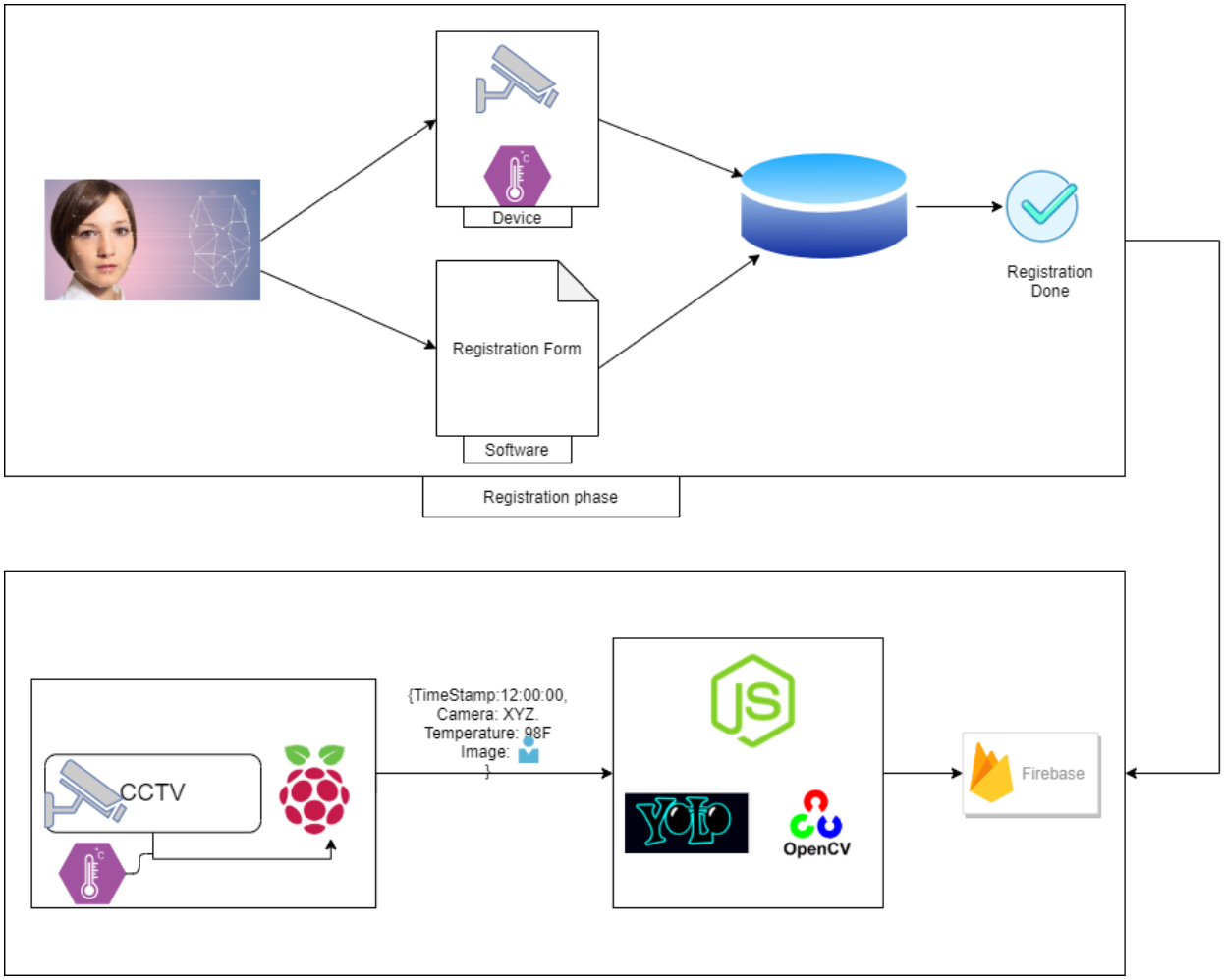
- In the registration phase, the details of visitors like their personal information, their purpose of visiting the society, society members they are concerned with, along with their facial picture will be recorded.

- During their subsequent visits, the captured face will be matched with the existing facial coordinates to recognize the person. Using specific regions of the face such as the inner side of the eyes and the forehead, the temperature will be recorded. All these details with the visiting time will be stored in the database.

- If the face cannot be recognized, then either an entry named as Guest will be recorded or an alert can be sent to some authority/watchman of the society and the house to be visited will be recorded along with their mobile numbers.

- Finally, a consolidated report will be generated at the end of the day.

b. Approach Diagram



c. Platform/Coding Language/Framework

Hardware	Software	Algorithms	External tools
Raspberry pi, thermal sensors, OR Thermal cameras	**Languages:** Python, JS **Frameworks:** Django/Flask **Database:** Firebase/ Sqlite. **Libraries:** Keras, tensorflow,OpenCV, pickle	**Face recognition:** CNN **Object detection:** YOLO, SSD,RCNN	Google colab, Github for collaboration

Algorithm for face detection and temperature reading :

1. **If thermal cameras are available :**

i. Probe Face image (Long wave infrared) is acquired from real time IR camera in monitoring area

ii. Image preprocessing (Denoising and normalization)

iii. Face detection (Region growing algorithm for segmentation to obtain contour)

iv. Face alignment (using Normalized mutual information(NMI))

v. Face masking

vi. Eye - glass and mask detection

vii. Facial Feature Extraction by GWT (FPW, FPB)

viii. Face detection by Hamming Distance

ix. Record temperature captured using thermal reading

2. **Else :**

i. Objection Detection with Humans through CCTV Cameras (YOLOv3/SSD/RCNN algorithms)

ii. Face Recognition using CCTV cameras (OpenCV Library)

iii. Temperature Check using sensors (IR) or temperature testing kiosk

f. Fortnightly targets

Sr No	Target	Deadline
0.	Research , Prototype development	Sept 26 - Oct 18
1.	Dataset collection and model training	Oct 19 - Nov 1
2.	Model testing	Nov 2 - Nov 15
3.	Improving accuracy of model	Nov 16 - Nov 29

4.	Comparing results of different models	Nov 30 - Dec 13
5.	Iot for non-thermal cameras to test temperature	Dec 14 - Dec 27
6.	Building basic web-app interface and database for registering and recording of visitors	Dec 28 - Jan 10
7.	Creating dashboard for analysis of end of day report and integration with model and Iot	Jan 11 - Jan 24
8.	Final testing	Jan 25 - Feb 7

Why do you think your team will be able to implement a winning solution?

a. Previous Projects Undertaken

- Weed identification using Image classification.
- Soda Bottle Classifier using ANN
- Object Detection in Computer Vision using SSD and YOLOv3.
- AI based Smart Mirror for enhancing selfie experience.
- Digital agriculture using IoT (Looking Beyond Syllabus)

b. Team Strengths

- Experience with Deep Learning and Machine Learning, being from a Computer background.
- Self Motivated, Avid Learners and Creative Developers.
- Enthusiastic and Passionate about whatever we do.

c. Team Achievements

- Code For Good 2020 organized by JP Morgan Chase and Co. Winners
- IBMHackChallenge 2020 Semi Finalist.
- WeTech Ideathon 2020 organized by Github Winners.
- Deep Blue season-5 Semi Finalist
- Active Participants of Syrus 2020 Hackathon organized by Github.
- Internal Hackathon Winners of Smart India Hackathon 2020.

d. Personal Motivations

We strongly believe that technology can make ground breaking changes, when appropriately leveraged. The issue of security in housing societies is a cause for concern for quite some time. Moreover, the onset of a pandemic has made residents more alert and aware about the people

who come into their buildings. Integration of IoT with Artificial Intelligence is an innovative and foolproof solution to the way visitor log is maintained in buildings. Our team has what it takes to build this solution and given a chance to work under Industry Experts we can definitely make this a tremendous success.