HAAR-CASCADE FACE DETECTION IN OPENCV

Submitted by

K.AKSAYA DHARINI (113218205001)
V.JANANI (113218205008)
S.MANISHMA (113218205018)
P.RASHMI (113218205035)
S.SANGAVI (113218205037)

DEPARTMENT OF INFORMATION TECHNOLOGY

VELAMMAL ENGINEERING COLLEGE, AMBATTUR,

CHENNAI 600-066

OCTOBER 2020

VELAMMAL ENGINEERING COLLEGE

DEPARTMENT OF INFORMATION TECHNOLOGY

BONAFIDE CERTIFICATE

It is certified that this mini project report titled **"HAAR-CASCADE FACE DETECTION IN OPENCV"** is the bonafide work of **Ms.Aksaya Dharini.K (113218205001), Ms.Janani.V (113218205008), Ms.Manishma.S (113218205018)** , **Ms.Rashmi.P (113218205035)** and **Ms.Sangavi.S (113218205037)** who carried out the mini-project work under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report.

SIGNATURE	SIGNATURE
----------------------	----------------------
Dr.V.Gowri, M.E,Ph.D	**Dr.Jeeva Katiravan, M.Tech.,Ph.D**
ASSISTANT PROFESSOR-I	**HEAD OF THE DEPARTMENT**
INTERNAL GUIDE	DEPARTMENT OF INFORMATION TECHNOLOGY
VELAMMAL ENGINEERING COLLEGE CHENNAI 600-066	VELAMMAL ENGINEERING COLLEGE CHENNAI 600-066

ACKNOWLEDGEMENT

Behind every achievement lies an unfathomable sea of gratitude to those who achieved it, without whom it would ever have come into existence. To them we express our words of gratitude.

We give all the glory and thanks to our almighty GOD for showering upon, the necessary wisdom and grace for accomplishing this project. We express our gratitude and thanks to our parents first for giving health and sound mind for completing this project.

First of all, we would like to express our deep gratitude to our beloved and respectable Chairman, Thiru M.V Muthuramalingam and Chief Executive Officer, Thiru M.V.M Velmurugan for their kind encouragement.We express our deep gratitude to Dr.N.Duraipandian, principal of Velammal Engineering College for his helpful attitude towards this project.We wish to express our sincere thanks and gratitude to Dr.Jeeva Katiravan Head of the Department of Information Technology for motivating and encouraging every part of our project.

We express our sincere gratitude to The Project Guide Dr.V.Gowri Assistant Professor-I, Department of Information Technology for her valuable guidance in shaping the project.

Our thanks to all Teaching and Non-teaching staff members of our department for their support and peers for having stood by us and helped us to complete this project.

ABSTRACT

Human face detection by computer systems has become a major field of interest. Face detection algorithms are used in a wide range of applications, such as security control, video retrieving, biometric signal processing, human computer interface, face recognitions and image database management. Keeping the use case in future we put forward our project Face detection. We have used Computer vision algorithms to detect the faces in individual or a group too. The input is given from a live cam that feeds into computer vision algorithm which detects the face using a predefined model. The output acts as a potential input to many projects out there. The output outlines the detected face of the live feed. This image could be saved as a dataset for further cases. The accuracy of our project is precise and perfect to identify faces.

INDEX

1. INTRODUCTION

1.1 Artificial Intelligence

Artificial intelligence (AI) is wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence. AI is an interdisciplinary science with multiple approaches, but advancements in machine learning and deep learning are creating a paradigm shift in virtually every sector of the tech industry.

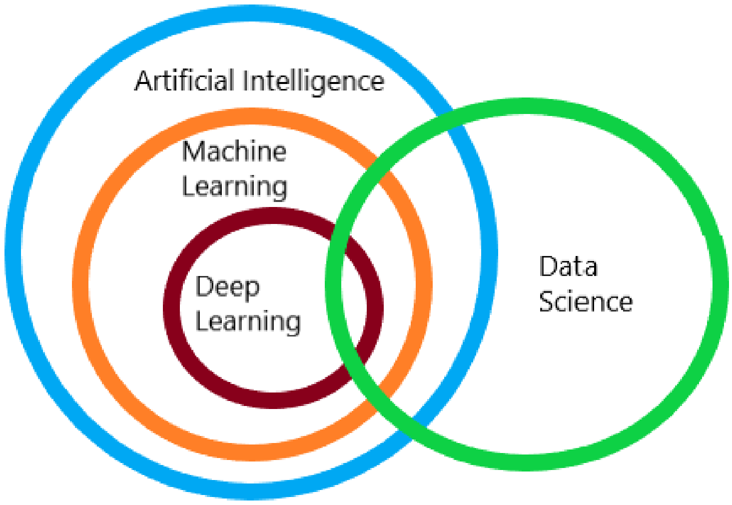
Artificial intelligence can be divided into two different categories: weak and strong.

Weak artificial intelligence embodies a system designed to carry out one particular job. Weak AI systems include video games such as the chess example from above and personal assistants such as Amazon's Alexa and Apple's Siri. You ask the assistant a question, it answers it for you.

Strong artificial intelligence systems are systems that carry on the tasks considered to be human-like. These tend to be more complex and complicated systems. They are programmed to handle situations in which they may be required to problem solve without having a person intervene. These kinds of systems can be found in applications like self-driving cars or in hospital operating rooms.

Although artificial intelligence evokes thoughts of science fiction, artificial intelligence already has many uses today, for example:

- **Email filtering:** Email services use artificial intelligence to filter incoming emails. Users can train their spam filters by marking emails as "spam".
- **Personalization:** Online services use artificial intelligence to personalize your experience. Services, like Amazon or Netflix, "learn" from your previous purchases and the purchases of other users in order to recommend relevant content for you.
- **Fraud detection:** Banks use artificial intelligence to determine if there is strange activity on your account. Unexpected activity, such as foreign transactions, could be flagged by the algorithm.
- **Speech recognition:** Applications use artificial intelligence to optimize speech recognition functions. Examples include intelligent personal assistants, e.g. Amazon's "Alexa" or Apple's "Siri".



1.2 Machine Learning

Algorithms are a sequence of instructions used to solve a problem. Algorithms, developed by programmers to instruct computers in new tasks, are the building blocks of the advanced digital world we see today. Computer algorithms organize enormous amounts of data into information and services, based on certain instructions and rules.

Instead of programming the computer every step of the way, this approach gives the computer instructions that allow it to learn from data without new step-by-step instructions by the programmer. This means computers can be used for new, complicated tasks that could not be manually programmed. Things like photo recognition applications for the visually impaired , or translating pictures into speech.

The basic process of machine learning is to give training data to a learning algorithm. The learning algorithm then generates a new set of rules, based on inferences from the data. This is in essence generating a new algorithm, formally referred to as the machine learning model. By using different training data, the same learning algorithm could be used to generate different models. For example, the same type of learning algorithm could be used to teach the computer how to translate languages or predict the stock market.

Inferring new instructions from data is the core strength of machine learning. It also highlights the critical role of data: the more data available to train the algorithm, the more it learns. In fact, many recent advances in AI have not been due to radical innovations in learning algorithms, but rather by the enormous amount of data enabled by the Internet.

1.3 How machines learn :

Although a machine learning model may apply a mix of different techniques, the methods for learning can typically be categorized as three general types:

- Supervised learning: The learning algorithm is given labeled data and the desired output. For example, pictures of dogs labeled “dog” will help the algorithm identify the rules to classify pictures of dogs.
- Unsupervised learning: The data given to the learning algorithm is un labeled, and the algorithm is asked to identify patterns in the input data. For example, the recommendation system of an e-commerce website where the learning algorithm discovers similar items often bought together.
- Reinforcement learning: The algorithm interacts with a dynamic environment that provides feedback in terms of rewards and punishments. For example, self-driving cars being rewarded to stay on the road.

1.4 Growth of AI and ML :

Machine learning is not new. Many of the learning algorithms that spurred new interest in the field, such as neural networks, are based on decades old research. The current growth in AI and machine learning is tied to developments in three important areas:

- **Data availability**: Just over 3 billion people are online with an estimated 17 billion connected devices or sensors. That generates a large amount of data which, combined with decreasing costs of data storage, is easily available for use. Machine learning can use this as training data for learning algorithms, developing new rules to perform increasingly complex tasks.

- **Computing power**: Powerful computers and the ability to connect remote processing power through the Internet make it possible for machine-learning techniques that process enormous amounts of data.
- **Algorithmic innovation**: New machine learning techniques, specifically in layered neural networks – also known as "deep learning" – have inspired new services, but is also spurring investments and research in other parts of the field.

1.5 Deep Learning

Deep learning is a machine learning technique that teaches computers to do what comes naturally to humans: learn by example. Deep learning is a key technology behind driverless cars, enabling them to recognize a stop sign, or to distinguish a pedestrian from a lamppost. It is the key to voice control in consumer devices like phones, tablets, TVs, and hands-free speakers. Deep learning is getting lots of attention lately and for good reason. It's achieving results that were not possible before.

In deep learning, a computer model learns to perform classification tasks directly from images, text, or sound. Deep learning models can achieve state-of-the-art accuracy, sometimes exceeding human-level performance. Models are trained by using a large set of labeled data and neural network architectures that contain many layers.

Deep learning achieves recognition accuracy at higher levels than ever before. This helps consumer electronics meet user expectations, and it is crucial for safety-critical applications like driverless cars. Recent advances in deep learning have improved to the point where deep learning outperforms humans in some tasks like classifying objects in images.

While deep learning was first theorized in the 1980s, there are two main reasons it has only recently become useful:

1. Deep learning requires large amounts of **labeled data**. For example, driverless car development requires millions of images and thousands of hours of video.
2. Deep learning requires substantial **computing power**. High-performance GPUs have a parallel architecture that is efficient for deep learning. When combined with clusters or cloud computing, this enables development

teams to reduce training time for a deep learning network from weeks to hours or less.

1.6 Computer Vision

Computer vision is a field of artificial intelligence that trains computers to interpret and understand the visual world. Using digital images from cameras and videos and deep learning models, machines can accurately identify and classify objects and then react to what they "see."

Computer vision works in three basic steps:

1. Acquiring an image

Images, even large sets, can be acquired in real-time through video, photos or 3D technology for analysis.

2. Processing the image

Deep learning models automate much of this process, but the models are often trained by first being fed thousands of labeled or pre-identified images.

3. Understanding the image

The final step is the interpretative step, where an object is identified or classified.

2. SOTWARE INVOLVED

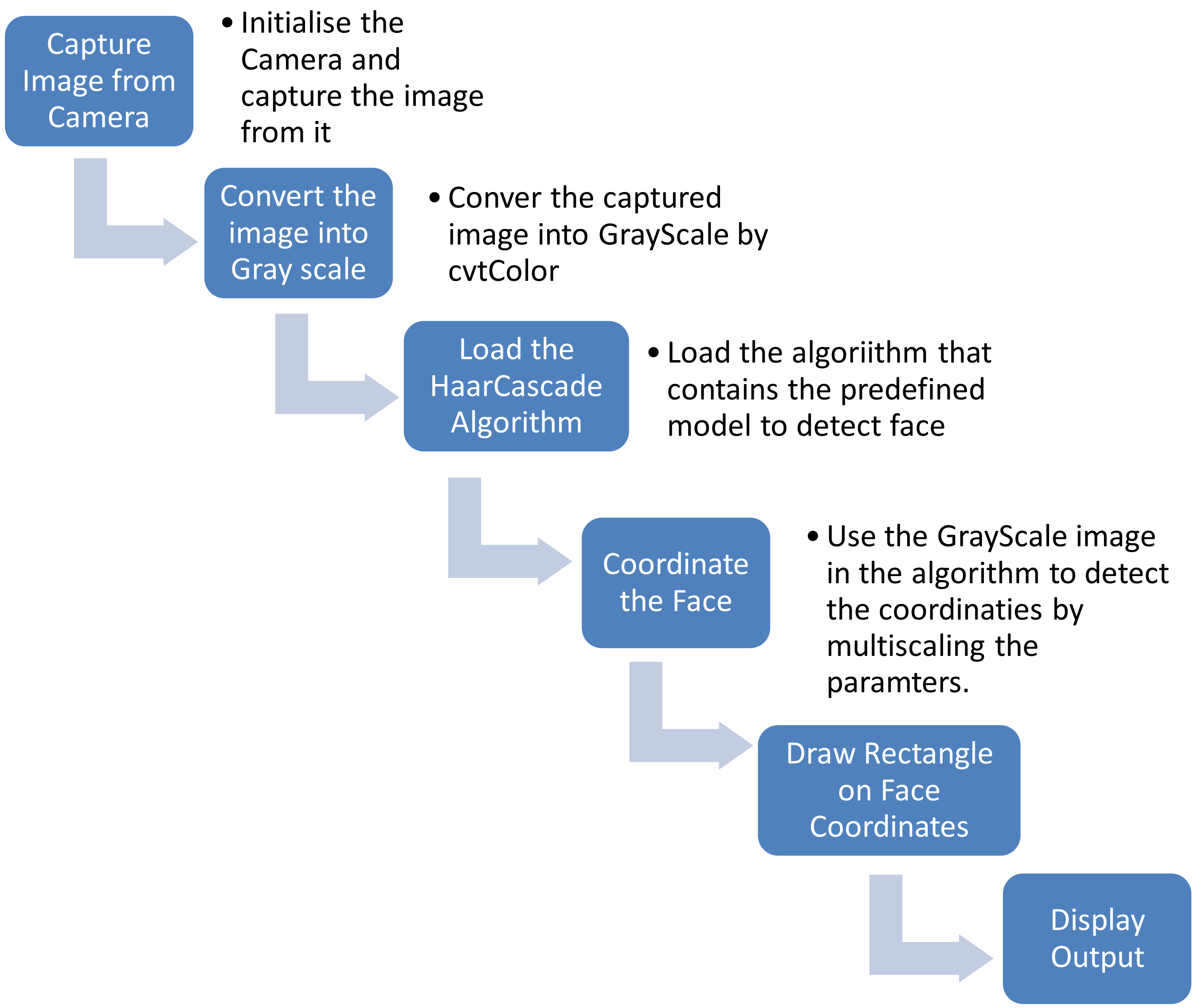
1. HARDWARE REQUIREMNTS

Processor	:	Intel Core-i3
Speed	:	1.7 GHz
RAM	:	256 MB(min)
Hard Disk	:	500 GB
Keyboard	:	Standard Windows Keyboard
Mouse	:	Two or three button Mouse
Monitor	:	SVGA

2. SOFTWARE REQUIREMNTS

Platform	:	Google colab or Python IDLE
Libraries	:	1. Open Cv 2. Imutils 3. Numpy

3. BLOCK DIAGRAM



4. SOURCE

```
from IPython.display import display, Javascript

from google.colab.output import eval_js
from base64 import b64decode

def take_photo(filename='photo.jpg', quality=0.8):
  js = Javascript('''
    async function takePhoto(quality) {
      const div = document.createElement('div');
      const capture = document.createElement('button');
      capture.textContent = 'Capture';
      div.appendChild(capture);

      const video = document.createElement('video');
      video.style.display = 'block';
      const stream = await navigator.mediaDevices.getUserMedia({video:
true});

      document.body.appendChild(div);
      div.appendChild(video);
      video.srcObject = stream;
      await video.play();

      // Resize the output to fit the video element.
      google.colab.output.setIframeHeight(document.documentElement.scro
llHeight, true);

      // Wait for Capture to be clicked.
      await new Promise((resolve) => capture.onclick = resolve);

      const canvas = document.createElement('canvas');
      canvas.width = video.videoWidth;
      canvas.height = video.videoHeight;
      canvas.getContext('2d').drawImage(video, 0, 0);
      stream.getVideoTracks()[0].stop();
      div.remove();
      return canvas.toDataURL('image/jpeg', quality);
    }
    ''')
  display(js)
  data = eval_js('takePhoto({})'.format(quality))
  binary = b64decode(data.split(',')[1])
  with open(filename, 'wb') as f:
    f.write(binary)
```

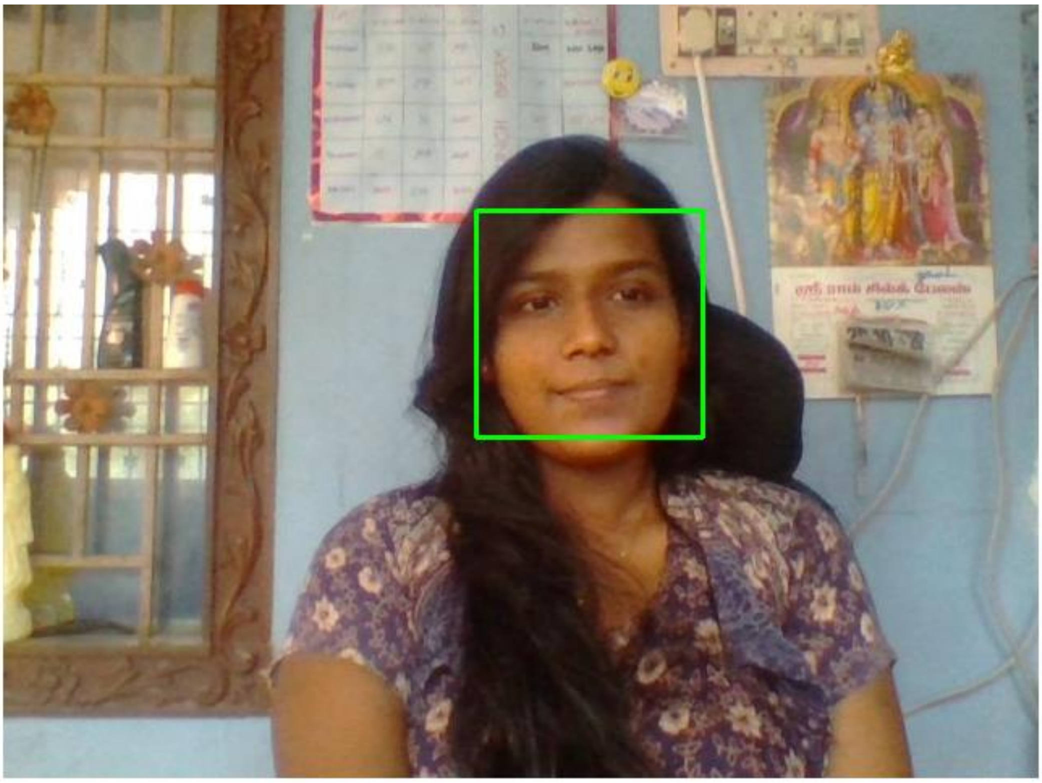
```
  return filename

from IPython.display import Image
try:
  filename = take_photo()
  print('Saved to {}'.format(filename))

  # Show the image which was just taken.
  display(Image(filename))
except Exception as err:
  # Errors will be thrown if the user does not have a webcam or if they
 do not
  # grant the page permission to access it.
  print(str(err))

!pip install opencv-python==3.4.2.16

import cv2
from google.colab.patches import cv2_imshow
import imutils
import numpy as np

image=cv2.imread("photo.jpg")

cv2_imshow(image)

mage=np.asarray(image,dtype=np.uint8)
gray=cv2.cvtColor(image,cv2.COLOR_BGR2GRAY)
cv2_imshow(gray)

detecting=cv2.CascadeClassifier("/content/haarcascade_frontalface_defau
lt.xml")
if imutils.is_cv2():

  faceRects = detecting.detectMultiScale(gray, scaleFactor=1.05, minNei
ghbors=5,
    minSize=(30, 30), flags=cv2.cv.CV_HAAR_SCALE_IMAGE)

# otherwise handle face detection for OpenCV 3+
else:
  faceRects = detecting.detectMultiScale(gray, scaleFactor=1.05, minNei
ghbors=5,
    minSize=(30, 30), flags=cv2.CASCADE_SCALE_IMAGE)
for (x, y, w, h) in faceRects:
  cv2.rectangle(image, (x, y), (x + w, y + h), (0, 255, 0), 2)
cv2_imshow(image)
cv2_imwrite(image)
```

5. SCREENSHOTS

Captured Image

Gray Scale Image

Detected Face



6. CONCLUSION

The project is done using computer vision based algorithm. The predefined Haarcascade Model coordinates the face coordinates of the captured image. The output image coordinates the face using a rectangular box. This could be a potential dataset image for further face recognizing projects. The face detected can be used in contactless Attendance Management system in replace of Biometrics. This project serves as the base for many potential projects out there.

7. REFERENCES

1. Stack Overflow
2. Python Libraries
3. Google Colab Image Capture Support
4. HaarCascade Classifier