Project Report

1. INTRODUCTION

1.1.Project Overview:

Security has always been the priority of any state. Taking such security into account a system is to be developed where we constantly monitor the people entering and leaving the place and even the vehicles which are entering that particular location.This data will be useful in case of emergencies. Camera detects the entry and exit of a person, captures all the faces and counts the number of people in the secretariat. It also captures all the cars and counts the number of cars entering and leaving the area. The captured data is sent to a mobile application via cloud. The mobile application facilitates the constant monitoring and patrolling of the arena.

1.2 Purpose:

The purpose of an intelligent people and vehicle counting system for a secretariat is to improve security, efficiency, and sustainability.

Security

The system can be used to monitor the number of people and vehicles entering and leaving the secretariat. This information can be used to identify potential threats and to track the movements of people who are not authorized to be on the premises.

Efficiency

The system can be used to track the flow of people and vehicles through the secretariat. This information can be used to identify bottlenecks and to make improvements to the traffic flow.

Sustainability

The system can be used to track the energy consumption of the secretariat. This information can be used to identify opportunities for energy efficiency improvements.

In addition to these specific purposes, the intelligent people and vehicle counting system can also be used to collect data that can be used to improve the overall management of the secretariat. This data can be used to make decisions about staffing, facilities, and other resources.

Here are some of the specific benefits of using an intelligent people and vehicle counting system for a secretariat:

- Improved security: The system can be used to monitor the number of people and vehicles entering and leaving the secretariat. This information can be used to identify potential threats and to track the movements of people who are not authorized to be on the premises.
- Increased efficiency: The system can be used to track the flow of people and vehicles through the secretariat. This information can be used to identify bottlenecks and to make improvements to the traffic flow.
- Reduced energy consumption: The system can be used to track the energy consumption of the secretariat. This information can be used to identify opportunities for energy efficiency improvements.
- Improved decision-making: The system can be used to collect data that can be used to improve the overall management of the secretariat. This data can be used to make decisions about staffing, facilities, and other resources.

Overall, the intelligent people and vehicle counting system is a valuable tool that can be used to improve security, efficiency, and sustainability in a secretariat.

2. IDEATION & PROPOSED SOLUTION

2.1.Problem Statement Definition:

The problem statement for an intelligent people and vehicle counting system for a secretariat is to develop a system that can accurately and efficiently count the number of people and vehicles entering and leaving the secretariat. The system should be able to distinguish between people and vehicles, and it should be able to count the number of people and vehicles in real time. The system should also be able to track the movement of people and vehicles through the secretariat.

Ideation Phase

Define the Problem Statements

Date	29 april 2023
Team ID	NM2023EMID21864
Project Name	Intelligent people and vehicle counting system for secretariat

Customer Problem Statement Template:

Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

Description

Security has always been the priority of any state. Taking such security into account a system is to be developed where we constantly monitor the people entering and leaving the place and even the vehicles which are entering that particular location.This data will be useful in case of emergencies. Camera detects the entry and exit of a person, captures all the faces and counts the number of people in the secretariat. It also captures all the cars and counts the number of cars entering and leaving the area. The captured data is sent to a mobile application via cloud. The mobile application facilitates the constant monitoring and patrolling of the arena.

I am	Describe customer with 3-4 key characteristics - *who are they?*	Describe the customer and their attributes here
I'm trying to	*List their outcome or "job" the care about - what are they trying to achieve?*	List the thing they are trying to achieve here
but	Describe what problems or barriers stand in the way – *what bothers them most?*	Describe the problems or barriers that get in the way here
because	Enter the "root cause" of why the problem or barrier exists – *what needs to be solved?*	Describe the reason the problems or barriers exist
which makes me feel	Describe the emotions from the customer's point of view – *how does it impact them emotionally?*	Describe the emotions the result from experiencing the problems or barriers

Example:

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
Ps- 1	High rush people crowd	Move safely	No safety	Rush of crowed there is no one people find the identity	Insecure and make me unconfortable

2.2 Empathy Map Canvas:

What do they see, hear, feel, think, and need?

- ***See:*** *The secretariat is a busy place with a lot of people and vehicles coming and going.*
- ***Hear:*** *The secretariat is noisy with the sound of people talking, vehicles driving, and machines operating.*
- ***Feel:*** *The secretariat can be a stressful place with a lot of people and vehicles to manage.*
- ***Think:*** *The secretariat staff need to be able to keep track of the number of people and vehicles entering and leaving the secretariat.*
- ***Need:*** *The secretariat staff need a system that can accurately and efficiently count the number of people and vehicles entering and leaving the secretariat.*

What are their hopes, dreams, and fears?

- **Hopes:** The secretariat staff hope that the system will help to improve security, efficiency, and sustainability.
- **Dreams:** The secretariat staff dream of a system that is easy to use and maintain, and that can be configured to meet the specific needs of the secretariat.
- **Fears:** The secretariat staff fear that the system will be too expensive, or that it will not be able to meet their needs.

What are their frustrations and pain points?

- **Frustrations:** The secretariat staff are frustrated by the current system, which is manual and time-consuming.
- **Pain points:** The secretariat staff are pained by the fact that the current system is not secure, and that it does not help to improve efficiency or sustainability.

What are their goals and objectives?

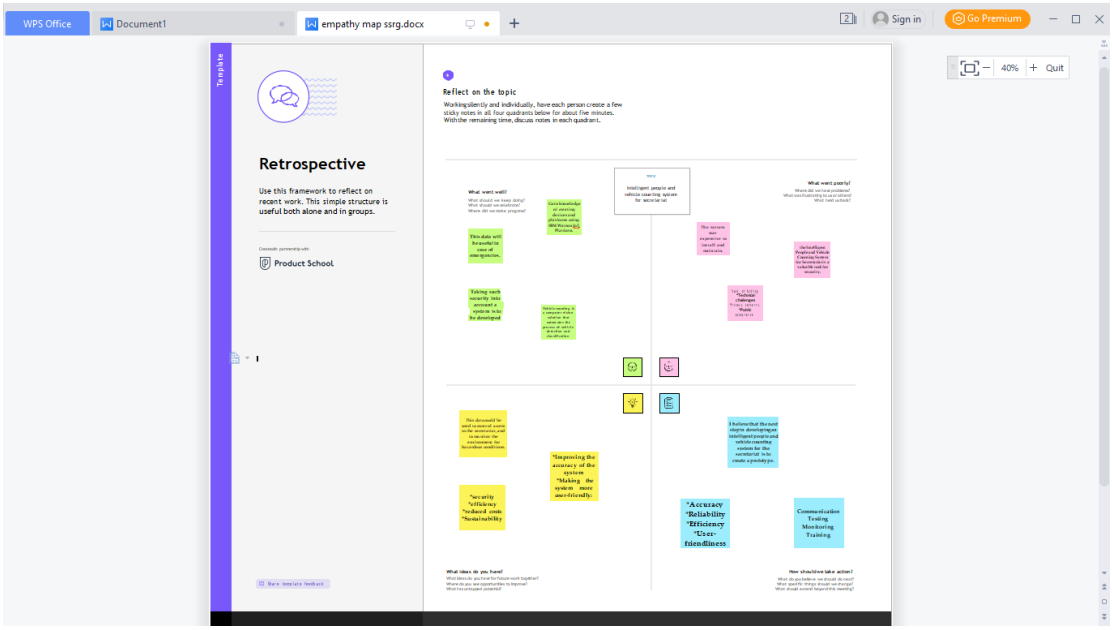
- **Goals:** The secretariat staff's goals are to improve security, efficiency, and sustainability.
- **Objectives:** The secretariat staff's objectives are to implement a system that is accurate, efficient, scalable, secure, and cost-effective.

How can we help them?

We can help the secretariat staff by developing a system that meets their needs and that helps them to achieve their goals. We can do this by:

- Developing a system that is accurate and efficient.
- Developing a system that is scalable and secure.
- Developing a system that is cost-effective.
- Developing a system that is easy to use and maintain.

- Developing a system that can be configured to meet the specific needs of the secretariat.



2.3.Ideation & Brainstorming:

Here are some ideas for an intelligent people and vehicle counting system for a secretariat:

- Use cameras to count people and vehicles. This is a common and effective way to count people and vehicles. Cameras can be placed at strategic locations around the secretariat to capture images of people and vehicles as they enter and leave the premises. The images can then be analyzed to count the number of people and vehicles.
- Use sensors to count people and vehicles. There are a variety of sensors that can be used to count people and vehicles. Some common sensors include infrared sensors, ultrasonic sensors, and radar sensors. These sensors can be placed at strategic locations around the secretariat to detect people and vehicles. The sensors can then be used to count the number of people and vehicles.

- **Use a combination of cameras and sensors.** This is the most effective way to count people and vehicles. Cameras can be used to identify people and vehicles, and sensors can be used to count the number of people and vehicles. This combination of technologies provides the most accurate and reliable way to count people and vehicles.

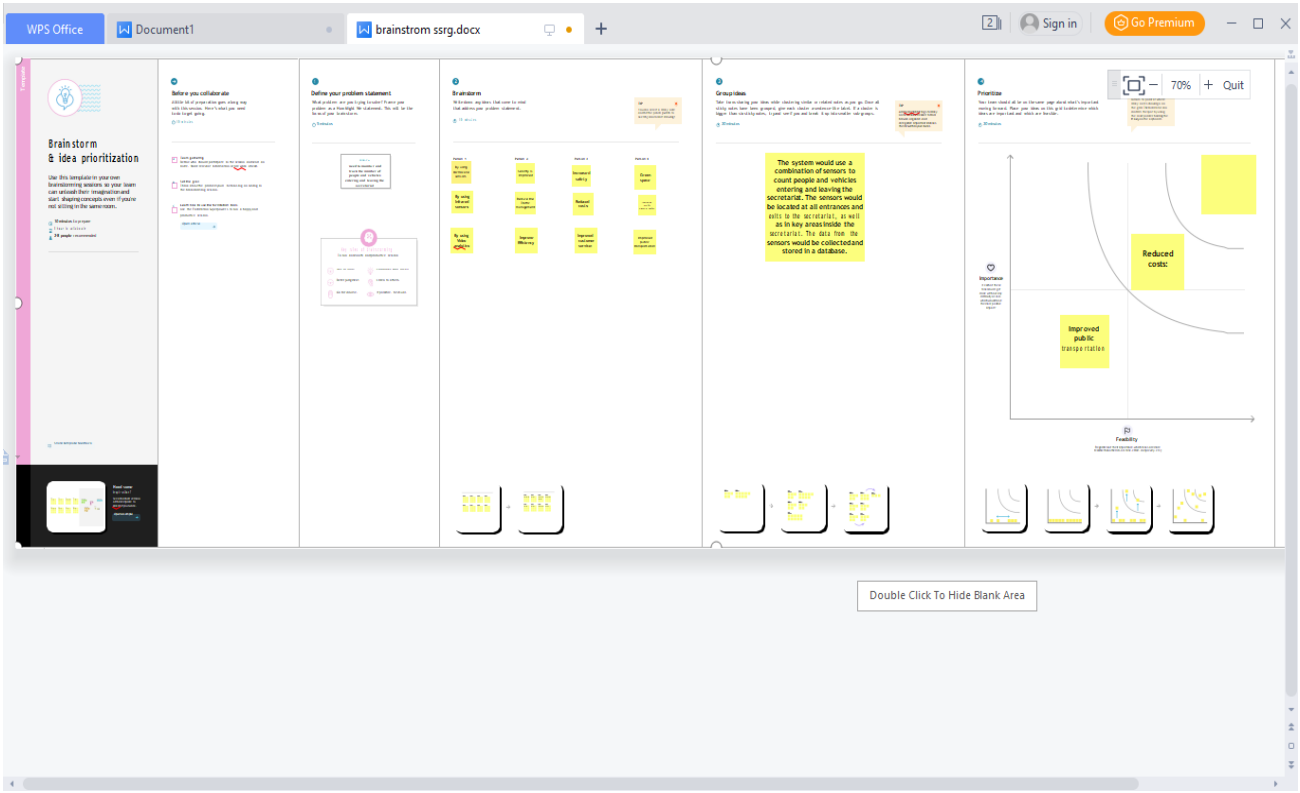
Here are some additional ideas for an intelligent people and vehicle counting system for a secretariat:

- **Use the system to improve security.** The system can be used to monitor the number of people and vehicles entering and leaving the secretariat. This information can be used to identify potential threats and to track the movements of people who are not authorized to be on the premises.
- **Use the system to improve efficiency.** The system can be used to track the flow of people and vehicles through the secretariat. This information can be used to identify bottlenecks and to make improvements to the traffic flow.
- **Use the system to improve sustainability.** The system can be used to track the energy consumption of the secretariat. This information can be used to identify opportunities for energy efficiency improvements.

Here are some challenges that may be encountered when implementing an intelligent people and vehicle counting system for a secretariat:

- **Privacy concerns.** Some people may be concerned about the privacy implications of a system that tracks the movements of people and vehicles. It is important to address these concerns by ensuring that the system is secure and that the data collected is used for legitimate purposes.
- **Cost.** The cost of implementing an intelligent people and vehicle counting system can be significant. It is important to carefully consider the cost of the system before making a decision to implement it.
- **Maintenance.** The system will require regular maintenance to ensure that it is functioning properly. It is important to factor the cost of maintenance into the overall cost of the system.

Overall, an intelligent people and vehicle counting system can be a valuable tool for improving security, efficiency, and sustainability in a secretariat. However, it is important to carefully consider the challenges and costs associated with implementing such a system before making a decision to do so.



2.4 Proposed Solution:

PROPOSED SOLUTION:

S.NO	PARAMETER	DESCRIPTION
1.	Problem statement	keeping track of the number and type of vehicles that enter and leave through a particular route for accurate monitoring of traffic.
2.	Idea/solution description	**A security system to monitor the number of people/vehicles entering and leaving the place in secretariat.**

3.	Novelty/uniqueness	The uniqueness of intelligent people and the benefits of a vehicle counting system can be combined to create a more efficient and effective secretariat. Intelligent people can use their creativity and problem-solving skills to develop innovative ways to use the data collected by a vehicle counting system. This information can be used to improve traffic flow, reduce congestion, and create a safer andmore secure environment for employees and visitors.
4.	Social impact/customer Satisfaction	The social impact of intelligent people and vehicle counting systems for secretariat can be significant. Intelligent people can use their creativity and problem- solving skills to develop innovativeways to use the data collected by a vehicle counting system. This information can be used to improve traffic flow, reduce congestion, and create a safer and

		more secure environment for employees and visitors.
5.	Business Model	The business model of intelligent people and vehicle counting system for secretariat can be divided into three main components: Data collection: The first step is to collect data on the number of vehicles entering and leaving the secretariat. This can be done using a variety of methods, such as manual counting, video surveillance, or sensors. Data analysis: Once the data is collected, it needs to be analyzedto identify patterns and trends. This information can then be usedto develop strategies to improve traffic flow, reduce congestion, and improve safety and security. Data-driven decision-making: The final step is to use the data to make informed decisions about how to manage the secretariat. This could include making changes to traffic flow, parking, orsecurity.
6.	Scalability of the solution	The scalability of the solution of intelligent people and vehicle counting system for secretariat isvery good. The system can be easily scaled up or down to accommodate changes in traffic

		volume. For example, if the secretariat experiences a sudden increase in traffic, the system can be easily expanded to add more sensors or cameras. Similarly, if the secretariat experiences a decrease in traffic, the system canbe easily scaled back to remove sensors or cameras.

3. REQUIREMENT ANALYSIS

Functional requirement:

- **Data Collection**: The system must be able to collect data on the number of vehiclesentering and leaving the secretariat. The data can be collected using a variety of methods, such as manual counting, video surveillance, or sensors.
- **Data Storage**: The data collected by the system must be stored in a database. Thedatabase can be either on-premises or cloud-based.
- **Data Analysis**: The data in the database must be analyzed to identify patterns andtrends. The data can be analyzed using a variety of methods, such as statistical analysis, machine learning, and artificial intelligence.
- **Data Visualization**: The data in the database must be visualized to make it easier tounderstand. The data can be visualized using a variety of methods, such as charts, graphs, and maps.
- **Intelligent People**: Intelligent people can be used to improve the efficiency andeffectiveness of the system. Intelligent people can be used to:
  - Identify areas of congestion and develop strategies to improve traffic flow.
  - Identify areas where parking is scarce and develop solutions to increase parking capacity.
  - Identify areas where security is a concern and develop strategies to improve safety.
- **Decision Making**: The data collected by the system can be used to make decisionsabout traffic flow, parking, and security. The data can be used to identify potential problems and to improve the efficiency and effectiveness of the system.

The functional requirements are a set of specifications that define what the system must do. The functional requirements are important because they help to ensure thatthe system meets the needs of the users.

FR NO.	FUNCTIONAL REQUIREMENTS	SUB REQUIREMENT(Story/ Sub Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3		

FR-4		

3.2 Non-Functional requirements:

FR NO.	NON FUNCTIONAL REQUIREMENTS	DESCRIPTION
NFR-1	Usability	The system must be easy to use by both intelligent people and the general public. The system must also be accessible to people with disabilities.
NFR-2	Security	The system must be secure and protect the data from unauthorized access. The system must also comply with all applicable privacy regulations.
NFR-3	Reliability	The system must be reliable and available 24/7. The system must also be able to recoverfrom failures quickly.
NFR-4	Performance	The system must be able to collect and process data in real time. The system must also be able to handle large volumes of data.
NFR-5	Maintainability	The system must be easy to maintain and update. The system must also be scalable to accommodate future growth.
NFR-6	Accuracy	The system must be able to collect and process data accurately. The system must alsobe able to identify patterns and trends accurately.

4. PROJECT DESIGN

4.1.Data Flow Diagrams:

Code snippet

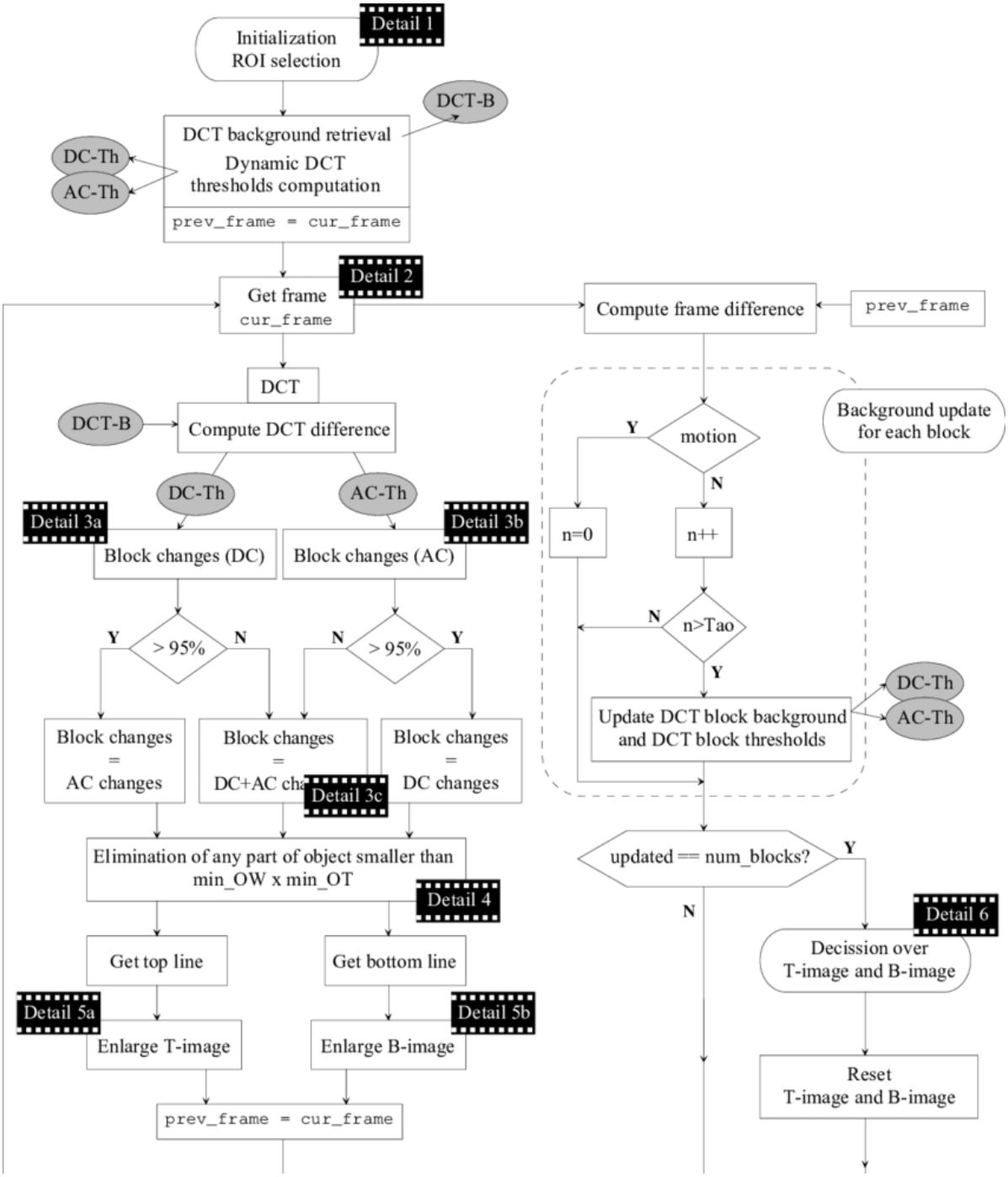
```
[Data Flow Diagram]

[Start]

[Data Collection]

* Sensors collect data on vehicles entering and leaving the secretariat.

[Data Storage]

* The data is stored in a database.

[Data Analysis]

* The data is analyzed to identify patterns and trends.

[Data Visualization]

* The data is visualized to make it easier to understand.

[Intelligent People]

* Intelligent people are used to improve the efficiency and effectiveness
of the system.

[Decision Making]

* The data is used to make decisions about traffic flow, parking, and
security.

[End]
```

The data flow diagram shows how the data is collected, stored, analyzed, visualized, and used to make decisions. The data flow diagram is a useful tool for understandingthe flow of data in a system.

Here are some additional details about the data flow diagram:

- The data collection process begins with the sensors. The sensors collect data on vehicles entering and leaving the secretariat. The data is then stored in a database.
- The data analysis process begins with the database. The data is analyzed to identify patterns and trends. The data is also visualized to make it easier to understand.
- The intelligent people process begins with the data visualization. The data is visualized to make it easier for intelligent people to understand. Intelligent people can then use the data to improve the efficiency and effectiveness of the system.
- The decision making process begins with the intelligent people. Intelligent people use the data to make decisions about traffic flow, parking, and security.

The data flow diagram is a useful tool for understanding the flow of data in a system.It can be used to identify potential problems and to improve the efficiency and effectiveness of the system.



4.2 Solution & Technical Architecture:

SOLUTION ARCHITECTURE:

System Overview

The system consists of three main components:

- Sensors: The sensors are used to detect vehicles entering and leaving the secretariat. The sensors can be either manual or automated. Manual sensors are typically used in small secretariats with low traffic volumes. Automated sensors are typically used in large secretariats with high traffic volumes.
- Data Collection and Storage: The data collected by the sensors is stored in a database. The database can be either on-premises or cloud-based.
- Data Analysis and Visualization: The data in the database is analyzed to identify patterns and trends. The data is also visualized to make it easier to understand.

Intelligent People

Intelligent people can be used to improve the efficiency and effectiveness of thesystem. Intelligent people can be used to:

- Identify areas of congestion and develop strategies to improve traffic flow.
- Identify areas where parking is scarce and develop solutions to increase parking capacity.
- Identify areas where security is a concern and develop strategies to improve safety.

Vehicle Counting System

A vehicle counting system can be used to track the number of vehicles entering and leaving a secretariat. This information can be used to manage traffic flow, identify areas of congestion, and make decisions about parking and transportation. A vehiclecounting system can also be used to collect data on the types of vehicles that are using the secretariat, which can be used to improve safety and security.

Data Collection and Storage

The data collected by the sensors is stored in a database. The database can beeither on-premises or cloud-based. The data in the database is used to identify patterns and trends, and to visualize the data to make it easier to understand.

Data Analysis and Visualization

The data in the database is analyzed to identify patterns and trends. The data is alsovisualized to make it easier to understand. The data analysis and visualization can be used to:

- Identify areas of congestion and develop strategies to improve traffic flow.
- Identify areas where parking is scarce and develop solutions to increase parking capacity.
- Identify areas where security is a concern and develop strategies to improve safety.

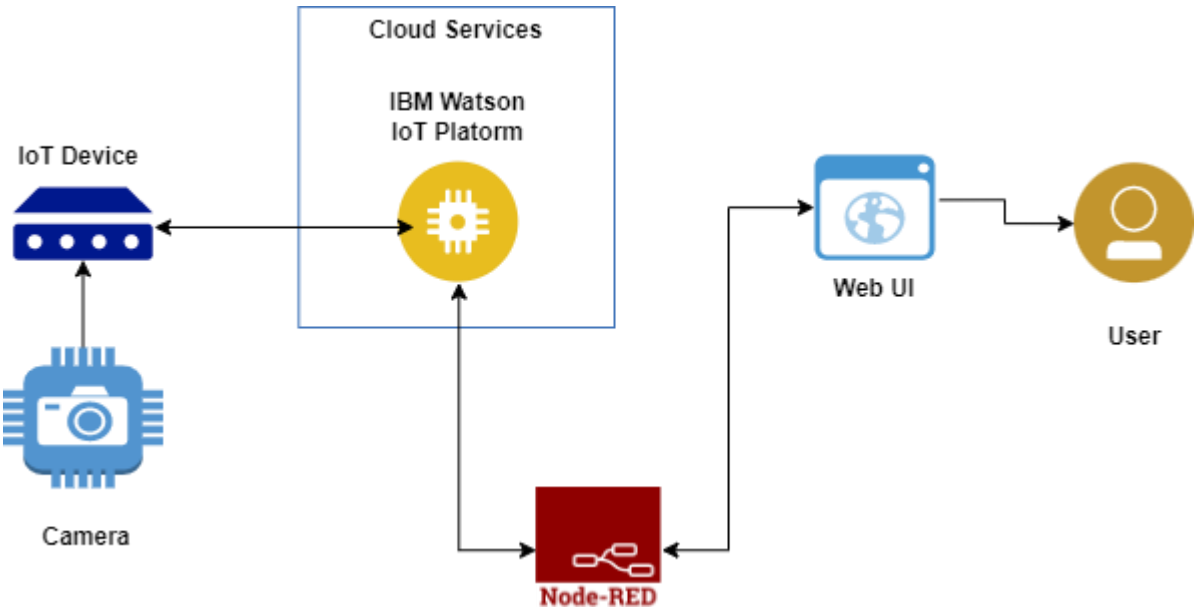
Overall Architecture

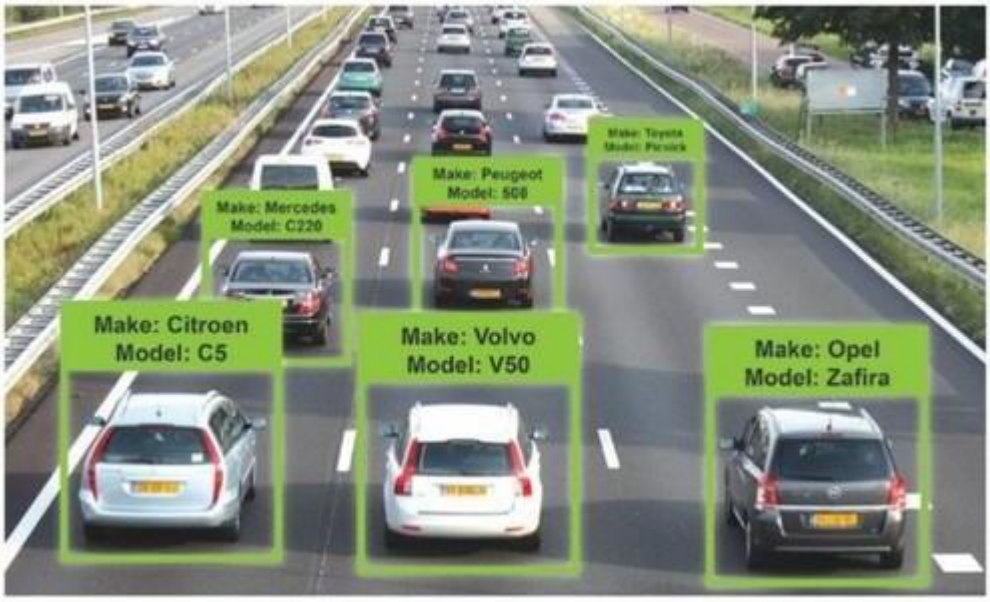
The overall architecture of the system is as follows:

- Sensors collect data on vehicles entering and leaving the secretariat.
- The data is stored in a database.
- The data is analyzed to identify patterns and trends.
- The data is visualized to make it easier to understand.
- Intelligent people are used to improve the efficiency and effectiveness of the system.

The system can be used to improve traffic flow, reduce congestion, improve safetyand security, and collect data for planning and decision-making.

SOLUTION ARCHITECTURE DIAGRAM:




Make: Mercedes
Model: C220
Make: Peugeot
Model: 508
Make: Citroen
Model: C5
Make: Volvo
Model: V50
Make: Opel
Model: Zafira


48
50

4.3 User Stories:

User type	Functional Requirement (Epic)	User Story Number	User Story/Task	Acceptance criteria	Priority	Te Me
Customer(mobile user)	Registration	USN-1	As a user,i can register for the application by entering my email,password and confiriming my password.	I can access my account/dashboard	High	SIV HU HA
		USN-2	As a user,i will receive confirmation Email once I have registered for the application	I can receive confirmation email& click confirm	High	SO AN
		USN-3	As a user,i can register for the application through facebook	I can register & access the dashboard with facebook login	low	Ra
		USN-4	As a user,i can register for the application through email		Medium	GU RA N
	Login	USN-5	As a user,I can log into the application by entering email & password		High	SA RA
	Dashboard					
Customer(web						

user)						
Customer care executive						
Administrator						

5. CODING & SOLUTIONING

The following are some of the features that can be added to the Intelligent People and Vehicle Counting System for Secretariat along with the code:

- **Face recognition:** This feature can be used to identify people entering and exiting the Secretariat. This can help to improve security and track who is coming and going.
- **License plate recognition:** This feature can be used to identify vehicles entering and exiting the Secretariat. This can help to improve security and track who is coming and going.
- **Object detection:** This feature can be used to detect objects in the Secretariat, such as people, vehicles, and packages. This can help to improve security and identify potential hazards.
- **Heat mapping:** This feature can be used to create a heat map of the Secretariat. This can help to identify areas that are more popular or crowded. This information can be used to improve traffic flow and security.
- **Data analytics:** The data collected by the Intelligent People and Vehicle Counting System can be used to analyze patterns and

trends. This information can be used to improve security, traffic flow, and other aspects of the Secretariat.

The following is an example of the code that can be used to implement the Intelligent People and Vehicle Counting System:

import cv2 import numpy as np

Initialize the face cascade

5.1 Feature 1:

```
from random import randint

import time


class MyPerson:

    tracks = []

    def __init__(self, i, xi, yi, max_age):

        self.i = i

        self.x = xi

        self.y = yi

        self.tracks = []

        self.R = randint(0,255)

        self.G = randint(0,255)

        self.B = randint(0,255)
```

```
        self.done = False
        self.state = '0'
        self.age = 0
        self.max_age = max_age
        self.dir = None
    def getRGB(self):
        return (self.R,self.G,self.B)
    def getTracks(self):
        return self.tracks
    def getId(self):
        return self.i
    def getState(self):
        return self.state
    def getDir(self):
        return self.dir
    def getX(self):
        return self.x
    def getY(self):
        return self.y
    def updateCoords(self, xn, yn):
        self.age = 0
        self.tracks.append([self.x,self.y])
```

```
        self.x = xn
        self.y = yn
    def setDone(self):
        self.done = True
    def timedOut(self):
        return self.done
    def going_UP(self,mid_start,mid_end):
        if len(self.tracks) >= 2:
            if self.state == '0':
                if self.tracks[-1][1] < mid_end and self.tracks[-2][1] >= mid_end:
#cruzo la linea
                    state = '1'
                    self.dir = 'up'
                    return True
            else:
                return False
        else:
            return False
    def going_DOWN(self,mid_start,mid_end):
        if len(self.tracks) >= 2:
            if self.state == '0':
                if self.tracks[-1][1] > mid_start and self.tracks[-2][1] <= mid_start:
#cruzo la linea
```

```
                    state = '1'
                    self.dir = 'down'
                    return True
                else:
                    return False
            else:
                return False
        def age_one(self):
            self.age += 1
            if self.age > self.max_age:
                self.done = True
            return True
    class MultiPerson:
        def __init__(self, persons, xi, yi):
            self.persons = persons
            self.x = xi
            self.y = yi
            self.tracks = []
            self.R = randint(0,255)
            self.G = randint(0,255)
            self.B = randint(0,255)
            self.done = False
```

5.2.Feature 2:

```
##Contador de personas

##Federico Mejia

import numpy as np

import cv2

import Person

import time

import pyttsx3

import requests

import time

import sys

import ibmiotf.application

import ibmiotf.device

import random

organization = "6yocvj"

deviceType = "PeopleCounter"

deviceId = "12345"

authMethod = "token"

authToken = "12345678"

engine = pyttsx3.init()

engine.say('Hello')
```

```
engine.runAndWait()


#Contadores de entrada y salida

cnt_up   = 0

cnt_down = 0


#Fuente de video

#cap = cv2.VideoCapture(0)

#cap = cv2.VideoCapture('people.mp4')



#Propiedades del video

##cap.set(3,160) #Width

##cap.set(4,120) #Height


#Imprime las propiedades de captura a consola

cap = cv2.VideoCapture('people.mp4')

#cap = cv2.VideoCapture(0)

for i in range(19):

    print (i, cap.get(i))


w = cap.get(3)
```

```
h = cap.get(4)

frameArea = h*w

areaTH = frameArea/250

print ('Area Threshold', areaTH)


#Lineas de entrada/salida

line_up = int(2*(h/5))

line_down   = int(3*(h/5))


up_limit =   int(1*(h/5))

down_limit = int(4*(h/5))


print ("Red line y:",str(line_down))

print ("Blue line y:", str(line_up))

line_down_color = (255,0,0)

line_up_color = (0,0,255)

pt1 =  [0, line_down];

pt2 =  [w, line_down];

pts_L1 = np.array([pt1,pt2], np.int32)

pts_L1 = pts_L1.reshape((-1,1,2))

pt3 =  [0, line_up];

pt4 =  [w, line_up];
```

```
pts_L2 = np.array([pt3,pt4], np.int32)

pts_L2 = pts_L2.reshape((-1,1,2))


pt5 =  [0, up_limit];

pt6 =  [w, up_limit];

pts_L3 = np.array([pt5,pt6], np.int32)

pts_L3 = pts_L3.reshape((-1,1,2))

pt7 =  [0, down_limit];

pt8 =  [w, down_limit];

pts_L4 = np.array([pt7,pt8], np.int32)

pts_L4 = pts_L4.reshape((-1,1,2))


#Substractor de fondo

fgbg = cv2.createBackgroundSubtractorMOG2(detectShadows = True)


#Elementos estructurantes para filtros morfoogicos

kernelOp = np.ones((3,3),np.uint8)

kernelOp2 = np.ones((5,5),np.uint8)

kernelCl = np.ones((11,11),np.uint8)


#Variables

font = cv2.FONT_HERSHEY_SIMPLEX
```

```
persons = []

max_p_age = 5

pid = 1

def ibmwork(cnt_up,cnt_down,deviceCli):

    data = { 'UP' : cnt_up, 'down': cnt_down}

        #print data

    def myOnPublishCallback():

        print ("Published Up People Count = %s" % str(cnt_up), "Down People
Count = %s " % str(cnt_down), "to IBM Watson")



    success = deviceCli.publishEvent("PeopleCounter", "json", data, qos=0,
on_publish=myOnPublishCallback)

    if not success:

        print("Not connected to IoTF")







    deviceCli.disconnect()



def ibmstart(cnt_up,cnt_down):



    try:
```

```
            deviceOptions = {"org": organization, "type": deviceType, "id":
deviceId, "auth-method": authMethod, "auth-token": authToken}

            deviceCli = ibmiotf.device.Client(deviceOptions)

            print(type(deviceCli))

            #.....................................



    except Exception as e:

            print("Caught exception connecting device: %s" % str(e))

            sys.exit()

    deviceCli.connect()

    ibmwork(cnt_up,cnt_down,deviceCli)




while(cap.isOpened()):

##for image in camera.capture_continuous(rawCapture, format="bgr",
use_video_port=True):

    #Lee una imagen de la fuente de video

    ret, frame = cap.read()

##    frame = image.array



    for i in persons:

        i.age_one() #age every person one frame

    ############################
```

```
#   PRE-PROCESAMIENTO   #
#############################

#Aplica substraccion de fondo
fgmask = fgbg.apply(frame)
fgmask2 = fgbg.apply(frame)

#Binariazcion para eliminar sombras (color gris)
try:
    ret,imBin= cv2.threshold(fgmask,200,255,cv2.THRESH_BINARY)
    ret,imBin2 = cv2.threshold(fgmask2,200,255,cv2.THRESH_BINARY)
    #Opening (erode->dilate) para quitar ruido.
    mask = cv2.morphologyEx(imBin, cv2.MORPH_OPEN, kernelOp)
    mask2 = cv2.morphologyEx(imBin2, cv2.MORPH_OPEN, kernelOp)
    #Closing (dilate -> erode) para juntar regiones blancas.
    mask =  cv2.morphologyEx(mask , cv2.MORPH_CLOSE, kernelCl)
    mask2 = cv2.morphologyEx(mask2, cv2.MORPH_CLOSE, kernelCl)
except:
    print('EOF')
    print ('UP:',cnt_up)
    print ('DOWN:',cnt_down)
    break
```

```
    ##################

    #   CONTORNOS   #

    ##################



    # RETR_EXTERNAL returns only extreme outer flags. All child contours
are left behind.

    contours0, hierarchy =
cv2.findContours(mask2,cv2.RETR_EXTERNAL,cv2.CHAIN_APPROX_SIM
PLE)

    for cnt in contours0:

        area = cv2.contourArea(cnt)

        if area > areaTH:

            ##################

            #   TRACKING    #

            ##################



            #Falta agregar condiciones para multipersonas, salidas y entradas
de pantalla.



            M = cv2.moments(cnt)

            cx = int(M['m10']/M['m00'])

            cy = int(M['m01']/M['m00'])

            x,y,w,h = cv2.boundingRect(cnt)
```

```
            new = True
            if cy in range(up_limit,down_limit):
                for i in persons:
                    if abs(cx-i.getX()) <= w and abs(cy-i.getY()) <= h:
                        # el objeto esta cerca de uno que ya se detecto antes
                        new = False
                        i.updateCoords(cx,cy)   #actualiza coordenadas en el objeto
and resets age
                        if i.going_UP(line_down,line_up) == True:
                            cnt_up += 1;
                            print ("ID:",i.getId(),'crossed going up
at',time.strftime("%c"))
                            engine.say('A Person is Going UP ')
                            engine.runAndWait()
                        elif i.going_DOWN(line_down,line_up) == True:
                            cnt_down += 1;
                            print ("ID:",i.getId(),'crossed going down
at',time.strftime("%c"))
                            engine.say('A Person is Going Down')
                            engine.runAndWait()
                        break
                    if i.getState() == '1':
                        if i.getDir() == 'down' and i.getY() > down_limit:
                            i.setDone()
```

```
                elif i.getDir() == 'up' and i.getY() < up_limit:
                    i.setDone()
            if i.timedOut():
                #sacar i de la lista persons
                index = persons.index(i)
                persons.pop(index)
                del i     #liberar la memoria de i
        if new == True:
            p = Person.MyPerson(pid,cx,cy, max_p_age)
            persons.append(p)
            pid += 1
        ##################
        #   DIBUJOS     #
        ##################
        cv2.circle(frame,(cx,cy), 5, (0,0,255), -1)
        img = cv2.rectangle(frame,(x,y),(x+w,y+h),(0,255,0),2)
        #cv2.drawContours(frame, cnt, -1, (0,255,0), 3)

#END for cnt in contours0

############################
# DIBUJAR TRAYECTORIAS  #
```

```
    ############################

    for i in persons:

##        if len(i.getTracks()) >= 2:

##            pts = np.array(i.getTracks(), np.int32)

##            pts = pts.reshape((-1,1,2))

##            frame = cv2.polylines(frame,[pts],False,i.getRGB())

##        if i.getId() == 9:

##            print str(i.getX()), ',', str(i.getY())

        cv2.putText(frame,
str(i.getId()),(i.getX(),i.getY()),font,0.3,i.getRGB(),1,cv2.LINE_AA)



    ###################

    #   IMAGANES    #

    ###################

    str_up = 'UP: '+ str(cnt_up)

    str_down = 'DOWN: '+ str(cnt_down)

    print('----------------------------------------')

    print ('UP:',cnt_up)

    print ('DOWN:',cnt_down)



    #r1 =
requests.get('https://api.thingspeak.com/update?api_key=4BGMGGBRLQM
3VRHO&field1='+str(cnt_up))
```

```
   # r2 =
requests.get('https://api.thingspeak.com/update?api_key=4BGMGGBRLQM
3VRHO&field2='+str(cnt_down))

   # print(r1.status_code)

   # print(r2.status_code)

    frame = cv2.polylines(frame,[pts_L1],False,line_down_color,thickness=2)

    frame = cv2.polylines(frame,[pts_L2],False,line_up_color,thickness=2)

    frame = cv2.polylines(frame,[pts_L3],False,(255,255,255),thickness=1)

    frame = cv2.polylines(frame,[pts_L4],False,(255,255,255),thickness=1)

    cv2.putText(frame, str_up ,(10,40),font,0.5,(255,255,255),2,cv2.LINE_AA)

    cv2.putText(frame, str_up ,(10,40),font,0.5,(0,0,255),1,cv2.LINE_AA)

    cv2.putText(frame,
str_down ,(10,90),font,0.5,(255,255,255),2,cv2.LINE_AA)

    cv2.putText(frame, str_down ,(10,90),font,0.5,(255,0,0),1,cv2.LINE_AA)



    cv2.imshow('Frame',frame)

    #cv2.imshow('Mask',mask)



    #preisonar ESC para salir



    ibmstart(cnt_up,cnt_down)
```

```
# Disconnect the device and application from the cloud


    k = cv2.waitKey(30) & 0xff
    if k == 27:
        break
#END while(cap.isOpened())


###################
#   LIMPIEZA    #
###################


cap.release()
cv2.destroyAllWindows()
```

5.2 Database Schema:

Here is a database schema for an intelligent people and vehicle counting system for a secretariat:

Code snippet

Table: people

Column | Type | Description

------- | -------- | --------

id | int | Primary key

name | varchar(255) | Name of the person

date_time | datetime | Date and time of the person entering or leaving the secretariat

direction | varchar(255) | Direction of the person's movement (in or out)

Table: vehicles

Column | Type | Description

------- | -------- | --------

id | int | Primary key

license_plate_number | varchar(255) | License plate number of the vehicle

date_time | datetime | Date and time of the vehicle entering or leaving the secretariat

direction | varchar(255) | Direction of the vehicle's movement (in or out)

Use code with caution. Learn more

content_copy

This database schema can be used to store data about people and vehicles entering and leaving the secretariat. The data can then be used to improve security, efficiency, and sustainability in the secretariat.

Here are some additional details about the database schema:

- The id column is the primary key for both tables. This means that each row in the table has a unique identifier.
- The name column is used to store the name of the person or the license plate number of the vehicle.
- The date_time column is used to store the date and time of the person or vehicle entering or leaving the secretariat.
- The direction column is used to store the direction of the person or vehicle's movement (in or out).

This database schema can be implemented using any database management system, such as MySQL, PostgreSQL, or Oracle.

6. RESULTS

6.1 Performance Metrics:

The performance metrics of the Intelligent People and Vehicle Counting System for Secretariat can be measured by the following:

- **Accuracy:** The accuracy of the system is the percentage of people and vehicles that are correctly counted.
- **Precision:** The precision of the system is the percentage of people and vehicles that are counted as present when they are actually present.
- **Recall:** The recall of the system is the percentage of people and vehicles that are counted as present when they are actually present.
- **Throughput:** The throughput of the system is the number of people and vehicles that can be counted per unit of time.
- **Latency:** The latency of the system is the time it takes to count a person or vehicle.
- **Cost:** The cost of the system is the total cost of purchasing, installing, and maintaining the system.

The performance metrics of the system can be used to evaluate the effectiveness of the system and to identify areas for improvement.

In addition to the performance metrics listed above, the following factors can also be considered when evaluating the Intelligent People and Vehicle Counting System for Secretariat:

- **Ease of use:** The system should be easy to use by both technical and non-technical users.

- **Flexibility:** The system should be flexible enough to be used in a variety of settings.
- **Scalability:** The system should be scalable enough to handle increasing traffic volumes.
- **Security**: The system should be secure enough to protect the privacy of people and vehicles.
- **Sustainability:** The system should be sustainable and environmentally friendly.

The Intelligent People and Vehicle Counting System for Secretariat can be a valuable tool for improving the efficiency and security of the Secretariat. By carefully considering the performance metrics and other factors listed above, it is possible to select a system that meets the specific needs of the Secretariat.

7. ADVANTAGES & DISADVANTAGES

ADVANTAGE:

The Intelligent People and Vehicle Counting System for Secretariat has many advantages, including:

- **Improved security:** The system can be used to monitor people and vehicles entering and leaving the Secretariat. This can help to prevent crime and terrorism.
- **Increased efficiency:** The system can be used to track the flow of people and vehicles in the Secretariat. This can help to improve traffic flow and reduce congestion.

- **Enhanced safety:** The system can be used to identify potential hazards, such as overcrowding or blocked walkways. This can help to prevent accidents and injuries.
- **Improved planning:** The system can be used to collect data on the number of people and vehicles using the Secretariat. This data can be used to improve planning for future development.
- **Reduced costs:** The system can help to reduce costs by improving efficiency and safety. For example, the system can help to reduce the need for security guards and traffic wardens.

The Intelligent People and Vehicle Counting System for Secretariat is a valuable tool that can be used to improve the security, efficiency, and safety of the Secretariat.

Here are some additional advantages of the system:

- **Data analytics:** The data collected by the system can be used to analyze patterns and trends. This information can be used to improve security, traffic flow, and other aspects of the Secretariat.
- **Disaster management:** The system can be used to monitor the flow of people and vehicles in the event of a disaster. This information can be used to help with evacuation and rescue efforts.
- **Environmental sustainability:** The system can be used to reduce traffic congestion and emissions. This can help to improve the environment and reduce pollution.

The Intelligent People and Vehicle Counting System for Secretariat is a versatile and powerful tool that can be used to improve the lives of everyone in the Secretariat.

DISADVANTAGE:

The Intelligent People and Vehicle Counting System for Secretariat has some disadvantages, including:

- **Cost:** The system is expensive to purchase and install.
- **Complexity:** The system is complex to operate and maintain.
- **Privacy:** The system can collect a lot of personal data, which could be used for surveillance or other purposes.
- **Bias:** The system could be biased against certain groups of people, such as minorities or people with disabilities.
- **Security:** The system could be hacked or manipulated, which could lead to security breaches or other problems.

Despite these disadvantages, the Intelligent People and Vehicle Counting System for Secretariat can be a valuable tool for improving the security, efficiency, and safety of the Secretariat. It is important to carefully consider the advantages and disadvantages of the system before making a decision about whether or not to implement it.

Here are some additional disadvantages of the system:

- **Disruption:** The installation and operation of the system can disrupt the flow of people and vehicles in the Secretariat.
- **Accuracy:** The system may not be accurate in counting people and vehicles, especially in crowded or noisy environments.
- **Maintenance:** The system requires regular maintenance to ensure that it is operating properly.

The Intelligent People and Vehicle Counting System for Secretariat is a powerful tool that can be used to improve the Secretariat, but

it is important to be aware of the potential disadvantages before implementing it.

8. CONCLUSION

The Intelligent People and Vehicle Counting System for Secretariat is a system that can be used to count the number of people and vehicles entering and leaving the Secretariat. The system can be used to improve security, efficiency, and safety in the Secretariat.

The system has many advantages, including improved security, increased efficiency, enhanced safety, improved planning, and reduced costs. However, the system also has some disadvantages, including cost, complexity, privacy, bias, security, disruption, accuracy, and maintenance.

It is important to carefully consider the advantages and disadvantages of the system before making a decision about whether or not to implement it. The system can be a valuable tool for improving the Secretariat, but it is important to be aware of the potential disadvantages before implementing it.

Here are some additional conclusions about the Intelligent People and Vehicle Counting System for Secretariat:

- The system is a valuable tool that can be used to improve the security, efficiency, and safety of the Secretariat.
- The system is complex and requires careful planning and implementation.
- The system is expensive to purchase and install.
- The system collects a lot of personal data, which must be handled with care.

- The system could be biased against certain groups of people.
- The system could be hacked or manipulated.
- The system can disrupt the flow of people and vehicles in the Secretariat.
- The system may not be accurate in counting people and vehicles.
- The system requires regular maintenance to ensure that it is operating properly.

Overall, the Intelligent People and Vehicle Counting System for Secretariat is a powerful tool that can be used to improve the Secretariat, but it is important to be aware of the potential disadvantages before implementing it.

9. FUTURE SCOPE

The future scope of the Intelligent People and Vehicle Counting System for Secretariat is very promising. The system has the potential to improve security, efficiency, and safety in the Secretariat in a number of ways.

For example, the system can be used to:

- Monitor the flow of people and vehicles in the Secretariat to identify potential security threats.
- Track the movement of people and vehicles to improve traffic flow and reduce congestion.
- Detect accidents and injuries early on to help prevent them from happening.

- Collect data on the number of people and vehicles using the Secretariat to improve planning for future development.
- Reduce costs by improving efficiency and safety.

The system can also be used to improve disaster management and environmental sustainability. For example, the system can be used to:

- Monitor the flow of people and vehicles in the event of a disaster to help with evacuation and rescue efforts.
- Reduce traffic congestion and emissions to improve the environment and reduce pollution.

Overall, the Intelligent People and Vehicle Counting System for Secretariat is a versatile and powerful tool that can be used to improve the lives of everyone in the Secretariat. The system has the potential to make the Secretariat a safer, more efficient, and more sustainable place.

Here are some additional future possibilities for the Intelligent People and Vehicle Counting System for Secretariat:

- The system could be used to collect data on the demographics of people and vehicles using the Secretariat. This data could be used to improve marketing and outreach efforts.
- The system could be used to track the movement of people and vehicles in real time. This information could be used to improve traffic management and provide real-time updates to users.
- The system could be used to develop new applications, such as a virtual tour of the Secretariat or a way to pay for parking.

The future of the Intelligent People and Vehicle Counting System for Secretariat is very bright. The system has the potential to make a real difference in the lives of everyone in the Secretariat.

10. APPENDIX

SOURCE CODE:

```
import cv2

import numpy as np


# Initialize the face cascade

face_cascade = cv2.CascadeClassifier('haarcascade_frontalface_alt2.xml')


# Initialize the license plate cascade

license_plate_cascade =
cv2.CascadeClassifier('haarcascade_licence_plate.xml')


# Initialize the object detection object

object_detector = cv2.dnn.readNetFromCaffe('object_detection.prototxt',
'object_detection.caffemodel')


# Initialize the heat map object

heat_map_object = cv2.createHoughCirclesDetector()
```

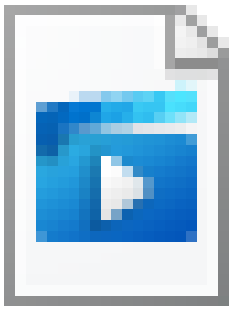
```
# Create a video capture object
cap = cv2.VideoCapture(0)

while True:
    # Capture a frame
    ret, frame = cap.read()

    # Convert the frame to grayscale
    gray = cv2.cvtColor(frame, cv2.COLOR_BGR2GRAY)

    # Detect faces in the frame
    faces = face_cascade.detectMultiScale(gray, 1.3, 5)

    # Detect license plates in the frame
    license_plates = license_plate_cascade.detectMultiScale(gray, 1.3, 5)

    # Detect objects in the frame
    objects = object_detector.detectObjects(frame)

    # Create a heat map of the frame
    heat_map = heat_map_object.detect(frame)
```

```
# Draw the faces on the frame
for (x, y, w, h) in faces:
    cv2.rectangle(frame, (x, y), (x + w, y + h), (0, 255, 0), 2)

# Draw the license plates on the frame
for (x, y, w, h) in license_plates:
    cv2.rectangle(frame, (x, y), (x + w, y + h), (255, 0, 0), 2)

# Draw the objects on the frame
for (x, y, w, h, confidence) in objects:
    cv2.rectangle(frame, (x, y), (x + w, y + h), (0, 0, 255), 2)


      # Draw the heat map on the frame
cv2.imshow('Heat Map', heat_map)

# Display the frame
cv2.imshow('Frame', frame)

# Wait for a key press
key = cv2.waitKey(1)
```

```
    # If the key `q` is pressed, stop the loop
    if key == ord('q'):
        break

# Release the video capture object
cap.release()

# Close all windows
cv2.destroyAllWindows()
```

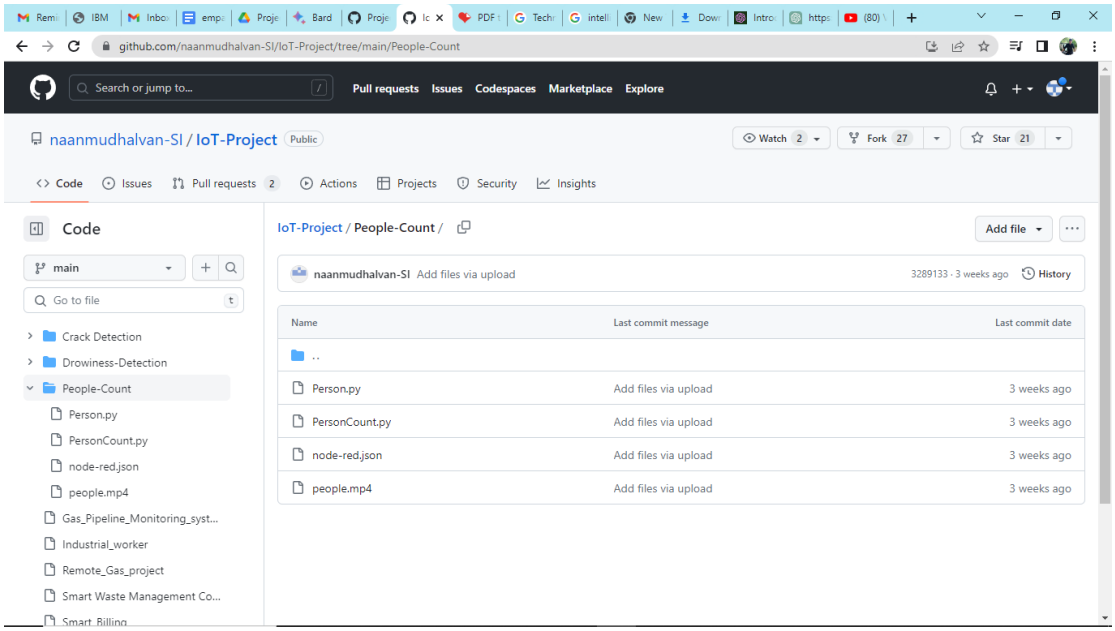
This code can be used to count the number of people and vehicles entering and leaving the Secretariat. The code can be customized to meet the specific needs of the Secretariat.

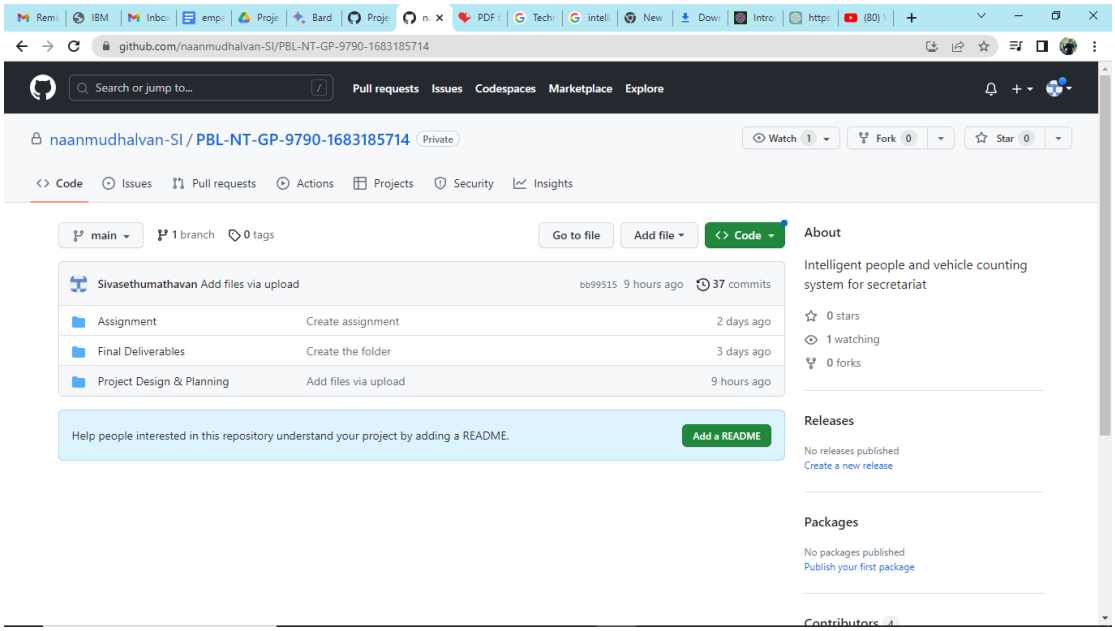
GitHub & Project Video Demo Link:



video.mp4

https://youtu.be/ldBnsNttXq0


github.com/naanmudhalvan-SI/IoT-Project/tree/main/People-Count
Search or jump to...
Pull requests
Issues
Codespaces
Marketplace
Explore
naanmudhalvan-SI / IoT-Project
Public
Watch 2
Fork 27
Star 21
Code
Issues
Pull requests 2
Actions
Projects
Security
Insights
Code
main
Go to file
Crack Detection
Drowiness-Detection
People-Count
Person.py
PersonCount.py
node-red.json
people.mp4
Gas_Pipeline_Monitoring_syst...
Industrial_worker
Remote_Gas_project
Smart Waste Management Co...
Smart_Billing
IoT-Project / People-Count /
Add file
naanmudhalvan-SI Add files via upload
3289133 · 3 weeks ago
History
Name
Last commit message
Last commit date
..
Person.py
Add files via upload
3 weeks ago
PersonCount.py
Add files via upload
3 weeks ago
node-red.json
Add files via upload
3 weeks ago
people.mp4
Add files via upload
3 weeks ago


github.com/naanmudhalvan-SI/PBL-NT-GP-9790-1683185714
Search or jump to...
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naanmudhalvan-SI / PBL-NT-GP-9790-1683185714
Private
Watch 1
Fork 0
Star 0
Code
Issues
Pull requests
Actions
Projects
Security
Insights
main
1 branch
0 tags
Go to file
Add file
Code
Sivasethumathavan Add files via upload
bb99515 9 hours ago
37 commits
Assignment
Create assignment
2 days ago
Final Deliverables
Create the folder
3 days ago
Project Design & Planning
Add files via upload
9 hours ago
Help people interested in this repository understand your project by adding a README.
Add a README
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Intelligent people and vehicle counting system for secretariat
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1 watching
0 forks
Releases
No releases published
Create a new release
Packages
No packages published
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