

Smart Fan Using Face Detection and Voice assistant

¹. Umang Srivastava ². Shashwat Tripathi ³. Vipul Gupta ⁴. Vikash Raghuvanshi
Computer Science and Engineering, Inderprastha Engineering College(IPEC)/Aktu, Ghaziabad, India

ABSTRACT

In the last several years, face detection has been listed as one of the most engaging field in research. Face detection algorithms is used for detection of frontal human faces. Face detection find use is many applications such as face tracking, faces analysis and face recognition. The term Face Recognition and detection is like an ocean of research and innovation with the applications of image analysis and algorithm- based understanding which can be called as computer vision. Voice assistant helps to perform task in quick and real time. The humans give voice command and the system performs tasks.

Keywords: Python, Face Detection, Haar cascades classifier, OpenCV, Google Text to Speech, VS code Arduino UNO.

Date of Submission: 25-04-2022

Date of Acceptance: 07-05-2022

I. INTRODUCTION

The project is mainly targeted on developing a “Smart Fan” using the Face Detection and Voice Assistant by minimizing the human interaction and focusing on more friendly user.

Face Detection is seen as an AI based computer technology that can be used to identify and locate the presence of human faces during real time. The applications of these algorithms are in almost every field and industry in today’s time.

Face Detection using Haar Cascades classifier is a Machine Learning algorithm which use a cascades function for face detection .

Haar cascades classifier is Machine Learning approach in which the cascades function is trained to using a sample containing a lot of positive and negative images.

The speed and direction(movement) of the fan will also be controlled using the voice assistant which on passing voice command to the system will control the speed and direction of the fan

II. OBJECTIVE

The main objective of the project is to built an automated fan system using face detection using OpenCV, Haar Cascades Classifier. We will use voice assistant based system to control the speed as well as the direction of the fan which will lead in reducing human effort.

III. METHODOLOGY

For the development of the smart Fan , Hardware components were required such as Arduino UNO, Servo motor , ordinary fan, USB cables and other power modules. It used software such as Python, VS studio code, Open CV, GTTS. Python was used to code the face detection application along with Haar cascade classifier which held the information about how to detect the human face. Open CV was used to run the face detection application. Arduino used the Arduino IDE for its coding purposes .Voice Assistant enabled in Fan using google text to speak Library. Smart Fan developed for human- less intervention and making automation in offices, home and various places.

IV. TECHNOLOGY

Python: Python is an interpreted high-level general-purpose programming language. Its design philosophy emphasizes code readability with its use of significant indentation. Its language constructs as well as its object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects.

Face Detection: Face detection can be regarded as a specific case of object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class. Examples include upper torsos, pedestrians, and cars. Face detection simply answers two question, 1. are there any human faces

in the collected images or video? 2. where is the located? Face-detection algorithms focus on the detection of frontal human faces.

VS code: Stands for Visual Studio Code Is a source-code used for editor made by Microsoft for Windows, Linux and macOS. Features include support for debugging, syntax highlighting, intelligent code completion, snippets, code refactoring, and embedded Git. Users can change the theme, keyboard shortcuts, preferences, and install extensions that add additional functionality.

Voice assistant: A voice assistant is a digital assistant that uses voice recognition, language processing algorithms, and voice synthesis to listen to specific voice commands and return relevant information or perform specific functions as requested by the user. Amazon's Alexa, Apple's Siri, Microsoft's Cortana, and Samsung's Bixby may be the flag bearers of voice assistants.

Haar Cascades Classifier: Haar feature-based cascade classifiers is an effectual machine learning based approach, in which a cascade function is trained using a sample that contains a lot of positive and negative images. The term "cascade" means that the classifier thus produced consists of a set of simpler classifiers which are applied to the region of interest until the selected object is discarded or passed.

V. LITERATURE REVIEW

A lot of research is currently carried out by experts of the computational field. The previous works that we found were using different face detecting algorithm to detect the face of the user.

There has been ample amount of research that has been taken place in the domain of Face recognition and various techniques and algorithms.

- Design and Implementation of Smart motor speed with Face recognition [1] :- This paper covers face detection and processing. It also includes different algorithms for audio recognition.
- Development of Intelligent Automatic Motor System[2]:- This paper covers Face recognition speed controls. It also gives an alternative to use automated speed controls instead of conventional speed controls.
- Real time implementation of face recognition system[3]:-This paper covers the implementation of face recognition system.
- Motor Speed Control using Face detection[4]:- This paper gives the pictorial representation of how the model works. Also it deals with flow charts associated with it.
- Study of Automated Face recognition[5]:- This paper gives the example of recording the attendance in a new innovative way.

- Student Attendance in classroom records[6]:- This research paper was related to the study of the previous image processing techniques and their results.

VI. RESULT AND DISCUSSION

First, we want to put in an OpenCV package to be imported for python . This can be done by downloading the following package from the python site or by using the pip install command. The implementation of code is done in python on VS studio and we also need a working webcam to capture images or videos for testing the movement, speed of the fan in the real time . After the execution is successfully we will be able to recognize faces in still images, videos, webcam capture etc.

Fig.1 shows the fan direction towards centre.

Fig.2 shows the fan direction towards left.

Fig.3 shows the fan direction towards right.

Fig.4 shows the detection of face in centre. Fig.5 shows the detection of face towards left. Fig.6 shows the detection of face towards right.

We will import gTTS (Google Text To Speech) for python which will lead to listening voice command pass by the user to control the speed and direction of the fan.

The final output of the project we will be able to control the speed, direction of the fan using the face detection method and the voice assistant

Snapshot: Movement of the fan



Fig1: Centre

Fig2: Left



Fig3: Right

Face Detection Images:

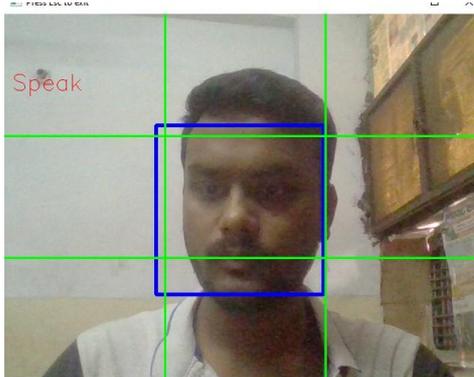


Fig4: Centre

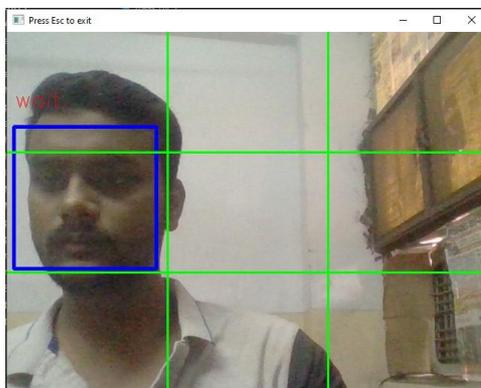


Fig5: Left

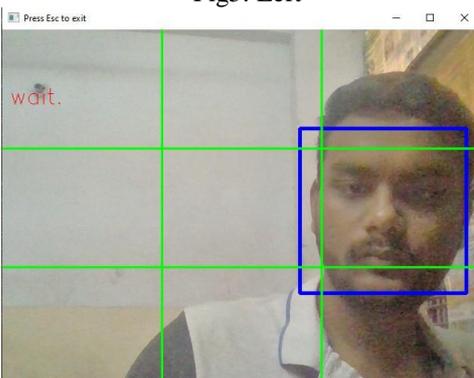


Fig6: Right

VII. CONCLUSION

In this project, the necessary steps, methods, hardware and software is presented to create an automated smart fan using face detection and voice assistant. The camera is enabled to do realtime face detection meanwhile the Arduino UNO is enabled to control the fan's basic functionalities.

The voice assistant will help in accessing the fan through the voice commands or functions pass to the system in order to operate the fan.

Major problems of the ordinary fans such as higher human interactivity has been greatly reduced with the help of the face detection methods.

Usability, controllability and comfortability showed some improved feedbacks compared with the normal ordinary fan since 'Smart fan' consists of features that makes it user-friendly, effective and easier to use.

In future, further this technique can be applied in the other

electrical appliances that would make them more user friendly and less human intervention or interaction. Appliances such as refrigerator, lamps and ceiling fans in order to make each appliance connected and smarter in order to make a smart home.

ACKNOWLEDGMENT

We would like to acknowledge and extend our heartfelt gratitude to the following persons who have made the completion of this huge project this much of success. This project would not have been such a great achievement without the support and guidance of key people acknowledged here. Our Supervisor Dr Isha Mehra and Ms Annu Mishra for his vital encouragement, assistance and excellent support. During this project, I acquired many valuable skills, and I hope that in the years to come, those skills will be put to good use.

REFERENCES

- [1]. (2018) Design and Implementation of Smart motor speed with Face recognition by Saurav Roy, Nasir Udiin and Md Kabir.
- [2]. (2017) Development of Intelligent Automatic Motor System by Toshihiro Mori , Takashi Suehiro and Tetsuo Tomizawa.
- [3]. (2017) Real-Time Implementation of face recognition system by Neel Ramakant Borkar and Sonia Kuwelkar, India.
- [4]. (2012) Motor Speed Control using Face detection by Omkar Pawar, Prathamesh Lonkar, Randhir Singh, Vivek Salunke, Prof. D.M.
- [5]. (2012) Study of Automated Face recognition by Ratnawati Ibrahim andZalhan Mohd Zin.
- [6]. (2016) Student Attendance in classroom records by Samuel Lukas, Aditya RamaMitra, Ririn Ikana Desant.
- [7]. Ismail, Nurulhuda, Idayu, Mas, Md Sabri, Mas Idayu. : Review of existing algorithms for face detection and recognition.. pp. 1-39 (2009).
- [8]. Owusu E, Abdulai J-D, Zhan Y.: Face

- detection based on multilayer feed-forward neural network and Haar features. *Softw Pract Exper.* pp.1–10 (2018). <https://doi.org/10.1002/spe.2646>
- [9]. Viola, Paul & Jones, Michael. : Rapid Object Detection using a Boosted Cascade of Simple Features. *IEEE Conf Comput Vis Pattern Recognit.* pp. 1-9 (2001).
- [10]. Vaibhav Bhatia, Gavish Bhatia: *International Journal of Computer Applications*, Room Temperature based Fan Speed Control System using Pulse Width Modulation Technique, 2013.
- [11]. Mustafa Saad, Hossam Abdoalgader, and Muammer Mohamed: *Automatic Fan Speed Control System Using Microcontroller*, 2013.
- [12]. Viola P, Jones M.: Rapid object detection using a boosted cascade of simple features. In: *Computer Vision and Pattern Recognition (CVPR 2001)*. Proceedings of the 2001 IEEE Computer Society Conference, Vol. 1; (2001).
- [13]. (2016) Dong Yu and Li Deng. *AUTOMATIC SPEECH RECOGNITION*. Springer
- [14]. Lawrence R Rabiner and Biing-Hwang Juang. *Fundamentals of speech recognition*, volume 14. PTR Prentice Hall Englewood Cliffs, 1993.
- [15]. Joseph P Campbell. Speaker recognition: A tutorial. *Proceedings of the IEEE*, 85(9):1437– 1462, 1997.
- [16]. Sharma, Manik & Anuradha, J. & Manne, H & Kashyap, G.: Facial detection using deep learning. *IOP Conference Series: Materials Science and Engineering.* pp. 1-9 (2017).
- [17]. Geoffrey Hinton, Li Deng, Dong Yu, George E Dahl, Abdel-rahman Mohamed, Navdeep Jaitly, Andrew Senior, Vincent Vanhoucke, Patrick Nguyen, Tara N Sainath, et al. Deep neural networks for acoustic modeling in speech recognition: The shared views of four research groups. *IEEE Signal Processing Magazine*, 29(6):82–97, 2012.
- [18]. Amirsina Torfi, Nasser M Nasrabadi, and Jeremy Dawson. Text-independent speaker verification using 3d convolutional neural network.
- [19]. Theodoros Giannakopoulos. pyaudioanalysis: An open-source python library for audio signal analysis. *PloS one*, 10(12), 2015.