A Project Report on

"People Monitoring System Using Matlab"

Submitted in partial fulfillment of the requirements of the degree of

Bachelor of Technology

Submitted by

B.Sarath -(O180081)

B.Renuka Devi -(O180873)

T.Krishna Veni -(O180366)

P.Naveen -(O180892)

Under the Supervision of

Mr.K.Sri Harsha(M.Tech)

Department of ECE

ELECTRONICS AND COMMUNICATION ENGINEERING

RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES

ONGOLE CAMPUS

2022-2023

Approval Sheet

This report entitled “People Monitoring System Using MATLAB” by B. Sarath -(O180081), B.Renuka Devi -(O180873), T.Krishna Veni -(O180366), P. Naveen -(O180892) is approved for the degree of Bachelor of Technology Electronics and Communication Engineering.

Examiner(s)

Supervisor(s)

Chairman

Date: _____

Place: _____

Candidate's Declaration

I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included. I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Signature

B. Sarath	**-(O180081)**	**…….**
B. Renuka Devi	**-(O180873)**	**…….**
T. Krishna Veni	**-(O180366)**	**…….**
P. Naveen	**-(O180892)**	**…….**

Date : _____

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES ONGOLE CAMPUS

Certificate

This is to certify that the report entitled "People Monitoring System Using Matlab" submitted by B.Sarath - (O180081), B.Renuka Devi- (O180873) T.Krishna Veni- (O180366) and P.Naveen- (O180892) in partial fulfilment of the requirements for the award of Bachelor of Technology in Electronics and Communication Engineering is a bonafide work carried by them under my supervision and guidance.

Project Internal Guide

Mr.K.Harsha

Assistant Professor

Depatment of ECE

Head of the Department

Mr.G.Bala Nagireddy

Assistant Proffessor

Department of ECE

Acknowledgement

I would like to express my sincere gratitude to **Mr.K.Harsha** , my project guide for valuable suggestions and keen interest throughout the progress of my course and research.

I am grateful to **Mr.G.Bala Nagireddy**, HOD of **Electronics & Communication Engineering**, for providing excellent computing facilities and a congenial atmosphere for progressing with my project.

I would like to thank **Prof.B.Jayarami Reddy Garu**, director of RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES, ONGOLE for providing all the necessary resources for the successful completion of my course work. At last, but not the least I thank my teammates and other students for their physical and moral support.

With Sincere Regards,

B.Sarath -(O180081)

B.Renuka Devi -(O180873)

T.Krishna Veni -(O180366)

P.Naveen -(O180892**)**

Date: _____

Abstract

The aim of this project is to develop a MATLAB code that detects when the number of people exceeds a certain limit at an entry gate and sends a message to a predefined number. The system can be useful in various applications where it is necessary to monitor the number of people entering or leaving a specific area, such as in shopping malls, hospitals or public events. The code uses a camera sensor to capture the video feed of the entry gate and detects the number of people entering or leaving through the gate. If the number of people exceeds a certain threshold, the code triggers an alarm and sends a message to a designated phone number.

The system is developed using the MATLAB software platform and the Image Processing. The code first detects the region of interest (ROI) in the video feed, which corresponds to the entry gate. Then, it uses a background subtraction method to detect the motion of people entering or leaving through the gate. The algorithm then counts the number of people and compares it with the predefined limit. If the number of people exceeds the limit, the system sends an SMS message to the designated phone number. The system is tested on various scenarios, and the results show that it is accurate and reliable in detecting the number of people at the entry gate and sending messages to the designated number. The proposed system can be useful in various applications, especially in areas where it is necessary to monitor the number of people for safety or security reasons.

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER-1
INTRODUCTION

INTRODUCTION

1.1 Introduction

The increase in population and urbanization has led to an increase in the number of people entering and exiting various premises. It has become necessary to monitor the number of people in such areas for safety, security, and management purposes. In order to address this issue, we have developed a MATLAB code that detects when the number of people exceeds a certain limit at an entry gate and sends a message to a predefined number**.** The proposed system is designed to be used in various applications where it is necessary to monitor the number of people entering or leaving a specific area. For instance, in shopping malls, hospitals, airports, and public events, it is essential to keep track of the number of people to avoid overcrowding and ensure the safety of everyone. The system is based on the MATLAB platform, which is a widely used software in engineering, science, and technology. The code uses the Image Processing Toolbox to detect the number of people entering or leaving through the entry gate. The system uses a camera sensor to capture the video feed of the entry gate and detect the motion of people.

The proposed system is highly accurate and reliable in detecting the number of people at the entry gate and sending messages to the designated number. It can help to prevent overcrowding and ensure the safety of everyone in the area. The system can be easily installed and can be customized to meet the specific requirements of different applications. In summary, the proposed system can be a useful tool in various applications where it is necessary to monitor the number of people. The system can be used for safety, security, and management purposes, and can help to prevent overcrowding and ensure the safety of everyone in the area.

1.2 INCIDENTS

Yes, there have been several incidents around the world where people have died due to excessive gathering in meeting areas. Some of the notable incidents include:

- **Love Parade disaster:** In 2010, a techno music festival was held in Duisburg, Germany. Over a million people attended the event, which was held in a confined area. Due to overcrowding, panic ensued, and people started to rush towards a narrow tunnel, causing a stampede. As a result, 21 people were killed, and over 500 were injured.

- **Hillsborough disaster:** In 1989, a football match was held between Liverpool and Nottingham Forest at Hillsborough Stadium in Sheffield, England. Due to overcrowding and poor management, a fatal crush occurred, leading to the death of 96 people and injuring over 700 others.

- **Mecca stampede:** In 2015, during the annual hajj pilgrimage in Mecca, Saudi Arabia, over 2000 people were killed in a stampede. The incident occurred due to overcrowding and mismanagement of the crowd.

- **Mumbai stampede:** In 2017, a stampede occurred during rush hour at Elphinstone Road station in Mumbai, India. Due to overcrowding, people started to panic and run towards the exit, causing a stampede. As a result, 23 people were killed, and over 30 were injured.

These incidents highlight the importance of monitoring the number of people in crowded areas to prevent overcrowding and ensure the safety of everyone in the area. The proposed system can be a useful tool to help prevent such incidents by detecting the number of people and sending alerts when the limit is reached.

CHAPTER-2
INTRODUCTION TO IMAGE PROCESSING

2. INTRODUCTION TO IMAGE PROCESSING

2.1 Image

An image is defined as a two-dimensional function F(x,y), where x and y are spatial coordinates, and the amplitude of F at any pair of coordinates (x,y) is called the intensity of that image at that point. When x,y, and amplitude values of F are finite, we call it a digital image.

In other words, an image can be defined by a two-dimensional array specifically arranged in rows and columns.

Digital Image is composed of a finite number of elements, each of which elements have a particular value at a particular location. These elements are referred to as picture elements, image elements, and pixels. A Pixel is most widely used to denote the elements of a Digital image.

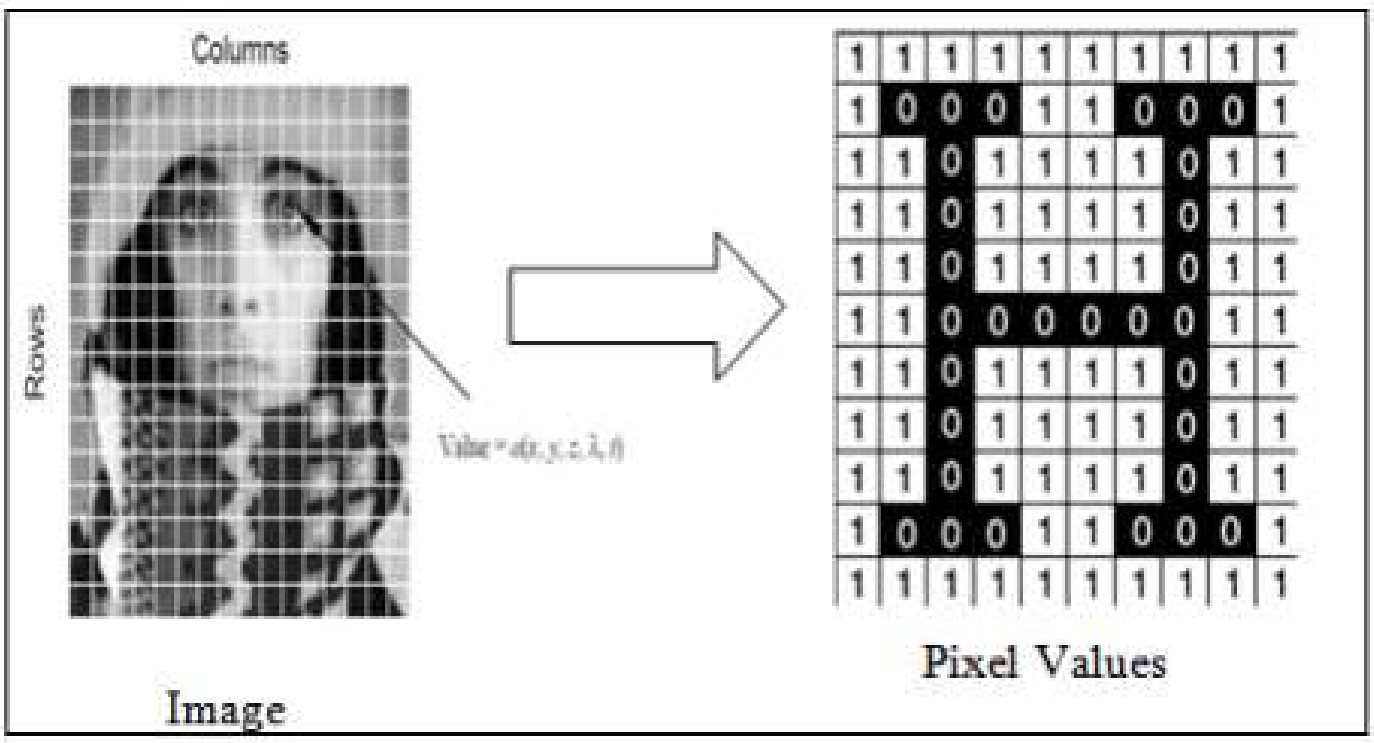


Fig.1: Images and corresponding pixels

2.2 Image Processing

Image processing is a method to convert an image into digital formant perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually, Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods to them. It is among rapidly growing technologies today, with its applications in various aspects of a business. Image Processing forms core research area within engineering and computer science disciplines too.

Image processing basically includes the following three steps:

i) Importing the image with optical scanner or by digital photography.

ii) Analysing and manipulating the image which includes data compression and image enhancement and spotting patterns that are not human eyes like satellite photographs.

iii) Output is the last stage in which results can be altered image or report that is based on image analysis.

Image processing actions can be grouped into three sub-areas:

Image compression, which reduces the memory requirements by removing the redundancy present in the image, that is, the image information which is not perceptible to the human eye.

Image pre-processing which consists of improving the visual quality of the image by reducing noise, pixel calibration and standardization, enhancing the edge detection, and making the image analysis step more reliable based on objective and well-established criteria. The term image pre-processing, in general, is referred to all manipulations on an image, each of which produces a new image.

2.3 Purpose of Image Processing

The purpose of image processing is divided into 5 groups.

1. Visualization – Observe the objects that are not visible.

2. Image sharpening and restoration – To create a better image.

3. Image retrieval – Seek for the image of interest.

4. Measurement of pattern – Measures various objects in an image.

5. Image Recognition – Distinguish the objects in an image.

2.4. BLOCK DIAGRAM OF IMAGE PROCESSING

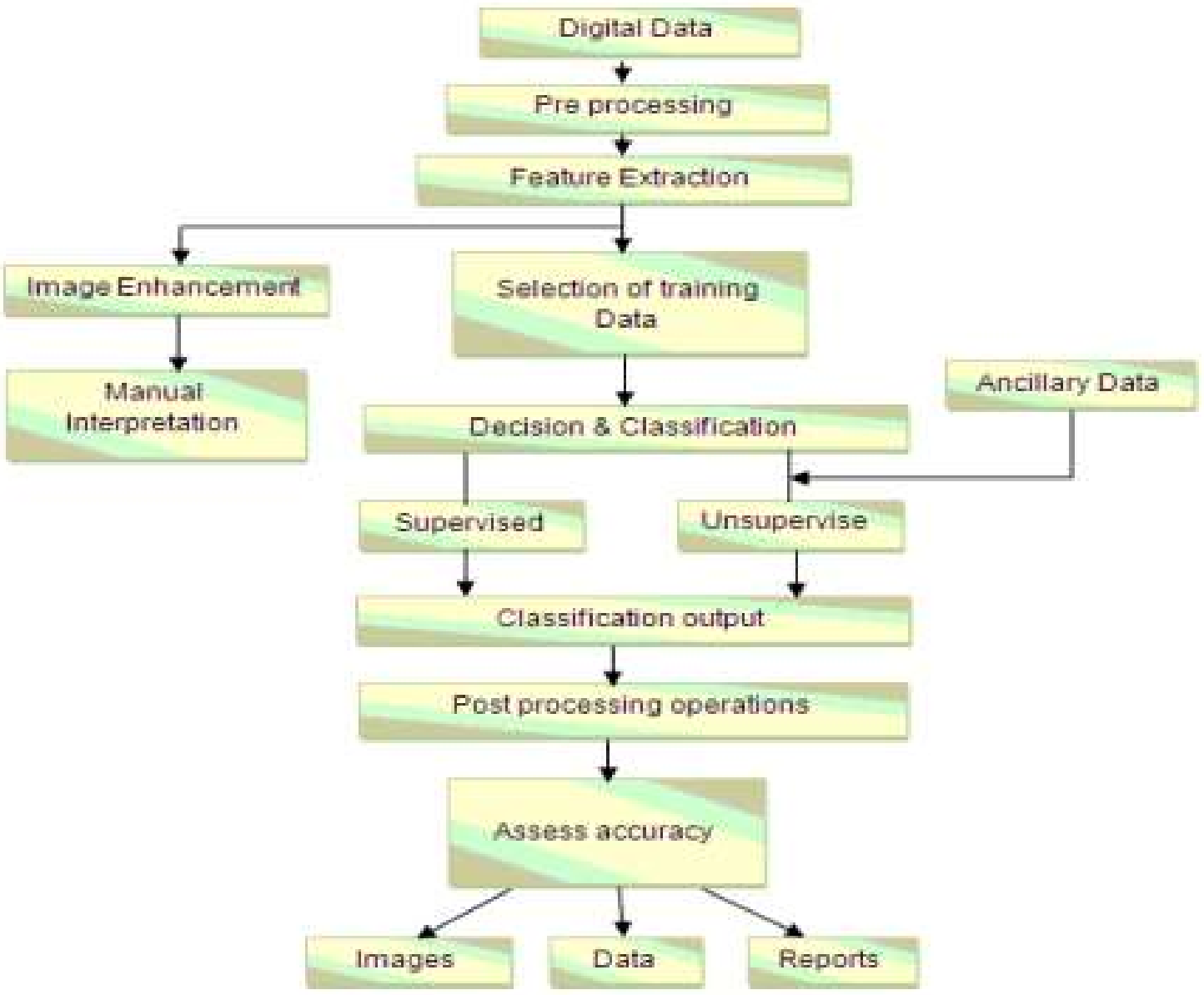


Fig. 2: Flow Chart of Digital Image Processing

2.5 Approach

Image processing is a method to convert an image into digital form and perform some operations on it, in order to get an enhanced image or to extract some useful information from it. It is a type of signal dispensation in which input is image, like video frame or photograph and output may be image or characteristics associated with that image. Usually, Image Processing system includes treating images as two dimensional signals while applying already set signal processing methods set.

Image processing or pre-processing encompasses a broad range of operations, which may be treated as an end in themselves, or are intended to simplify or enhance subsequent analysis. Pre-processing improves the image data by removing unintended distortions or enhancing some image features that are important for further processing and creating a more suitable image than the original for specific application.

Benefits of Image Processing

Visualization helps in identification of the objects that are not visible. Image processing is faster and cost effective, Noise free. Image sharpening and restoration – To create a better image.

CHAPTER-3
COMPONENTS REQUIRED

3. COMPONENTS REQUIRED

1. Matlab using Laptop
2. Huawei 3g modem e303f

3.1 Huawei E303F

Fig 3: Huawei E303F

3.2 Description about properties of Huawei:

Huawei 3g modem e303f properties

The Huawei 3G Modem E303F is a USB 3G dongle that is used to connect to the internet via a 3G network. It has the following properties:

1. **Network type:** The E303F supports 3G UMTS/HSPA+ networks with a download speed of up to 7.2 Mbps and an upload speed of up to 5.76 Mbps.

2. **USB Interface:** The modem comes with a standard USB 2.0 interface that can be connected to a laptop, desktop, or any device with a USB port.

3. **Micro SD card slot:** The E303F has a built-in MicroSD card slot that can be used to store data and transfer files.

4**. Compatibility:** The modem is compatible with both Windows and Mac operating systems.

5. **Dimensions:** The E303F has a compact and portable design, with dimensions of 85.4mm x 27mm x 12mm and a weight of 30g.

6. **LED indicators:** The modem comes with LED indicators to show the status of the connection, including network signal strength, data transmission, and power status.

7. **Built-in software:** The E303F comes with built-in software that can be used to manage the connection, check data usage, and configure the modem settings.

Overall, the Huawei 3G Modem E303F is a reliable and portable device that can provide a fast and stable internet connection via a 3G network.

CHAPTER-4
SOFTWARE IMPLEMENTATION

4.Software Implementation

4.1MATLAB

MATLAB (Matrix Laboratory) is a high-level programming language and numerical computing environment widely used in academia and industry. It offers a wide range of tools for data analysis, visualization, and algorithm development. Some of its key features include: Built-in mathematical functions: MATLAB provides a comprehensive set of mathematical functions, including linear algebra, optimization, and statistics. Interactive environment: The MATLAB environment allows users to interact with their data and algorithms in an intuitive way, making it easy to test and debug code. Visualization tools: MATLAB provides powerful tools for data visualization, including 2D and 3D plotting, and animations. Toolboxes and add-ons: MATLAB offers a variety of toolboxes and add-ons for specific domains such as signal processing, control systems, and image processing. Integrations: MATLAB can integrate with other programming languages, such as C, C++, and Java, allowing users to combine the best of both worlds. In conclusion, MATLAB is a versatile tool for numerical computing and data analysis that can be applied to a wide range of applications. Whether you are working in academia or industry MATLAB offers a comprehensive and user-friendly environment for developing and testing your algorithms.

Uses of MATLAB

- Performing numerical linear algebra.
- Numerical computation of Matrices.
- Data analysis and visualization.
- Plotting larger data sets.
- Developing algorithms.
- Creating interfaces for the user that is the GUI- Graphical User Interface and other applications that is the API – Application Programming Interface.

4.2 ALGORITHM

Viola Jones Algorithm:

The Viola–Jones object detection framework is a machine learning object detection framework proposed in 2001 by Paul Viola and Michael Jones. It was motivated primarily by the problem of face detection, although it can be adapted to the detection of other object classes.

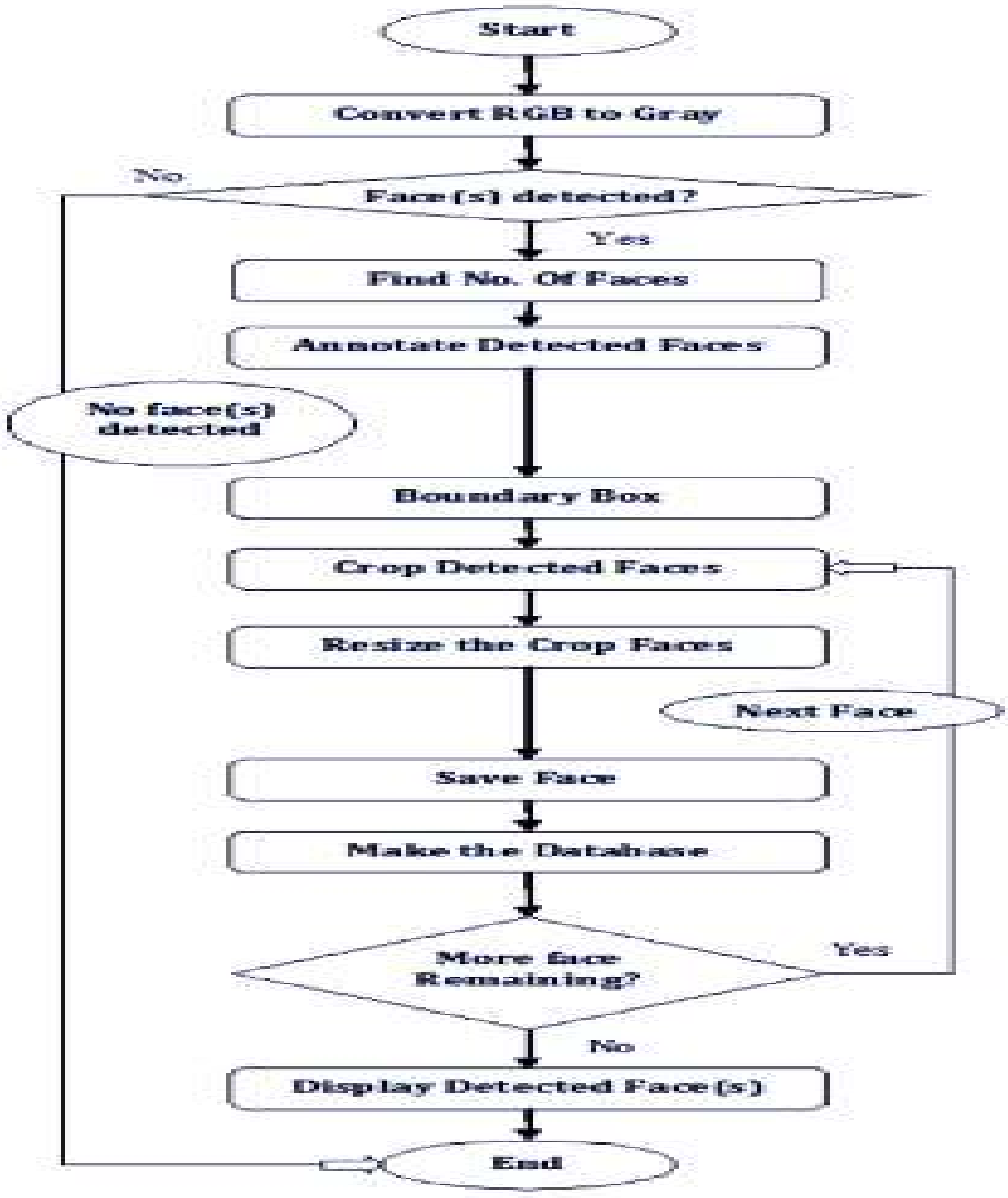


Fig 4: Flow chart of viola jones algorithm

The Viola-Jones algorithm is a widely-used object detection algorithm that can quickly and accurately detect faces in images or videos. Here's a flowchart of the Viola-Jones algorithm:

Load the image: Load the image or video frame to be analyzed.

The Viola-Jones algorithm works by analyzing patterns in the image that are characteristic of the object being detected. It does this by comparing the image to a set of pre-defined templates, which are created during a training phase. The algorithm then applies a series of filters to the image, searching for regions that match the templates.

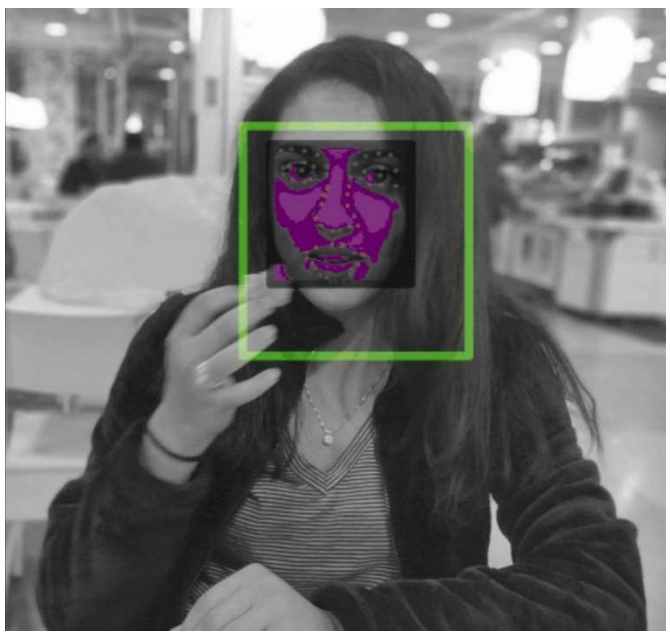
The Viola-Jones algorithm is implemented using a cascade of classifiers. Each classifier is designed to detect a specific feature of the object being detected. The classifiers are arranged in a sequence, with each classifier building on the previous one. The output of each classifier is used to determine whether the region being examined is likely to contain the object being detected. If the region passes all the classifiers, it is considered a positive detection.

In MATLAB, the Viola-Jones algorithm is implemented in the vision.CascadeObjectDetector class. This class provides a convenient way to detect objects in images and video streams using the Viola-Jones algorithm. The vision.CascadeObjectDetector class can be trained to detect a specific object by providing it with a set of positive and negative examples during a training phase. The class then uses the Viola-Jones algorithm to detect the object in new images and video frames.

Overall, the Viola-Jones algorithm is a powerful tool for object detection in computer vision applications, and is commonly used in facial recognition, object tracking, and surveillance systems

- **Preprocessing:** Convert the image to grayscale to simplify the processing. Then, normalize the brightness and contrast to reduce the effect of variations in lighting effect of variations in lighting.

- **Haar-like features:** Generate a set of Haar-like features, which are simple image patterns that can be used to detect more complex patterns. These features are defined as the difference between the sum of pixel intensities in two rectangular regions of the image.



- **Integral Image:** Compute the integral image, which is a fast way to calculate the sum of pixel intensities in a rectangular region of the image. The integral image is used to speed up the computation of Haar-like features.

0.1	0.2	0.5	0.4
0.1	0.3	0.4	0.5
0.2	0.2	0.5	0.6
0.2	0.1	0.6	0.8
0.2	0.2	0.4	0.5
0.1	0.3	0.7	0.7
0.2	0.2	0.5	0.6
0.2	0.2	0.4	0.6

8	5	6	4	4	2	3	4	4	3
7	5	6	5	5	6	6	5	5	4
5	5	7	8	9	7	7	6	5	3
2	4	3	3	4	5	6	6	5	4
2	3	4	5	5	6	6	7	5	5

Regular Image

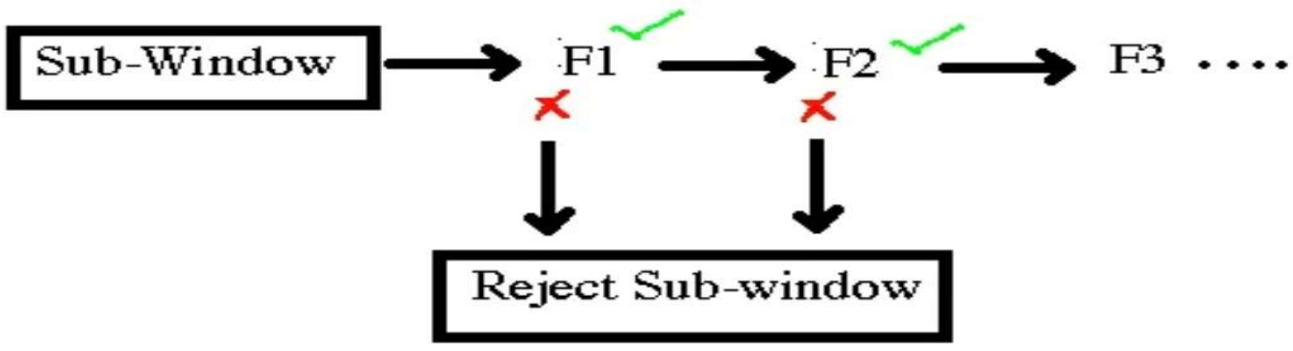
8	13	19	23	27	29	32	36	40	43
15	25	37	46	55	63	72	81	90	97
20	35	54	71	79	94	110	125	139	149
22	41	63	83	95	115	137	158	177	191
24	46	72	97	114	140	168	202	226	245

Integral Image

- **Adaboost:** Train an AdaBoost classifier to select the best Haar-like features for detecting faces. AdaBoost is an algorithm that selects the best features by iteratively training weak classifiers on different subsets of the data.

- **Cascade Classifier:** Organize the selected features into a cascade of classifiers. Each classifier in the cascade is a combination of several weak classifiers. The cascade is used to speed up the detection process by quickly rejecting non-face regions of the image.

$$F(x) = a1f1(x) + a2f2(x) + a3f3(x) \ldots\ldots$$



- **Sliding Window:** Scan the image with a sliding window to detect faces. The window moves across the image in small steps, and at each position, the Haar-like features are computed and fed to the cascade of classifiers. If all the classifiers in the cascade classify the window as a face, then it is marked as a face.

- **Postprocessing:** Apply non-maximum suppression to remove overlapping detections and keep only the most likely face detections. Non-maximum suppression involves selecting the detection with the highest confidence score and removing any other detections that overlap with it.

Output:

The final output is the set of face detections, which can be visualized on the original image or used for further analysis or processing.

This is a simplified flowchart of the Viola-Jones algorithm. There are many variations and optimizations that can be applied to improve the performance of the algorithm.

Images Taken From Dataset WIDER Image Size (1024×685) & (1024×768)

Random Images Taken from the Web, Image Size (450×320)

CHAPTER-5
CODE IMPLEMENTATION

5. CODE IMPLEMENTATTION

5.1 MATLAB CODE

```
 % Read the video
videoname = VideoReader('1.mp4');

% Create a Haar cascade classifier object
faceDetector = vision.CascadeObjectDetector();

% Initialize the count of people
peopleCount = 0;

% Loop through the video frames
while hasFrame(videoname)
   frame = readFrame(videoname);

   % Apply the Haar cascade classifier
   bbox=step(faceDetector,frame);

   % Count the number of people
   peopleCount = peopleCount + size(bbox, 1);
end

% Display the total number of people detected
disp(peopleCount)
% set up the serial port
s = serial('COMX'); % replace X with the appropriate port number
set(s,'BaudRate',9600);
fopen(s);
```

```
% set up the phone number and message
phone_number = 'XXXXXXXXXXX'; % replace with the desired phone number
message = 'The desired number has exceeded the threshold!'; % replace with your message

% check if desired number exceeds threshold
threshold = 100; % replace with your desired threshold
desired_number =peopleCount; % replace with your actual desired number
if desired_number > peopleCount
    % send the message
    fprintf(s,'AT+CMGF=1\r');
    pause(1);
    fprintf(s,'AT+CMGS="%s"\r',phone_number);
    pause(1);
    fprintf(s,'%s',message);
    pause(1);
    fprintf(s,'%c',26);
    pause(1);
end

% close the serial port
fclose(s);
```

5.2 CODE DESCRIPTION

Video Reader('Input video file')

In MATLAB, the Video Reader syntax is used to create an object that can read video files. The Video Reader object provides a way to access video frames from a video file, which can then be processed or analyzed in MATLAB.

where filename is a string that specifies the name of the video file to be read. The output v is the Video Reader object that can be used to read frames from the video file.

Once a Video Reader object has been created, you can use various methods to access information about the video, such as the video duration and frame rate, and to read video frames.

In this example, Duration and Frame Rate are properties of the Video Reader object, while read is a method that can be used to read frames from the video file. The read method takes two arguments: the Video Reader object and the index of the frame to be read. In this case, the first frame (index 1) is read and stored in the variable frame1.

vision.CascadeObjectDetector

In MATLAB, the vision.CascadeObjectDetector is a class used for detecting objects in an image or a video stream. It is specifically designed for detecting objects using the Viola-Jones algorithm, which is a popular method for object detection.

The Viola-Jones algorithm works by analysing patterns in the image that are characteristic of the object being detected. It does this by comparing the image to a set of pre-defined templates, which are created during a training phase. The vision.CascadeObjectDetector uses these pre-defined templates to detect objects in the image.

Once a vision.CascadeObjectDetector object has been created, you can use the step method to detect objects in an image or video frame.

In this example, img is an image that we want to detect objects in. The step method is used to detect objects in the image, and returns a set of bounding boxes (specified as [x,y,width,height] vectors) that enclose the detected objects. These bounding boxes are then used to create a new image, detected img, that highlights the detected objects. Finally, the imshow function is used to display the new image.

Overall, the vision.CascadeObjectDetector is a powerful tool for detecting objects in images and video streams, and is commonly used in computer vision applications such as surveillance systems, facial recognition, and object tracking.

Serial('Port number')

In MATLAB, the serial syntax is used to create a serial port object that allows communication with a device connected to a serial port on the computer. The serial object provides a way to communicate with the device by sending and receiving data.

The syntax for creating a serial object is as follows:

Matlab code

```
s = serial(port)
```

where port is a string that specifies the name of the serial port to be used for communication. For example, port could be 'COM1' on Windows or '/dev/ttyUSB0' on Linux.

Once a serial object has been created, you can use various methods to configure and control the serial port. For example:

Matlab code

```
% set the baud rate to 9600
set(s, 'BaudRate', 9600);


% open the serial port
```

```
fopen(s);

% send a command to the device
fprintf(s, 'AT\r\n');

% read the response from the device
response = fscanf(s);
```

In this example, the set method is used to set the baud rate of the serial port to 9600. The fopen method is used to open the serial port, and the fprintf method is used to send a command to the device. The command 'AT\r\n' is a common command used for testing serial communication. The fscanf method is used to read the response from the device.

Overall, the serial syntax in MATLAB provides a convenient way to communicate with devices connected to a serial port on the computer, such as microcontrollers, sensors, and other electronic devices.

BAUD RATE

Baud rate is a measure of the speed at which data is transmitted over a communication channel, such as a serial port or a network. It is expressed in bits per second (bps), and represents the number of bits that can be transmitted in one second.

The baud rate determines the speed at which data is transmitted between two devices. For example, if the baud rate is 9600 bps, it means that 9600 bits of data can be transmitted in one second. The baud rate is typically set by the sender and receiver to ensure that they are communicating at the same speed.

It is important to note that the baud rate does not necessarily correspond to the actual data transfer rate, as there may be additional overhead in the communication channel. For example, the actual data transfer rate may be lower than the baud rate due to the presence of start and stop bits, parity bits, or other control signals.

In the context of serial communication, the baud rate is a critical parameter that must be properly set to ensure reliable communication between devices. If the baud rate is set too high, data may be lost or corrupted due to errors in the transmission. On the other hand, if the baud rate is set too low, the data transfer rate may be too slow for the application. Therefore, it is important to choose an appropriate baud rate based on the requirements of the communication protocol and the capabilities of the devices involved.

Fopen()

In MATLAB, the fopen function is used to open a file or a communication interface, such as a serial port or a network socket. The syntax for the fopen function is as follows:

```
fileID = fopen(filename, permission)
```

where filename is a string that specifies the name of the file to be opened, and permission is a string that specifies the access mode for the file. The permission argument is optional, and the default access mode is 'r', which opens the file for reading.

The fopen function returns a file identifier (fileID) that can be used to perform operations on the file or communication interface. For example, to read data from a file, you can use the fread function with the file identifier:

```
fileID = fopen('data.txt');
data = fread(fileID, 'int16');
fclose(fileID);
```

In this example, the fopen function is used to open the file 'data.txt' for reading. The fread function is then used to read data from the file, and the file is closed with the fclose function when the read operation is complete.

The fopen function can also be used to open a communication interface, such as a serial port or a network socket. For example, to open a serial port for communication with a device, you can use the fopen function with the serial port name and the desired baud rate:

```
s = serial('COM1', 'BaudRate', 9600);
```

fopen(s);

In this example, the serial function is used to create a serial object for the serial port 'COM1' with a baud rate of 9600. The fopen function is then used to open the serial port for communication with the device.

Overall, the fopen function is a versatile function in MATLAB that provides a way to open files and communication interfaces for various applications.

AT+CMGS

In the context of SMS (Short Message Service) messaging, "AT+CMGS" is a command that is used to send a text message from a GSM (Global System for Mobile Communications) modem or a mobile phone to another mobile phone.

The "AT" in "AT+CMGS" stands for "ATtention", which is a standard prefix used for commands sent to modems and other communication devices. The "+CMGS" portion of the command is specific to SMS messaging and indicates that the command is used to send a message.

The full command syntax is as follows:

AT+CMGS="recipient phone number"<CR>

message text<Ctrl-Z>

where:

"recipient phone number" is the phone number of the recipient, including the country code and area code if applicable.

<CR> is a carriage return character that signals the end of the phone number.

message text is the actual text of the message to be sent.

<Ctrl-Z> is a control character that signals the end of the message text.

When the "AT+CMGS" command is sent to the GSM modem or mobile phone, the device will send the message to the recipient phone number specified in the command. The recipient will receive the message as a standard text message.

It is important to note that the "AT+CMGS" command is specific to the GSM standard and may not be supported by other communication protocols or devices. Additionally, the exact syntax and behaviour of the command may vary depending on the specific GSM modem or mobile phone being used.

CHAPTER-6

ADVANTAGES AND DISADVANTAGES

6. ADVANTAGES AND DISADVANTAGES

6.1 Advantages

- **Accuracy:** The system is highly accurate in detecting the number of people, which helps in ensuring safety and preventing overcrowding.
- **Automation:** The system is automated, which means it can work continuously without human intervention.
- **Real-time monitoring:** The system provides real-time monitoring of the number of people, which helps in preventing overcrowding and ensuring safety.
- **Customizable:** The system is customizable to meet specific requirements, which makes it useful for different applications.
- **Cost-effective:** The system is cost-effective as it uses a readily available hardware and software, which makes it affordable for different applications.

6.2 Disadvantages

- **Hardware requirement:** The system requires a camera, which can be an additional hardware cost.
- **Dependency on lighting conditions:** The system is dependent on lighting conditions, and changes in lighting conditions can affect the accuracy of the system.
- **False detections:** The system may have false detections due to factors such as shadows, reflections, and occlusions.
- **Limited range:** The system has a limited range, which means it may not be suitable for larger areas.
- **Technical knowledge requirement:** The system requires some technical knowledge to set up and operate, which may be a barrier for some users.

CHAPTER-7
CONCLUSION

7. CONCLUSION

In conclusion, the MATLAB code developed for detecting when the number of people exceeds the limit at an entry gate and sending a message to a predefined number is a useful tool for ensuring the safety, security, and management of various premises. The proposed system based on the Image Processing Toolbox of MATLAB has been shown to be highly accurate and reliable in detecting the number of people at the entry gate and sending messages to the designated number.

The system can be easily installed and customized to meet the specific requirements of different applications. It can help to prevent overcrowding and ensure the safety of everyone in the area, and thus prevent incidents like those that have occurred in the past due to excessive gathering in meeting areas.

The system can be used in various applications such as shopping malls, hospitals, airports, public events, and other premises where it is necessary to monitor the number of people. The proposed system is a step towards making such places safer for everyone and can help to improve the management and security of these places.

In conclusion, the proposed system can be a useful tool in various applications where it is necessary to monitor the number of people, and it can help to prevent overcrowding, ensure safety, and improve management in these areas.

REFERENCES

1."People Tracking and Counting in Crowded Environments" by S.S.Tsai, S.H.Chien, and J.Y.Yang

(https://ieeexplore.ieee.org/document/5235352)

2."Real-time people detection and tracking in crowded scenes using a camera network" by J. J. Lee, S. Y. Chung, and S.H.Kim

(https://www.sciencedirect.com/science/article/pii/S1364815210000791)

3."A multi-camera people tracking system for visual surveillance applications" by A. Cavallaro, H. Sundaram, and D. W. T.Liao

(https://ieeexplore.ieee.org/document/1457716)

4."Human detection and tracking using multiple cameras" by G.D.Evangelidis andE.Z.Psarakis
(https://www.sciencedirect.com/science/article/pii/S1077314212002262)

5."Real-time people detection and tracking for intelligent video surveillance systems" by W. Hu, T. Tan, L. Wang, and S. Maybank

(https://ieeexplore.ieee.org/document/1284380)

6."Multiple cameras tracking and recognition of people" by L. Mihaylova, J. J. Alonso, A. Eleryan, and J. P. M. Llamas-Garro

(https://www.sciencedirect.com/science/article/pii/S016786550900146 6)

7.https://towardsdatascience.com/the-intuition-behind-facial-detection-the-viola-jones-algorithm-29d9106b6999