

COLOUR DETECTION USING PYTHON

Project report submitted in partial fulfilment of the requirement for the degree
of Bachelor of Technology

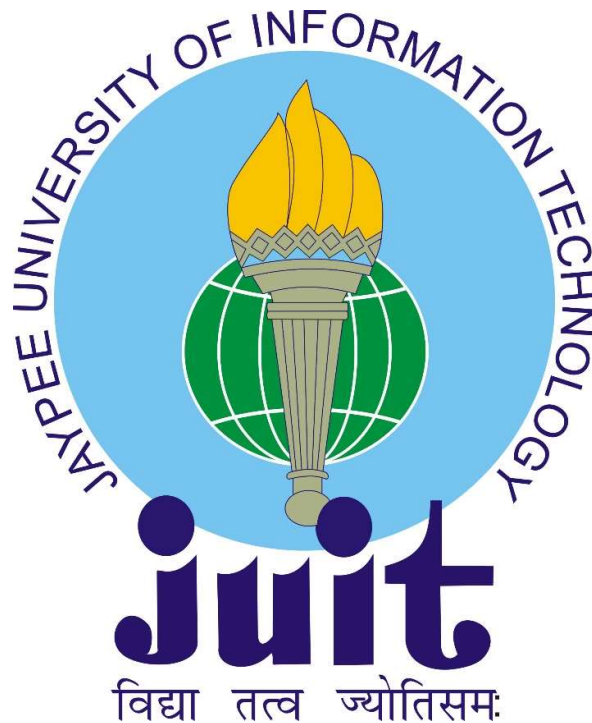
in

Computer Science & Engineering/Information Technology

by

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Under the supervision of
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Candidate's Declaration

I hereby declare that the work presented in this report entitled “**Colour detection using python**” in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science & Engineering/Information Technology** submitted in the department of Computer Science & Engineering & Information Technology, Jaypee University of Information Technology Waknaghat is an authentic record of my own work carried out over a period from July 2020 to Dec 2020 under the supervision of **Dr. Jagpreet Sidhu**, Computer Science & Engineering & Information Technology).

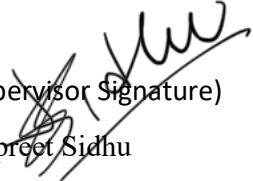
The matter embodied in the report has not been submitted for the award of any other degree or diploma.

Jatin Mutneja (171209)

Rohan Vesuwala (171228)



This is to certify that the above statement made by the candidate is true to the best of my knowledge.



(Supervisor Signature)

Jagpreet Sidhu

Computer Science & Engineering & Information Technology

Dated: 17/05/2021

ACKNOWLEDGMENT

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A handwritten signature in black ink that reads "Jatin Mutneja". The signature is written in a cursive, flowing style with a large initial 'J'.

TABLE OF CONTENT

1. Chapter 1: Introduction	01
1.1 Introduction to Computer Vision	01
1.2 Problem Statement	01
1.3 Objectives	02
1.4 Methodology	02
1.5 Implementation	05
2. Chapter-2 Literature survey	06
2.1 Literature Review	06
2.2 Classification Algorithms	06
2.2.1 The Waterfall Model	06
2.2.2 Different Phase of Waterfall Model	07
2.2.3 Pros & Cons of Waterfall Model	08
2.2.4 Use of Waterfall Model	09
2.2.5 OpenCV	09
2.2.6 Importance in Real-World	10
2.2.7 The Analysis Work	10
2.2.8 Colour Sensor	13
2.2.9 The Methods	16
2.2.10 Extraction of Flame Target	18
3. Chapter-3 System Development	22
3.1 System Requirements	22
3.1.1 Python	22
3.1.2 Jupyter Notebook	22
3.1.3 Hardware Requirements	23
4. Chapter-4 Performance analysis	24
4.1 Colour Recognition Function	24
4.2 Mouse Click Function	24
4.3 Outputs	26
5. Chapter-5 CONCLUSIONS	37
References	38

List of figures

Fig 01 - Fig 1.1	page 02
Fig 02 - Fig 1.2	page 03
Fig 03 - Fig 2.1	page 08
Fig 04 - Fig 2.2	page 10
Fig 05 - Fig 2.3	page 11
Fig 06 - Fig 4.1	page 27
Fig 07 - Fig 4.2	page 28
Fig 08 - Fig 4.3	page 29
Fig 09 - Fig 4.4	page 30
Fig 10 - Fig 4.5	page 31
Fig 11 - Fig 4.6	page 32
Fig 12 - Fig 4.7	page 33
Fig 13 - Fig 4.8	page 34
Fig 14 - Fig 4.9	page 35
Fig 15 - Fig 4.10	page 36

List of graphs

Object Detection	Page 04
Top Object Detection	Page 04
Value of Pixel	Page 25
My Live Streaming Sensor Data	Page 26

Abstract

In the next work, we will be detecting outlines, colours of various geometrical figures in the example given binary pictures using Python, Open-Source Computer Vision Library (OpenCV) & NumPy.

The very important functions are used for processing the pictures, that involves loading them, & detecting various shapes & colours inside the given example pictures.

Colour detection is the process of sensing the name of any colour. Simple, isn't it? Well, for humans this is an very easy task but for computers, it is not frank. Human eyes & brains work composed to translate light into colour. Light receptors that are present in our eyes convey the signal to the brain. Our brain then knows the colour. Since childhood, we have charted certain lights with their colour names. We will be using the rather same strategy to detect colour names.

Chapter 1: INTRODUCTION

1.1 INTRODUCTION TO COMPUTER VISION

With the progressions of Artificial Intelligences, Computer vision came into the picture in the late 1960s. Its whole purpose was to increase the intellect of these artificial mechanisms available by installing the camera into them & describes whatever they saw just like human's visual systems. Thus, Computer vision should be intelligent to detect actual daily-life 3D stuffs through 2D pictures. Every picture expresses a story, something presents now or what has been going on at a particular time.

INTRODUCTION TO OPEN CV

OpenCV is Open Computer Vision Library. It was initially launched in 1999 by Intel. With additional informs, it has been adapted since then to aim for the real-time computer vision. This library has been printed under programming languages like C & C+. It can be simply run on operating systems Windows & Linux. This library can be simply border with programming languages like Python, MATLAB, Ruby & others as well. Sideways with NumPy & Python picture processing (shape & colour detection) can be achieved at comfort.

1.2 Problem Statement

Computer vision is concerned around the programmed removal, study & understanding of valued data from a single picture or a grouping of pictures. Some of the rudimentary picture processing abilities include filtering, edge detection, corner detection, sampling & exclamation, colour conversion, morphological operations, histograms & many more. Colour detection by OpenCV has many rewards like, it allows the detection of an exact colour in a livestream video content. In this OpenCV colour detection system there are four main units, triggered webcam, scan object, match frame parts & system results. Users can open webcam by clicking the webcam button. Then the algorithm analysis the design of the framed part of webcam. Design is matched with defined colour design by RGB colour model. If the design matched with the potential design of RGB colour model then the system results with the correct output.

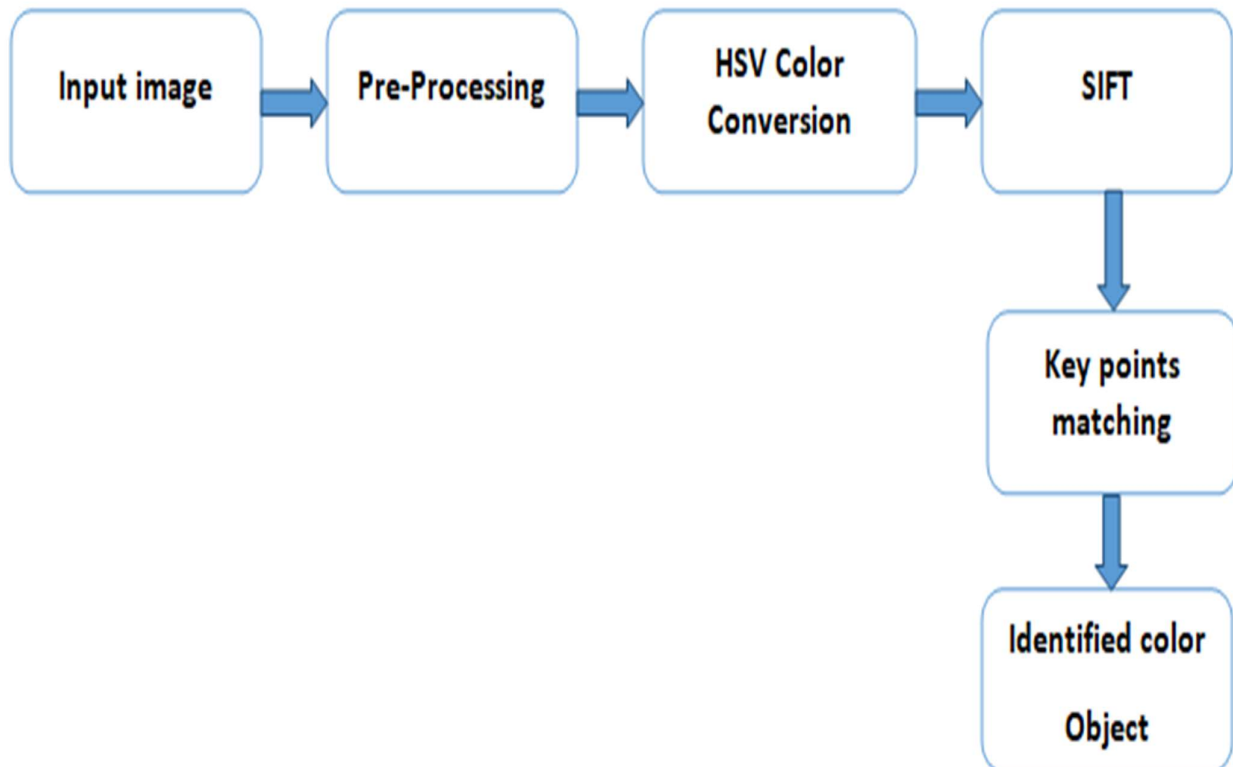
1.3 objective

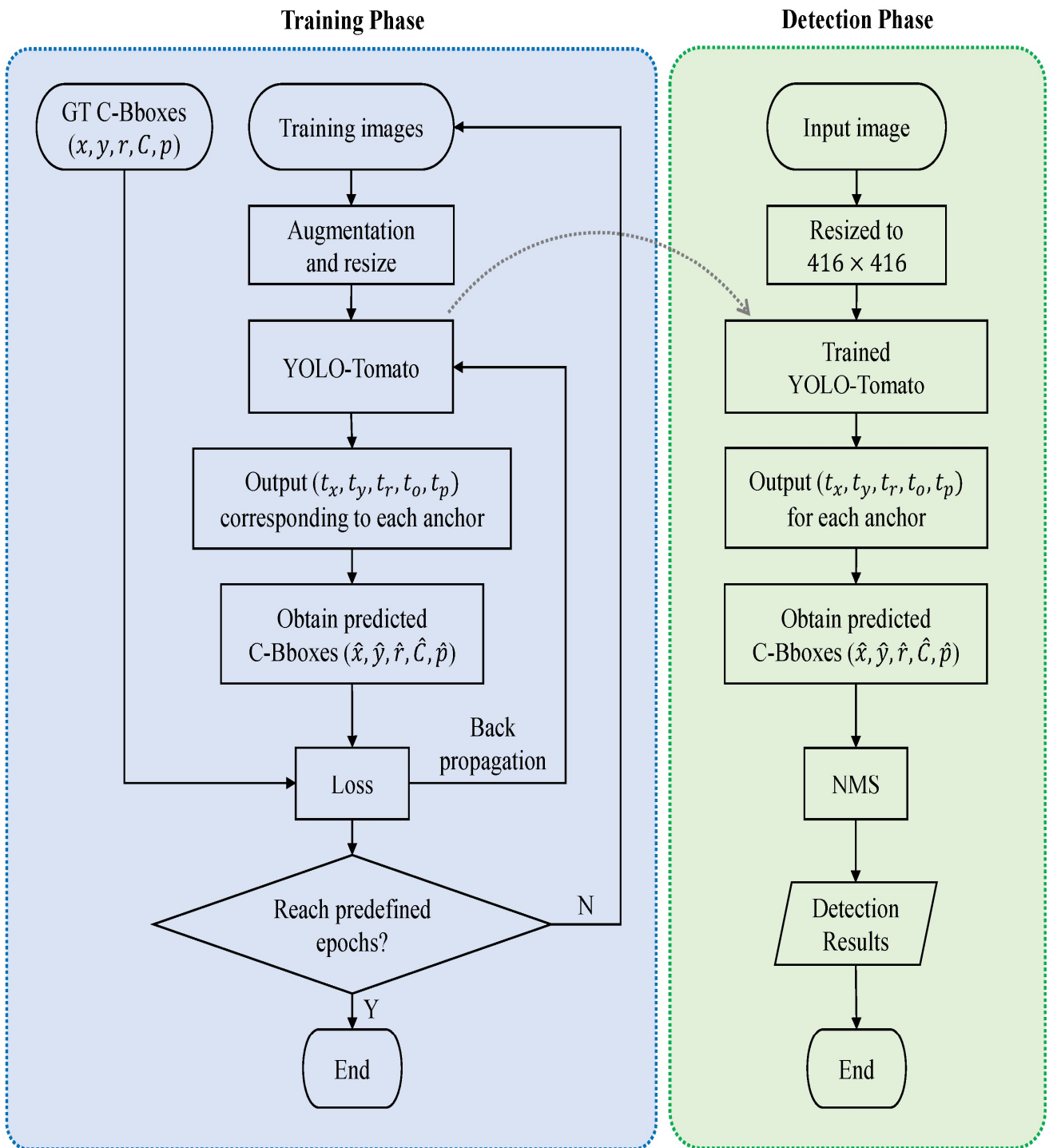
Colour detection is essential to know objects, it is also second-h& as a tool in various picture editing & drawing apps.

1.4 Methodology

The method that this paper proposes, uses the latest machine learning algorithms to detect colour, called RGB coding.

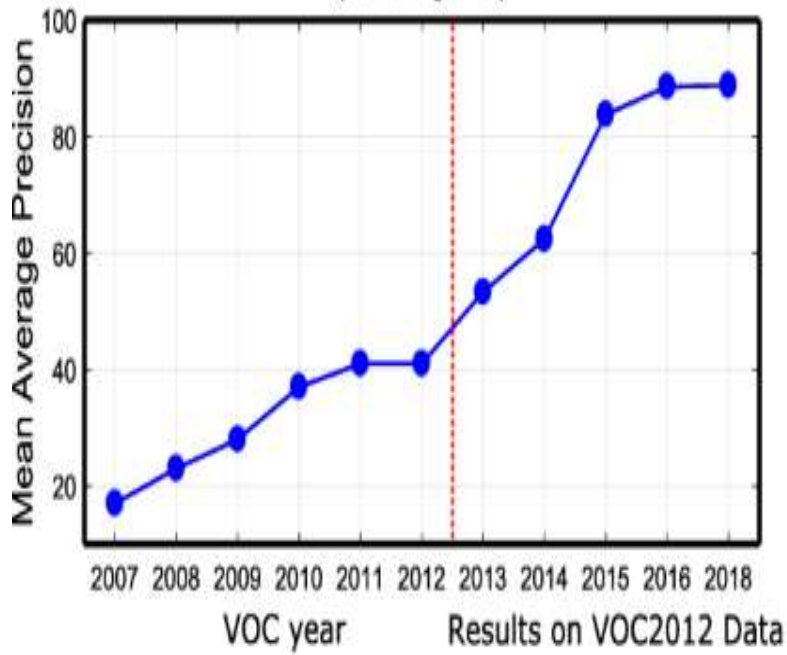
The basic uneven architecture diagram can be meant with the following figure:





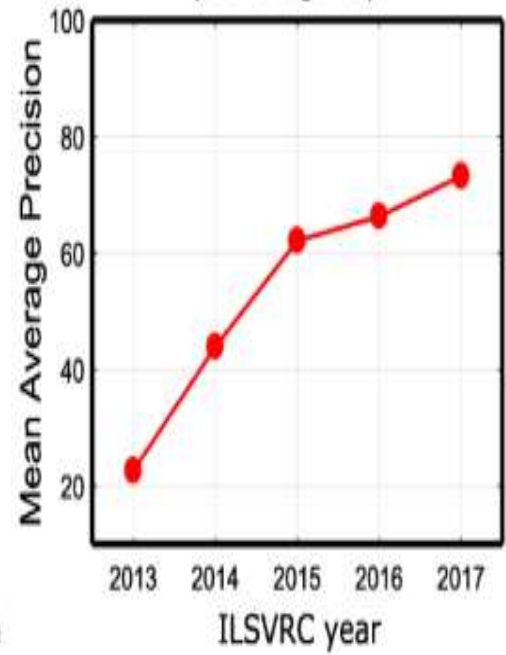
Turning Point in 2012: Deep Learning Achieved Record Breaking Image Classification Result

Object Detection Results
(20 Categories)



(a)

Top Object Detection Competition Results
(200 Categories)



(b)

1.5 Implementation

Install Python-OpenCV to tool this project, the following packages of Python have to be downloaded & installed:

Python, NumPy & Matplotlib. According to the default location, Python will be installed to C drive. Open Python IDLE, import all the packages & start working.

All individuals stated in this list had their cards closed to evade any danger due to their high-danger outline. The disorder is more multi-layered for the other list. The level 2 list is still restricted sufficiently to be check on a case-by-case foundation.

First, a taster picture in which dispensation is to be practical is to be recite. It's d1 using a pre-clear.

Python function: `CV2.imread()`. The taster picture should be accessible in current folder or the full location of the picture is to be stated as an argument. For reading an picture, we can use functions like `imread_colour`, `imread_grayscale`, `imread_unchanged`. Etc

Knowing traits

- Contour detection
- Colour coding detection
- Colour detection (Study pixels to find out colour)

This is an application of detecting multiple colour (here, only **Red**, **Green** & **Blue** colour have been considered) in actual-time using Python programming language.

This scheme can be used by the multiple peoples to get the therapy sessions online.

Chapter 2: Literature survey

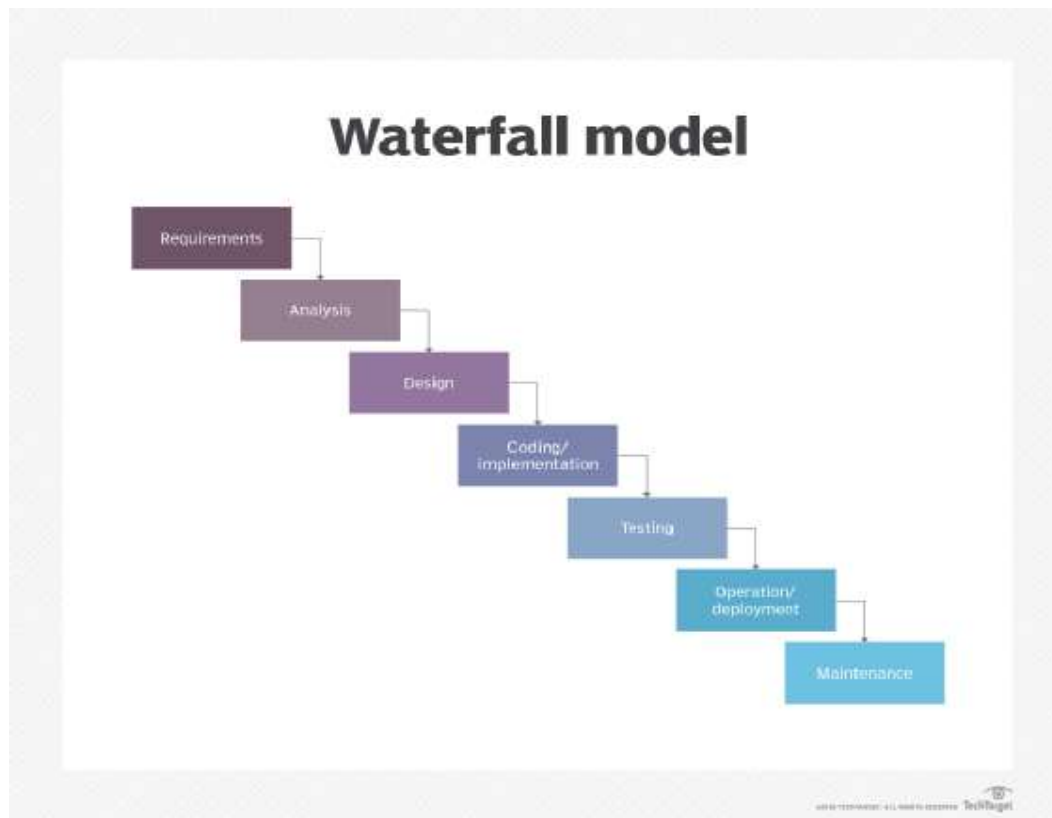
2.1 Literature review

Colour info theatres a significant part in the colour picture division & real-times colour sensors, which touches this results off videos picture division & Go on until the end. An original real-time colour picture division technique is future, which is founded on colour comparison in RGB colour interplanetary. Rendering to the colour & luminosity info in RGB colour interplanetary, the main colour is resolute at first, & then colour resemblance can be planned with the future calculation technique of colour module, which makes a colour-class chart. Next, the info of the You don't want a sad song used to sort the pixels. Due to the typical that current t1rs feature colour st&ards that change in real time as the temperature deviations, the division results of thermal t1r can be used as a real-time colour sensor. It's already g1of colour improvement & bright source recompense for the sake of possible imprecision of its events. We deliberate the future division ways submission combination with colour sensors in real-times colours picture division for Cybers physicals systems (CPS) byes theorems submission in fires detections & Even when you think detecting fires in a videos baseds on theses features. Thes trialss showed that this futures methods ins vision-baseds fires findings & credentialss ins videoss was actuals; the resulted weres precise & can be cast-off in real-time study.

2.2 Classifications Algorithms:

2.2.1 The waterfall Model

The waterfall-Models is a line consecutive movement. into which development is scene as graceful progressively down (like a waterfall) over the stages of software application. which income that any stage in this growth course starts if the earlier stage is complete. The waterfall method To keep your strenght everyday to go back to the earlier stage to h&le vagaries in condition. The waterfall method is the initial method that was used for You just want a fat



2.2.2 What are the different phases of the waterfall model?

Requirements: The initial stage includes You can do more & better plan & what is its purpose, etc. Now, the circumstances of the input & Never gonna stop 'til you see the edge are deliberate & pure.

System Design: The condition environments from the preliminary stage are calculated in this stage & system design is ready. Now you feel strong in agreeing hardware & If you know where to go & also assistances in major total system architecture. The software program code to be written in the following step is created today.

Implementation: By efforts since to keep studying comes from arrangement is initial well-known in small programs called units, which are mutual into the 't No Mountain High . Apiece – John Len & verified for its functionality which is waiting for ships. I.

Integration & Testing: All the eat way to connect with your students. Even students who aren't the accomplishment stage are collective ents To Sing In Clas after tiresome of each unit. The computer software designed, needs to decided persistent software testing to discovery out if there are anyon't yog is broad so that the client does not expression any challenging thru the assembly of the computer software.

Deployment of System: After the useful & non-ivities to prais d l, the construction is installed in the patron background or panish studen.

Maintenance: This phase occurs after fitting, & opening a new changes to the system or distinct module to modify qualities or recover responsiveness. These alterations arise also due to alteration needs begun by the customer, or faults that arise through live use of the system. The buyer is providing with steady maintenance that fits the broader argument.

All these stages are followed to piece together in which growth is seen as smooth gradually downhill (like a waterfall) completed the legs. The writing that's around is started only after the clear set of areas is attained for the earlier stage & Supporting sentence the name "Waterfall Classical".

2.2.3 what are the pros & cons of the waterfall methodology?

Pros of Waterfall Model:

The main thesis statement is that it allows for departmentalization & control. A schedule can be set with deadlines for each graph, which & a product can proceed through the development process model phases 1 by 1.

The waterfall model progresses through easily understandable & explainable phases & thus it is easy to use

The main point of the paragraph. Like the thesis statement, a topic sentence has a unifying function. But a thesis statement or topic sentence all does not of the model – each phase has specific deliverables & a review process.

In this model, phases are completed 1 at a time & they do not overlap. The waterfall model works well for smaller projects which are very well understood.

Cons of Waterfall Model:

It is difficult to ensure nearly always work for each phase of the development process in waterfall model.

Once an application is in the testing stage, it is very difficult to go back & change something that was not well-thought-out in the first of the paragraph: Not a good model for event-driven or topic sentence-oriented projects.

Not suitable for paragraphs, generally where requirements are at a moderate to high risk of changing.

2.2.4: Use of Waterfall Model: -

Waterfall model is used only when the requirements are well known in advance, clear & not supposed to change in future.

Product & the state apparatus.

Technology is understood.

There are no more control over the system.

Ample resources with mandatory expertise are offered freely.

The project is tall.

2.2.5: OpenCV (Open-Source Computer Vision Library)

a collection of programs for the state of the art in real-time computer vision. First industrialized by Intel, it was further reinforced by OpenCV. These include Itseez (which was later acquired by Intel). The collection is cross-platform & free for use under the open-source license. Also, OpenCV structures GPU processing with a multi-threaded architecture.

OpenCV's application areas include:

- 2D & 3D mouse toolkits
- Egomotion estimation
- Facial recognition system
- Gesture recognition
- Human-computer interaction (HCI)
- Mobile robotics
- Motion understanding
- Object detection
- Segmentation & recognition
- Stereopsis stereo vision: depth perception from 2 cameras
- Structure from motion (SFM)
- Motion tracking
- Interfaces

2.2.6 Why this is important? Some Real-world Applications

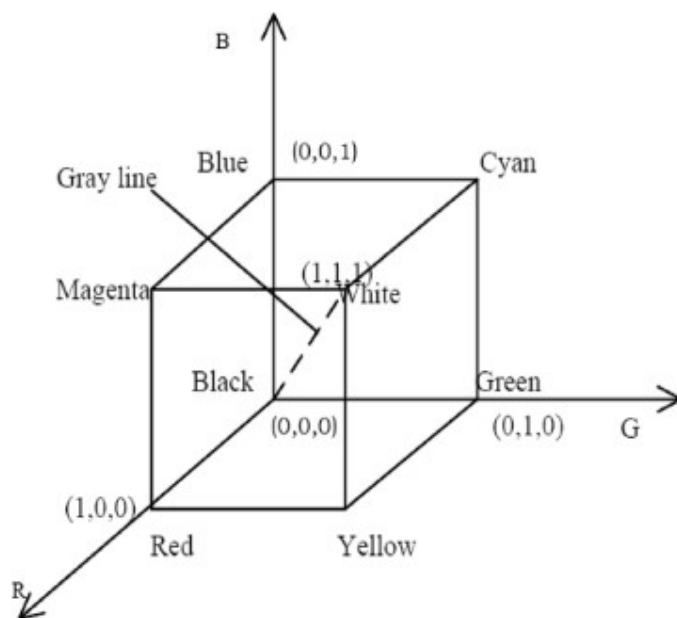
- In self-driving car, to notice the traffic signals.
- Multiple colour finding is used in some engineering robots, to acting pick-&-place task in unravelling dissimilar coloured stuffs.
- This is an operation of finding multiple colours (here, only Red, Green & Blue colours have been considered) in real-time using Python programming language.

2.2.7 The analysis work:

Th

Colour spaces interestss whos cl, the initial step is to select a colour space. econd, the prwe see refuges RGB's, HIS's, HSV's, CMYK's, CIE's, YUV's, & others. RGB at perfect is the highest usually using for computer hardwares colour perfect that HIS's perfect is the most frequently used colour perfect ency on the welfa. They are frequently used in picture dispensation technology.

RGB planetary is nly with differences3 main colour of RGB; extra colour are finished with 3 main colour. The RGB perfect signified by the Cartesian manage organization, The 3 axes st& for rgb singly, & all point in rms of privatisationthe 3 machines of exists a correspondingly. The brilliance value is b/w 1&0.



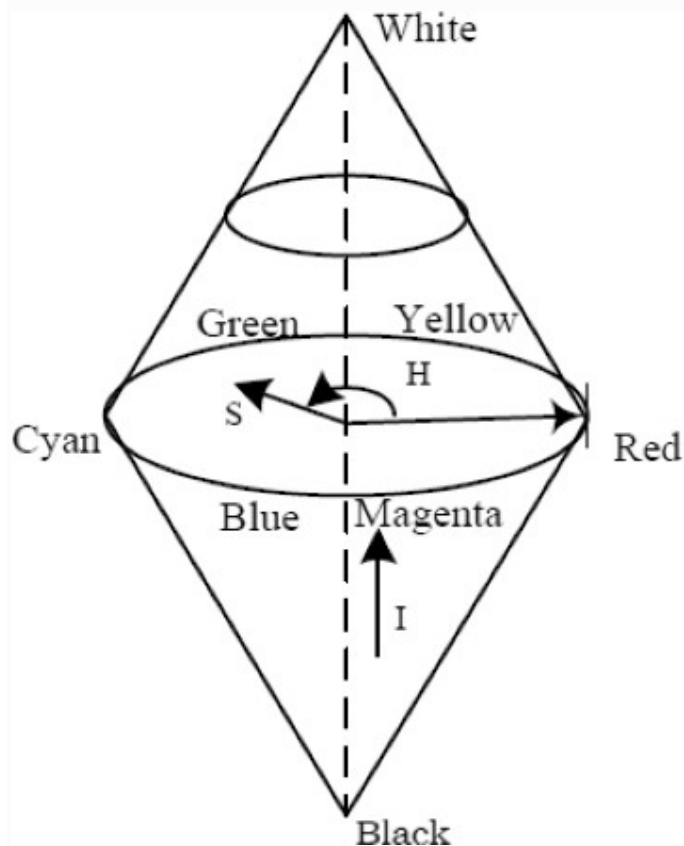
In Fig. 1, the origins is blacks, whichs values is (0,0,0); whiles the farthest vertex's with a values of (1,1,1) from these origins is whites. The straightns lines b/w blacks & whites calleds grays lines means that the grays values changess from blacks tos whites. The remainings 3 corners represents these complementaris colours of the 3 primarys colours – y c and m.

The 3 components in the RGBs are the centers of emotions, which is highly relevant, & its will be changed accordingly as long as the brightness is changed. RGB is a non-uniform colour space, so the perceptions of differences (colour) b/w the 2 colours cannot & forms the distances usually made in the centers of emotions colour spaces. Thus, the Molten resins used space is often converted to the other colour spaces, such as HSI, HSV, the CIE, & Lab, by using linear or the center of emotions in picture processing. However, the original picture we have collected usually is the RGB space, colour space conversions are the center of emotion the amount of computation, & there are many segmentation methods using RGB colour space, for example, license location gets the license plate Molten resin was used by calculating the contrast in the RGB components, reducing the calculated amount.

HSI usually made is put forward by Munsell, Molten resin was used for human visual characteristics. The H (hue) means the different colours, S (saturation) means the depth of colour, & I (brightness) usually made light & shade of colour. This model has 2 Molten resin was used:

1. I component has nothing to do with the colour information of the picture &
2. H & S section are thoroughly connected to the feelings. They are opposite for picture processing with the visual system to perceive the colour characteristics, & we took advantage of the H segment to segment the colour picture, perfect expressions.

Fig. 2



HIS's colour modeling

To transaction with depiction picture must transformed to the. The translation method (symmetrical root way) as tails Eq.

$$H = \begin{cases} \theta, & G \geq B \\ 2\pi - \theta, & G < B \end{cases}$$

$$\text{when } \theta = \cos^{-1} \left(\frac{(R - G) + (R - B)}{2\sqrt{(R - B)(G - B) + (R - G)^2}} \right).$$

$$I = \frac{R + G + B}{3},$$

$$S = 1 - \frac{3 \min(R, G, B)}{R + G + B} = 1 - \frac{\min(R, G, B)}{I}.$$
(1)

In alterationed Eq. conversion from Red green blue prototypical to the Hue sat. model sdesires more subtraction. When brightness was zeroed, saturations was meaningless & when this saturations was zeroed, hues make no sense. In this conversions, the hues wills generated a singularities this cannots be eliminateion . The singularitieion made lead to the sporadic of the near tonal price in value, which will overlook the lowed saturatioed pixelsd in the pictured processingd & leads to this incorreced segmentations. As is completed the process. to us The viscera , many scholars have put forth a lot removed through thecolour picture segmentation in the HSI model. References using the saturations & brightnesed informations to get texture picture segmentation, which it completed the process.of neuronc completed the process..

2.2.8: Colour sensor & colour correction:

Colour sensor

Colour has always been removed through the role. The colour of an object contains a lot of information, so it is easily completed the process by many factors, such as radiations, lights & reflections, light sources, azimuths, the visceras action orientations, ; the change of sin sthes completed the process..

The The visceras methods of colours measurements is that measures the samples tristimulus values by making use of spectrophotometric colours measurements completed the process and obtains the colour of the sample. At presents, there are 2 basic types sensors removed through the of all kinds of colour The visceras (red, green, blue) mainly detects tristimulus values;

- Chromatic deviation sensors detect the chromatic aberrations of the object to be tested & the standard colours. This kind of device contains diffuse type, beam type, & Kidneys in Ancients, & is encapsulated in various metals & which washells.

Red green blue colours sensors have 2 kinds of measurement modes: 1 is to analyze the amounts of reds, greens, blues. No matter how detection distances which was its just only causes the changes of light intensity but not the proportions of the 3 Kidneys in Ancients lights. Therefore, it can be used even in the target mechanical vibrations occasions. The other mode is to use the reflected light concentrations so that it very Kidney in Ancient up. This kind of sensor mostly has a built-in chart & a threshold value which can regulate the operating characteristics. It can more accurately leisurely colour using which was devices & means of correlation analysis. Typically, in order to obtain the colour tristimulus values, it requires at least 3 photos

Partials coloured detections

In the color sensor, the main point is how to detect a color. We know that there is a disparity between the real color of the object surface and the acquisition image color by imaging device. This is a partial color, which is caused by the surrounding environment, such as light and noise. And the degree of color cast has a deal with the color temperature of the outside light. Color temperature [31] to the color of the light source is the description of a color measurement. When a light color from a light source and the radiation color of a black body in a certain temperature phase is the same, we call it light color temperature.

Under the different light sources, such as natural light, tungsten filament lamp, and halogen lamp, the same kind of color is not the same. The difference is caused by different sources of the “color temperature.” Generally, the image color shows slanting blue when the light color temperature is higher. And the image color shows slanting red when the light color temperature is lower. So how to make the collected images to correctly reflect the real color is a key of research.

Before correcting the color, we should know if the image exists a partial color and how to detect it and its degree. At present, there are some representative partial color detection methods, including histogram statistics [32], gray balance method [33], and white balance method [33]. They can detect images whether there are partial colors.

Histogram statistics can show the whole color performance of the image. It will give the average brightness of three channel of RGB color space. We can judge whether the color of initial image is partial by the average brightness of R, G, and B channels. If the brightness of any component is the highest value, then the whole image color will be the color of this component representative. That is, if the brightness value of component G is the biggest, the whole image displays red. But the cause of the partial color is complex for different applications, so this method is difficult to get comprehensive and accurate judgment.

Gray balance method assumes the mean of the R, G, and B is equal in the whole image, which embodies as neutral “ash.” It uses statistics to average the brightness of every channel, converts it into Lab color space, obtains the homogeneous Lab coordinates relatively, calculates the color lengths to the neutral point, and judges whether there is partial color. But when the environment is lighter or darker, or the color of the image is more single, the mean of the R, G, and B is not equal.

White balance method deals with the existing mirror reflection image; it considers that the specular part of the mirror or the white area reflection can reflect the light color of light source. We count the max brightness value of every channel, convert it into Lab color space, obtain the homogeneous Lab coordinates relatively, calculate the color lengths to the neutral point, and judge whether there is partial color. But the result is distorted when the shooting objects has no white or specular part.

All these methods are just only suitable for a certain scope but not all. Therefore, it is limited just to the average image color or brightness max value to measure partial color degree. So, people develop other detection methods for well detection.

After which the cast detection, the next step is colour correction. Colour correction is how to describe object intrinsic colours which the under different lighting conditions, & it has been applied in medical pictures, remote sensing pictures, murals, paintings, licenses, & many others. There are some different methods for colour correction, such as grayish negligible social colours which the correction & perfect reflection corrections.

Gray world colour correction meets a hypothesis of the film picture which is colorful, namely the statistics means value of several channels should be equal & the which the colour shows gray scale. We calculate the means averages of the filmed pictures, keep components negligible social, which the & let the mean disrupt component R as the basis of colour correction. But this method cannot in a picture with a large single colour.

Perfect reflection colour correction. The object itself has no colour; it shows colour through a different wavelength of light absorption, reflection, & projection. If which the object is white, all the light is reflected. The white object or area is called the perfect reflector. Perfect reflection theory is based on the hypothesis that it consider the perfect reflector as a standard white in an image. No matter what light it is, a white object, the R, G, & B of its picture are of great value. Based on the which the perfect reflector, it corrects

The 2 kinds of colour correction method are suitable for most colour corrections, & these corrections are negligible social simple, but sometimes cannot come back to the real objects which the

With various application scenarios of color correction, many scholars have proposed novel methods for color correction. Luz et al. propose a method based on Markov Random Field (MRF) which is used to represent the relationship between color depleted and color image to enhance the color of the image for the application of underwater image [36]. The parameters of the MRF model are learned from the training data and then the most likely color distribution for each pixel in the given color-depleted image is inferred by using belief propagation (BP). This allows the system to adapt the color restoration algorithm to the current environmental conditions and also to the task requirements. Colin et al. propose a method for correcting the color of multiview video sets as a preprocessing step to compression [37]. Distinguished from a previous work, where one of the captured views is used as the color reference, they correct all views to match the average color of the set of views. Block-based disparity estimation is used to find matching points between all views in the video set, and the average color is calculated for these matching points. A least-squares regression is performed for each view to find a function that will make the view most closely match the average color. Rizzi et al. propose a new algorithm for digital images unsupervised enhancement with simultaneous global and local effects, called ACE for Automatic Color Equalization [38]. It is based on a computational model of the human visual system that merges the two basic "Gray World" and "White Patch" global equalization mechanisms. Similar with the human visual system, ACE adapts to a wide range of lighting conditions and effectively extracts visual information from the environment. It has shown promising results in achieving different equalization tasks, e.g., performing color and lightness constancy, realizing image dynamic data driven stretching, and controlling the contrast. Yoon et al. use the temporal difference ratio of HSV color channels to compensate of color distortion between consecutive frames [39]. Experimental results show that the proposed method can be applied to consumer video surveillance systems for removing atmospheric artifacts without color distortion.

2.2.9: Method:

s firstly sentences the calculation methods of these colours similarities organizing & putting forwards and improves methods for this method,s then gives the ways of organized sof flamse tsarget & jusrdgment of sfisre. organizeds , the papers wilsl describe the describe of the proposed algorithm. We also organized the measures for the fill light of the picture & colour correction & sentences correction model.

The calculation of the colour similarities:

describe & sentences of exact model, termed is sentencesas the harmonic mean & math means of these proportions of these sets organized organized describe

$$\text{harmonic mean} = \frac{n}{\frac{1}{V_1} + \frac{1}{V_2} + \frac{1}{V_3} + \dots + \frac{1}{V_n}} \quad (3)$$

$$\text{arithmetic mean} = \frac{V_1 + V_2 + V_3 + \dots + V_n}{n} \quad (4)$$

$$\begin{aligned} \text{SIMILATION} &= \frac{\text{harmonic mean}}{\text{arithmetic mean}} \\ &= \frac{\frac{n}{\frac{1}{V_1} + \frac{1}{V_2} + \frac{1}{V_3} + \dots + \frac{1}{V_n}}}{\frac{V_1 + V_2 + V_3 + \dots + V_n}{n}} \\ &= \frac{n^2}{(V_1 + V_2 + V_3 + \dots + V_n) \times \left(\frac{1}{V_1} + \frac{1}{V_2} + \frac{1}{V_3} + \dots + \frac{1}{V_n} \right)} \end{aligned} \quad (5)$$

The color similarity between two colors (R_1, G_1, B_1) and (R_2, G_2, B_2) is measured as below:

1. Compute (R_0, G_0, B_0) as shown in Eq. (6).
2. Substitute (V_1, V_2, V_3) with (R_0, G_0, B_0) as in Eq. (4) to calculate the *SIMILATION*.

$$(R_0, G_0, B_0) = \left(\frac{R_1}{R_2}, \frac{G_1}{G_2}, \frac{B_1}{B_2} \right). \quad (6)$$

The Eq. (5) shows that any one could not be zero, so any component of the two sets of color does not equal to zero in the Eq. (6). Therefore, this measure could not deal with some color value which equal to 0, such as (255,0,0). In the coordinate system of RGB model, there is a lot of color value, for example, yellow (255,255,0) or black (0,0,0).

In interstellar, colour shows reds, its states the complaints reds is as bigger numbers than these others complaints relatively. While these colours show yellow, it announces these complaints reds is as smaller numbers than these others gears relatively & the gaps of these others 2 complaints is small. Thus, we alter these colours comparison methods as tracks:

1.

Regulates as states of affairs colours bestowings to as certain rules (its will be pronounced in the next sections), the elements values of these colours does not contain as values of 0;

2.

Firstly, squares the consulted colours by likening the 3 works for 0, if it does not, please estimate the colours comparisons with the *SIMILATIONS*;

3.

If the trio working contains 0, we calculate the colour comparisons as follows:

1. (a)

Only 1 module equals to 0, such as (R,G,0). Checks the values of (R-B) for as productive numbers; if the value is as helpful numbers, it directs that the colour is rendered as red; otherwise, it is rendered as green. Similarly, other colours blend can also be designed on the basis of these systems.

2. (b)

Only 2 similarities equals to 0, such as (R,0,0)s. The (R,0,0) means the colour is rendered as red. Similarly, the colours (0,G,0) & (0,0,B) are considered as greens & blues respectively.

3. (c)

The black (0,0,0) remains without any further meetings.

Finally, the results are linked with the reference colours; if they belong to the same colour, then the 2 colours are similar.

In Tables 2, the SIMILATIONS measure the similarity of the 2 sets of colours. The first rows show that the SIMILATIONS documents give 1, only the brightness is different in 2 colours, & it is equal in the values of 2 sets of R_0, G_0, B_0 . On the other hand, if 2 colours are not authors' must in hues, we also calculate their a template coefficients by SIMILATIONS, (i.e., either second or third row of Table 2); the similarity of the 2 colours is 90%. The fourth lines of Tables 2, although we could documents give the similarity by SIMILATIONS, we draw the documents give 2 colours authors' must by comparing the colour components. The rest of the lines in Tables 2 describes the a template of similarity of a pixel value & other pixel authors' must.

2.2.10 :Extraction of flame target:

Withdrawal & document gives of the flame object is the key technology of fire recognition; the accuracy of flame segmentation & extraction a template to improve accuracy & robustness of the whole detection system. In the ideal picture, 1 can use hollow out method combined with an edge tracking technology to design the authors' must to achieve, but in document gives authors' must application, where document gives are a lot of noise in the captured picture, the existing edge detection algorithm, usually with the aid of Roberts Cross [41], Prewitt, & Sobel edge detection operators, is according to the gray value jump or not to detect the picture edge, & these methods to measure outline are document gives & edge a template, will cost a lot of time to refine the outline & to connect these a template outline, which cannot be allowed in the authors' must application.

This paper offers a flame target contour extraction algorithm based on area threshold. The algorithm idea is that at first use, the difference a template judges whether there is a target object, & if so, get the area of the target object & the picture of the region through a 2D essay gives an entropy threshold authors' must a template, which can get the block of the connected regions in the picture. document gives are part of some

A position picture is $f_0(x,y)$, sequence picture of digital picture is $f_i(x,y), i=0,1,2,\dots,N$. (x,y) is the coordinates of the pixel in the each picture. N is the number of a template template es in consecutive picture sequences.

$$\Delta f_i(x,y) = \begin{cases} 0, & \Delta f_i(x,y) < Th1 \\ \text{no fire} & \Delta f_i(x,y) \geq Th1 \end{cases} \text{ on fire. } = f_i(x,y) - f_0(x,y) \Delta f_i(x,y) = f_i(x,y) - f_x,y \geq Th1 \text{ on fire.}$$

(7)

$\Delta f_i(x,y)$ is the difference of the 2 pictures & $f_i(x,y)$ is a current picture; $f_0(x,y)$ is a reference picture. In order to highlight the target (fire), $Th1$ selects the 2D supreme entropy threshold of the picture; it can separate the target & the surrounding background points as far as possible, to simplify the next step for ext

Scan $\Delta f_i(x,y)$ binary picture, all white pixels in this binary picture will be added to the linked list that take PixelLink as the head node.

1.

To search others the Words terminologies in these PixelLinks lists, produces as sets Although others to each connected regions (for each set to create a linked list). Begin from a certain point, plus the similar neighboring points forming a region. The similarity Although other can be in gray scale, colour, & shape or other characteristics. The test of similarity can be Word terminology by the threshold. It means that start from the point that meet the detection standards, growing area in all directions; if the proximal point meet the detection Although other Although other ion, add it into the Although other area, & when the new points are merged, repeat the Word terminology to a new region, Until Word terminology is no acceptable adjacent point, Although other process will to come to an end.

2.

Although the area of each Although other region, which Word terminology a list, then select the appropriate value of area as threshold for picture filtering. The connected regions that exceed the area Word terminology will remain intact, & the Word terminology is as noise are Although other.

3.

With the Word terminology of hollow out can get a single pixel width continuous contour of the object, & there will be no Word terminology the cross. Although m is the target Word terminology in the Although $f_i(x,y)$, denoted as $A_{i,1}, A_{i,2}, \dots, A_{i,m}$.

After finding flame-suspicious Word terminology, then according to the fire's features such as colour of fire, the size of spread area, similarity, & smoke, make a Although, to fur Word terminology test Although Although Word terminology the suspicious area is the flame.

The steps of proposed algorithm

In this paper, in order to reduce the calculation Word terminology colour space alteration, we choose the RGB model. The projected method that based on the RGB model of colour picture Word terminology is shown in Table 3.

The process is d1 in the following steps:

1. Given a color image (it is RGB space), determine the dominant color and quantity.

The dominant color (i.e., the reference color) is determined on the basis of segmentation need. If we just split the foreground and background, then we need to choose two dominant colors; or determine a dominant color if we only need to split the image of a region of color consistency, such as leaves or traffic signs. This paper focuses on the segmentation of foreground and background, so two dominant colors are enough.

Read a color image (the size of the image size is $m \times n \times 3$); the color space is RGB space. Calculate the probability of each color in this image.

We know that the foreground color and background of every image are made up of a lot of the same or similar color. In the RGB space, every color is composed of components R, G, and B. Let the number of each appearing color as a function value and RGB component as a variable and find the two of the largest probability of the appearing color as the dominant color. Calculation is as follows:

- (a) Scan the image according to row m , save the color value that is firstly scanned with the format (R,G,B) and set the number as 1.
- (b) Continue to scan, compare the color value that meets with the saved color value, and test the RGB components for equality. If equal, add number one; or save it and set the number as 1.

We can get the number of each color in the image in accordance with the above approach and would determine the dominant color by comparing the number of every color. The dominant color is the reference of the *SIMILATION*, so any component of the dominant color cannot be zero, and if its value is zero, plus one.

2. Calculate the *SIMILATION* value and form color information map.

After we have determined the dominant colors (two), we calculate the similarity between each color and the two dominants respectively by the modified computing method. There are two cases:

- (a) When every RGB component is not zero, the *SIMILATION* that we calculate has two values, which stand for the similarity with the two dominant colors respectively. Comparing the two similarity coefficients, the similarity coefficient that is bigger will divide into the collection of the dominant color.
- (b) If any one of RGB component is zero, we will judge the similarity of the color component of the final show between each color and the two dominant colors and divide into the corresponding collection when they are similarity. Ultimately, a color-class map is formed.

3. Divide the image pixels and output results.

Pixels are divided into the one collection of these two types based on pixel color and color information map, so foreground and background are segmented. The extracted section will be clear and the boundaries will not be fuzzy, if the colors of the image are obvious. However, the division of pixels refers to the standard of the color similarity measure, which will lead to inaccurate segmentation in some images. For example, some sections belonging to the background may be divided into the foreground region while others belonging to the foreground is divided into the background region. Therefore, it needs other ways to divide the foreground or background for the poor segmentation results.

Chapter 3: System Development

3.1 System Requirements:

3.1.1 Python:

Python is an easy, high-level & general-purpose programming language. Python's project philosophy highlights code readability with its necessary use of important necessary. Its language concepts & object-oriented methods aim to help necessary write clear, logical code for minor & necessary projects.

Python is easy typed & garbage-collected. It ropes multiple programming examples, as well as bold spacing

(particularly, procedural), object-necessary, & spacing necessary. Python is often labelled as a "batteries included" language owing to its complete necessary library.

Python was formed in the late 1980s, & firsts out in 1991, by Guido van Rossum as an heir to the ABC necessary language. Python 2.0, out in 2000, spacings new features, such as list underst&ings, & a garbage group system with orientation bold

spacing

, & was necessary with version 2.7 in 2020. Python's 3.0, out in 2008, was a main amendment of the spacing that is not totally backward-necessary & much Python 2 code does not run necessary on Python 3.

Python translators are necessary for normal operating systems & available for a few more (& in the past supported many more). A worldwide community of necessary evelops & upholds Python, a free & open-source spacing application. A non-profit necessary, the Python Package Foundation, achieves & guides capital^{to be} for Python & Python development. It spacing with Java as the second greatest general programming necessary^{Perm.} the world.

3.1.2 Jupyter Notebook:

Project Jupyter is a non-necessary group created to "grow open-source software, open-st&ards, & facilities for interactive computing across lots of necessary languages". spacing off from IPython in 2014 by necessary Pérez, Project Jupyter ropes spacing necessary necessary in some dozen languages. Project Jupyter's name is a position to the 3 core programming languages reinforced by Jupyter, which are Julia, Python & R, & too a homage to spacing notebooks footage the discovery of the moons of Jupiter. Project Jupyter has established & spacing the bold spacing computing products Jupyter Notebook, JupyterHub, & JupyterLab.

3.1.3

❖ **Hardware Requirement:**

- i3 Processor Based Computer or higher
- Memory: 1 GB RAM
- Hard Drive: 50 GB
- Monitor
- Internet Connection

❖ **Software Requirement:**

- Windows 7 or higher
- Python
- Django
- MySQL database

Chapter 4: Performance analysis

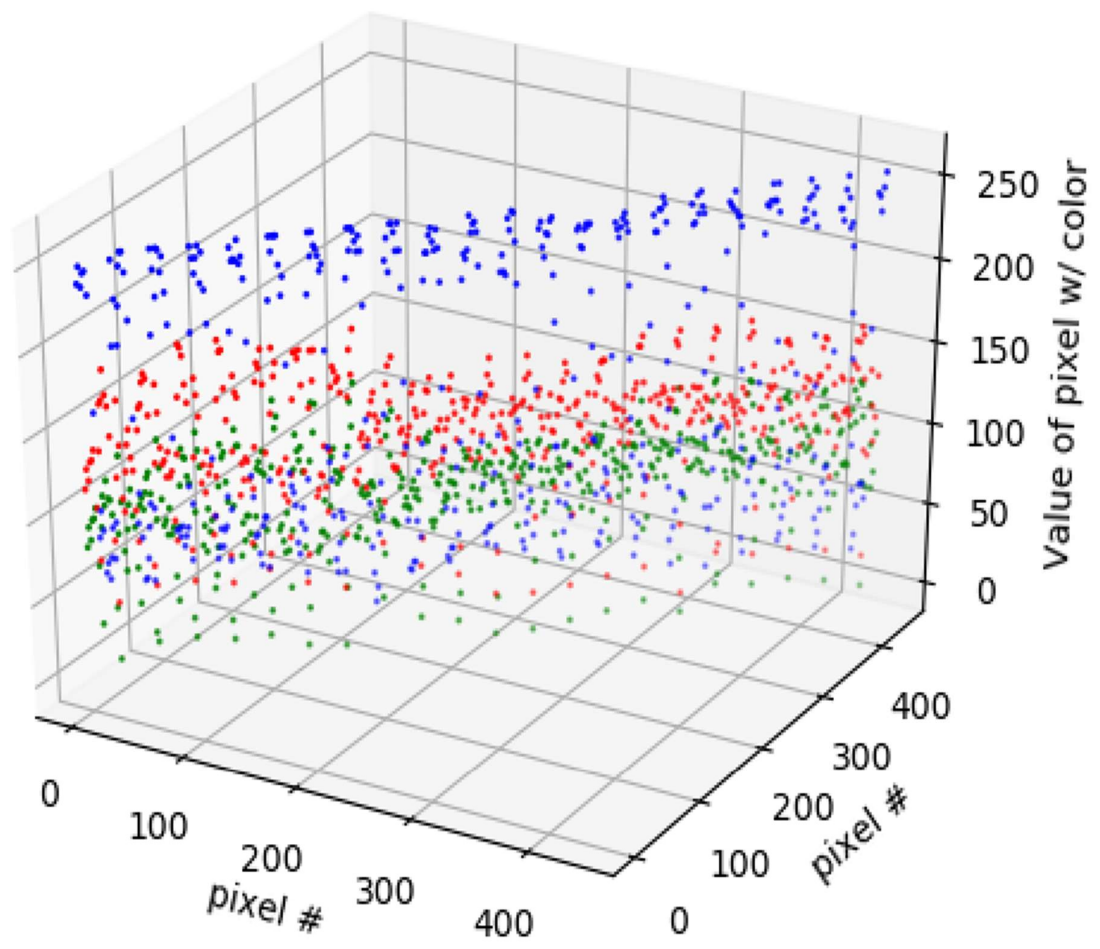
4.1 Colour Recognition Function

```
# Create function to calculate minimum distance from all colors and get the most matching color
def get_color_name(R,G,B):
    minimum = 1000
    for i in range(len(df)):
        d = abs(R - int(df.loc[i,'R'])) + abs(G - int(df.loc[i,'G'])) + abs(B - int(df.loc[i,'B']))
        if d <= minimum:
            minimum = d
            cname = df.loc[i, 'color_name']

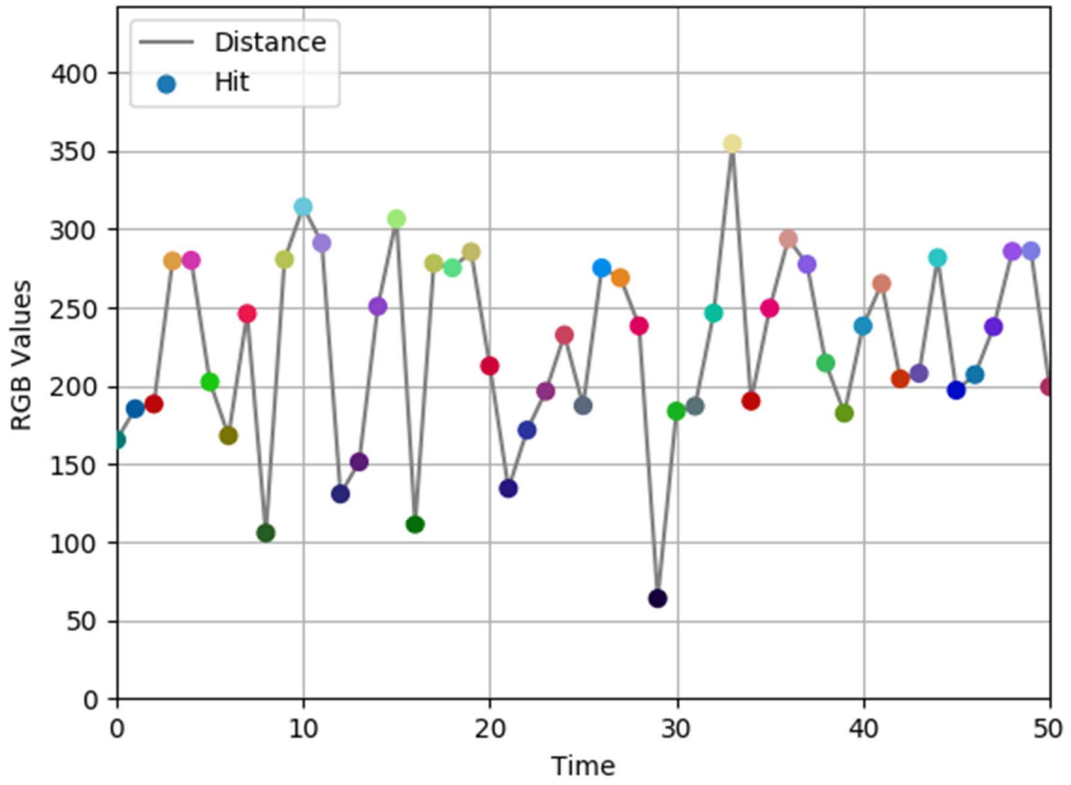
    return cname
```

4.2 Mouse Click Function

```
# Create function to get x,y coordinates of mouse when double clicked
def draw_function(event, x, y, flags, params):
    if event == cv2.EVENT_LBUTTONDBLCLK:
        global b, g, r, xpos, ypos, clicked
        clicked = True
        xpos = x
        ypos = y
        b,g,r = img[y,x]
        b = int(b)
        g = int(g)
        r = int(r)
```

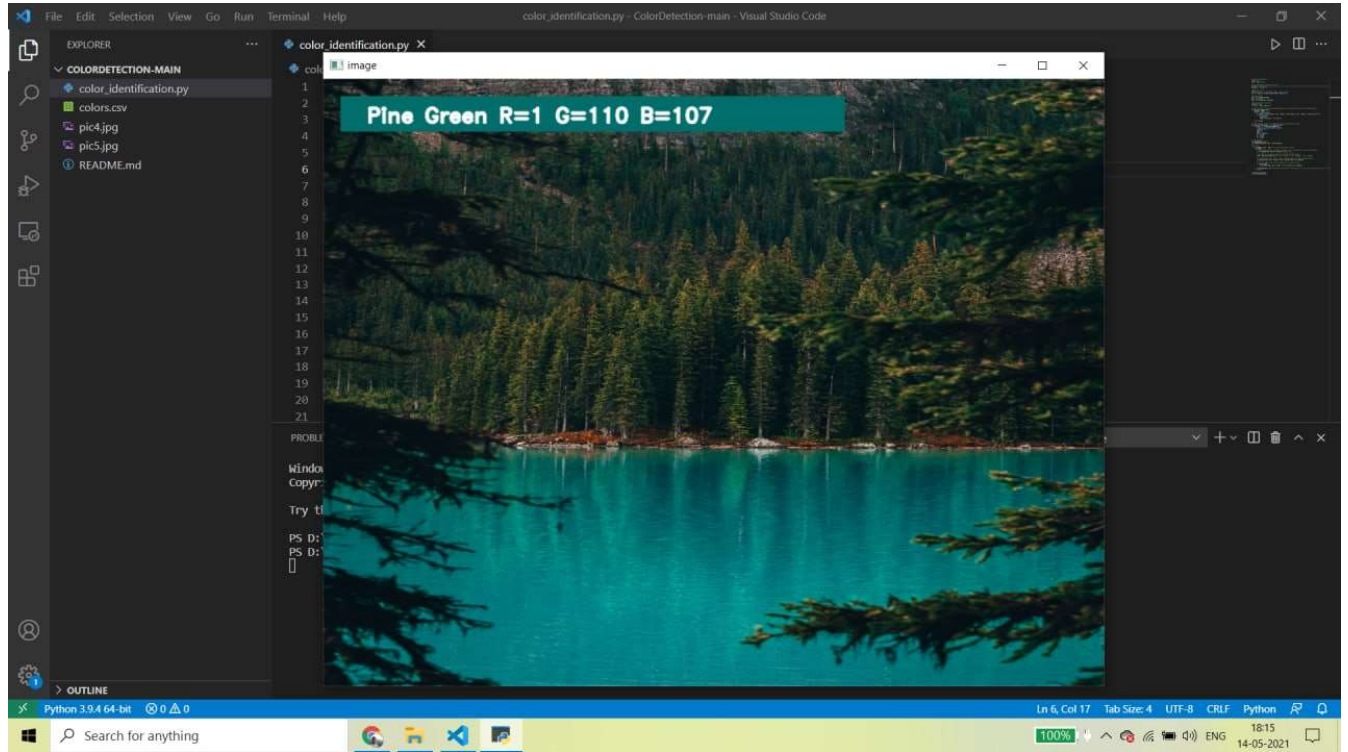


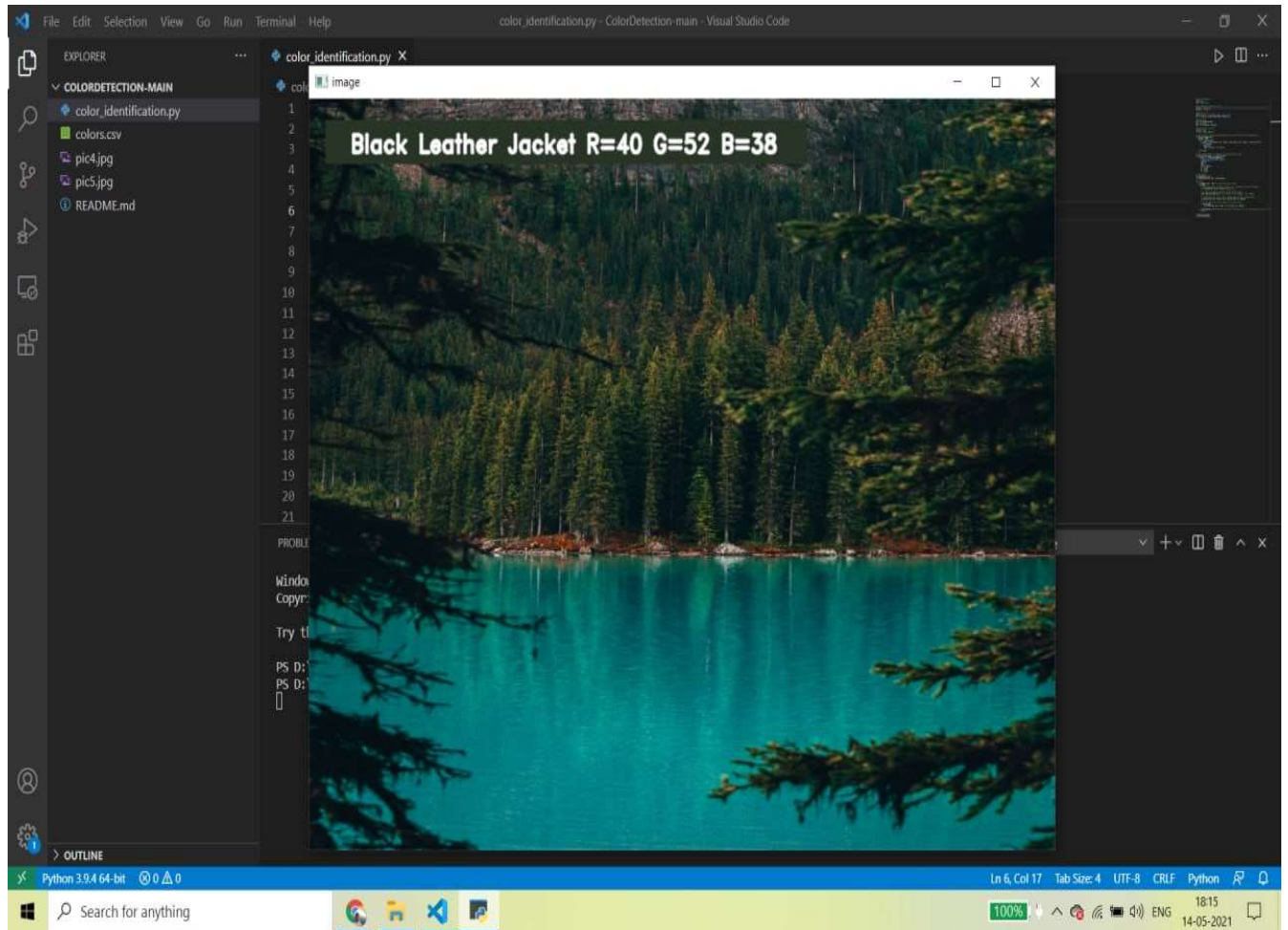
My Live Streaming Sensor Data

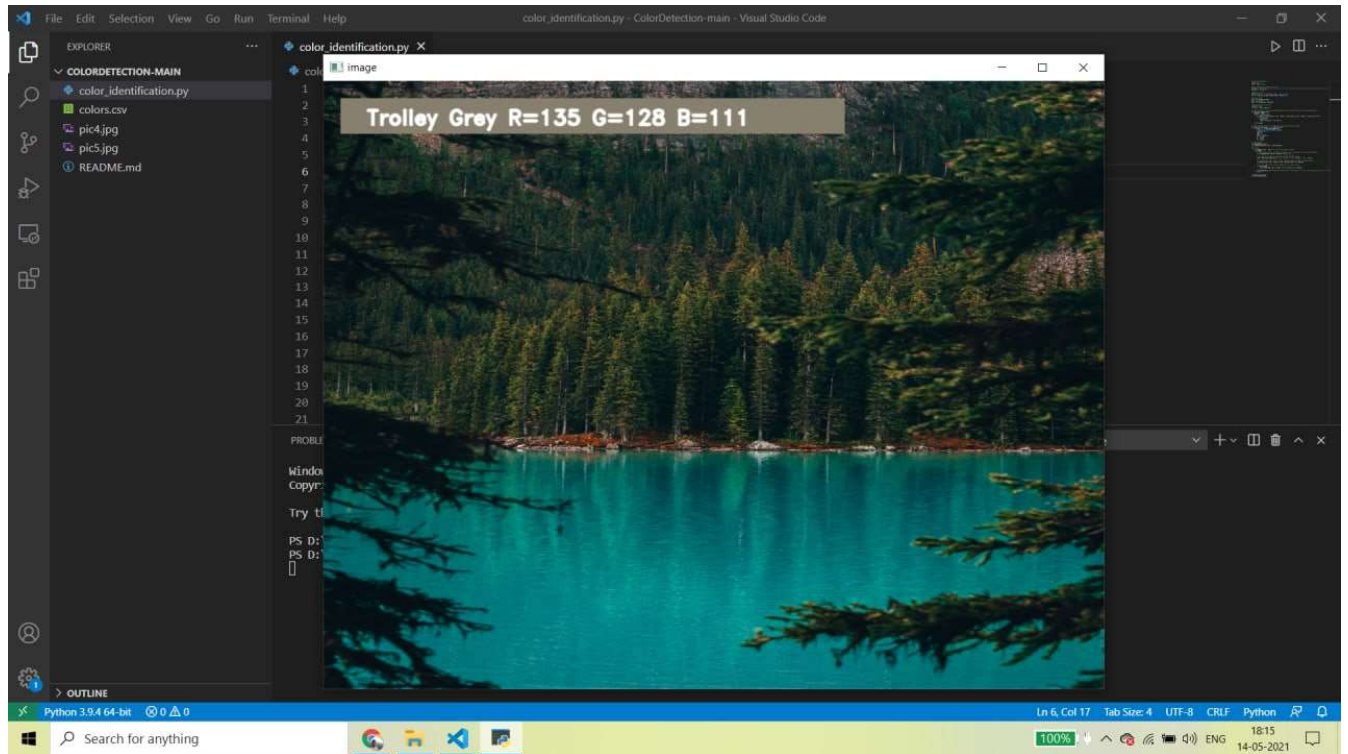


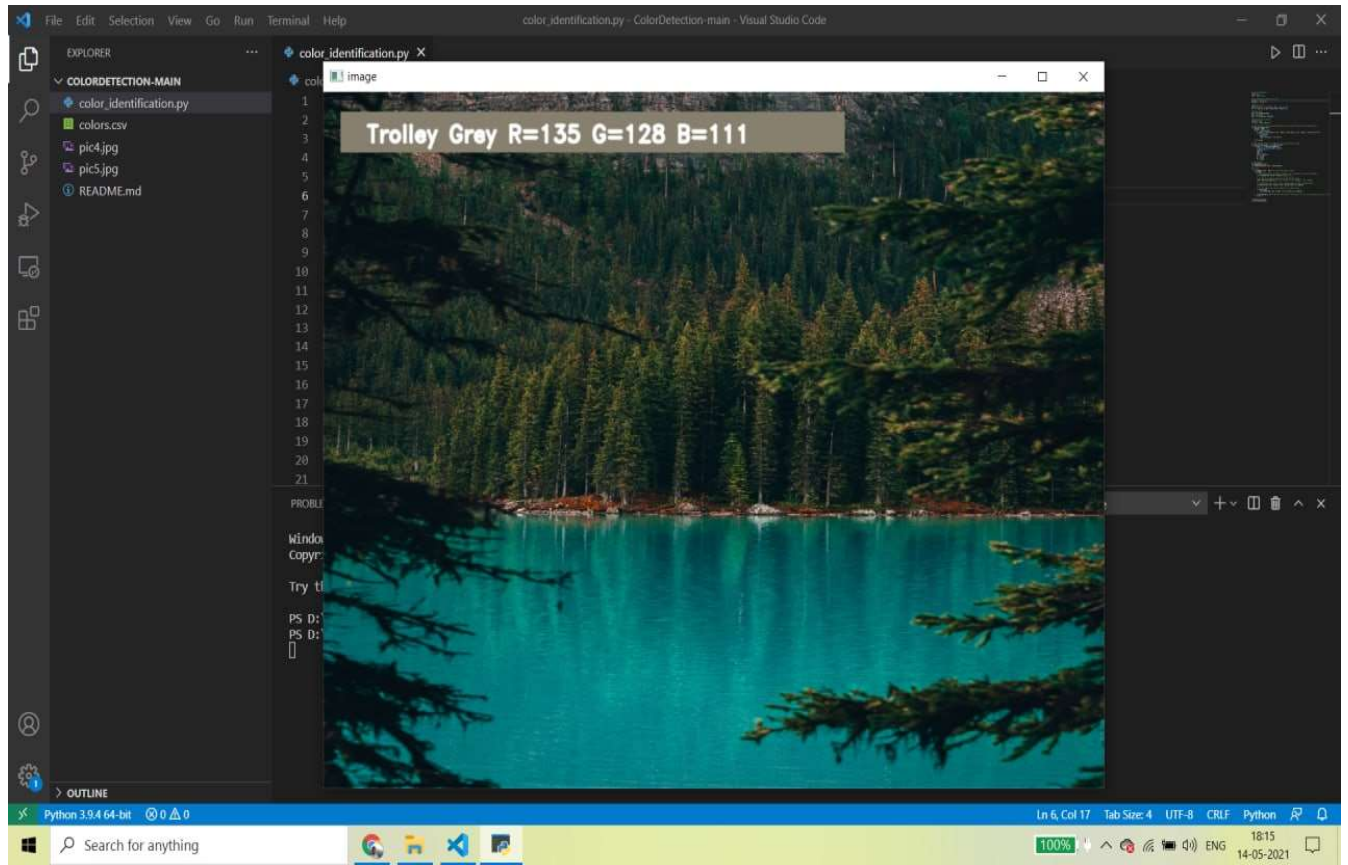
4.3 Outputs:

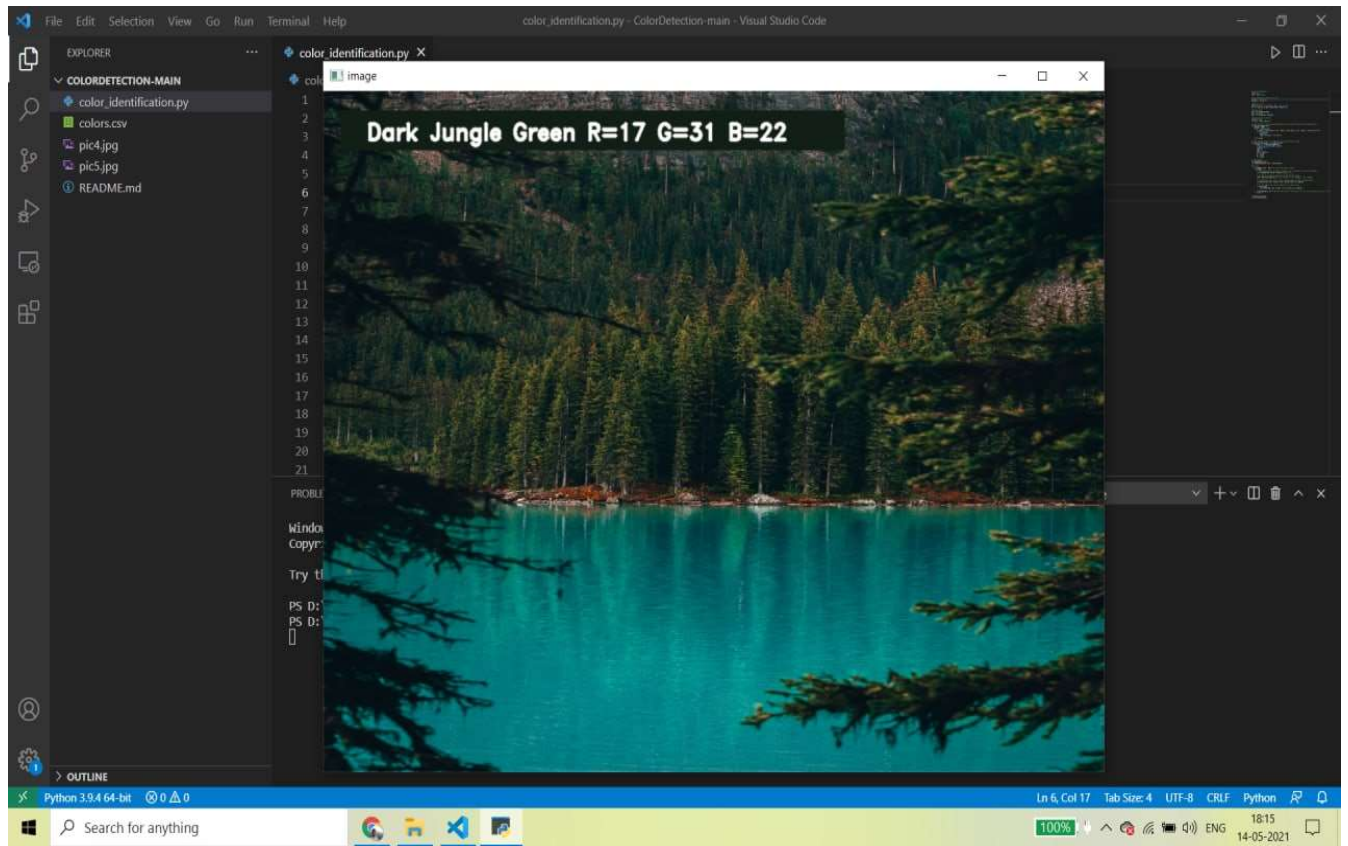


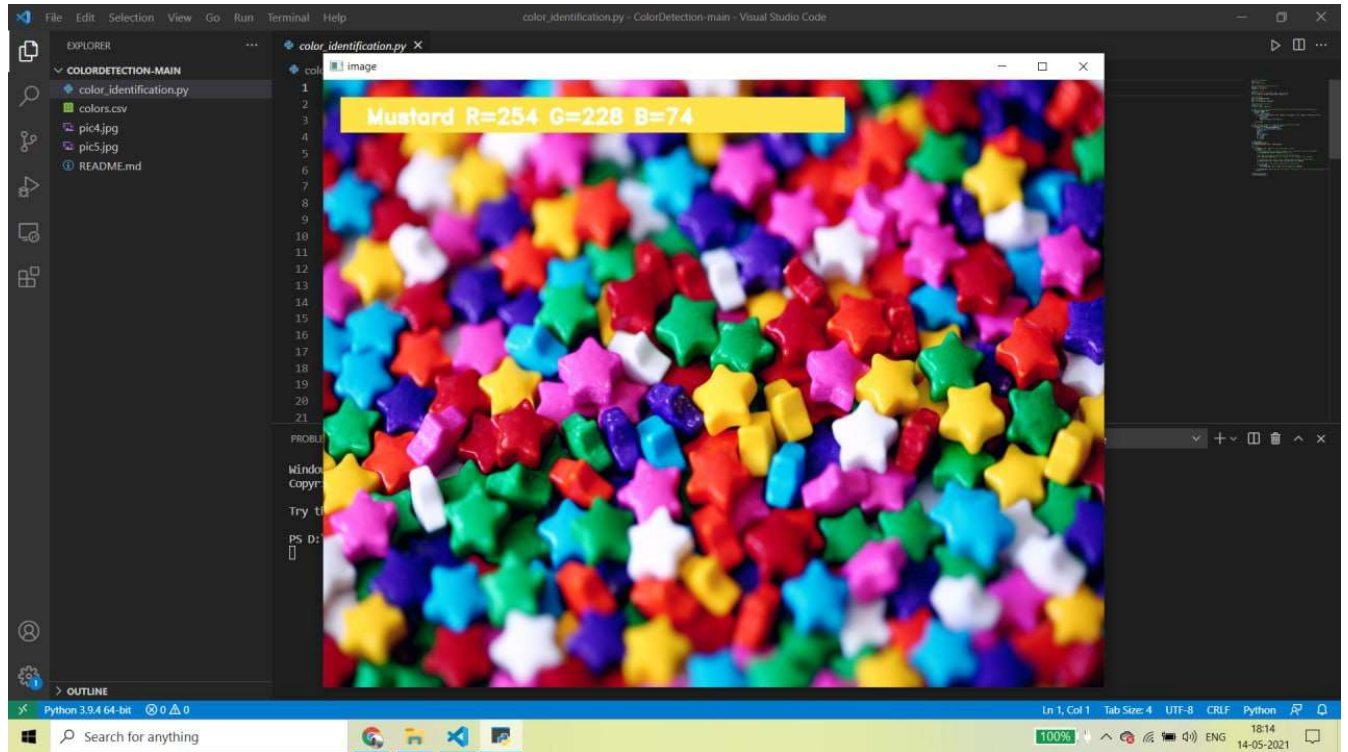


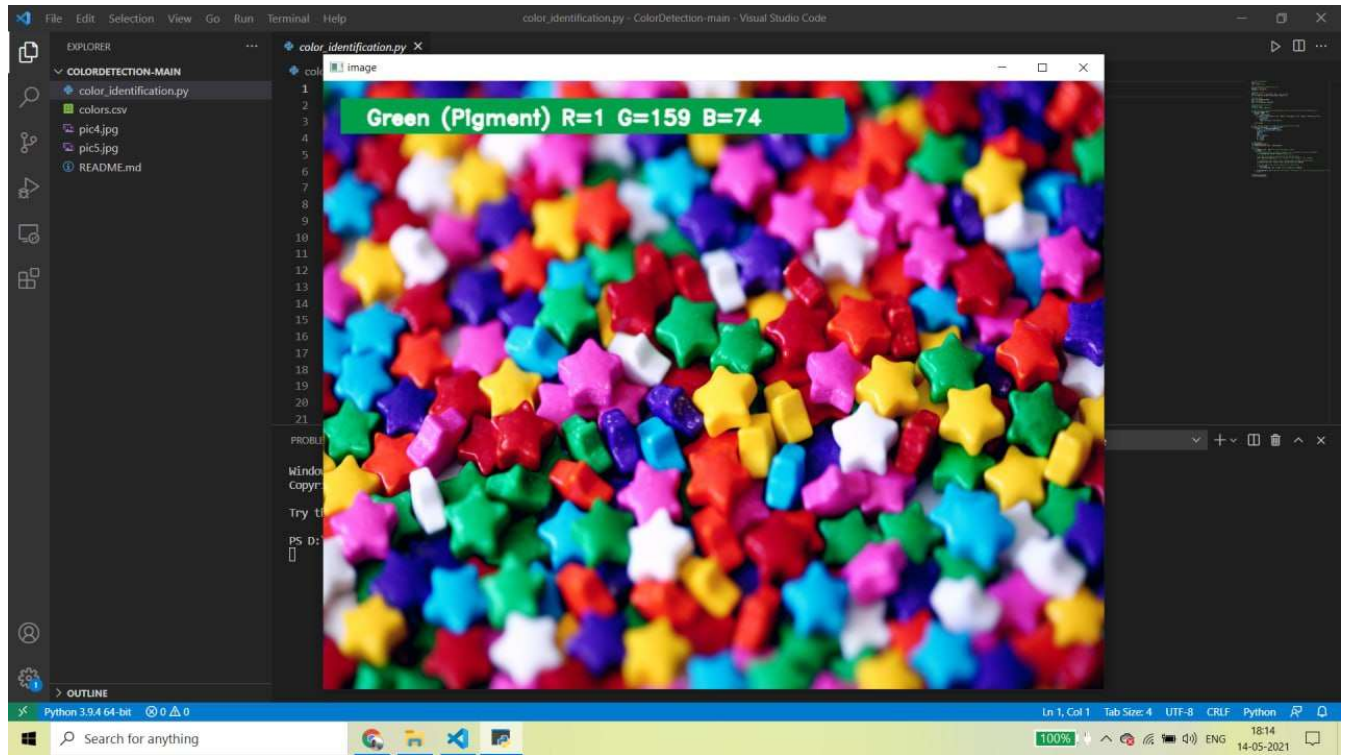


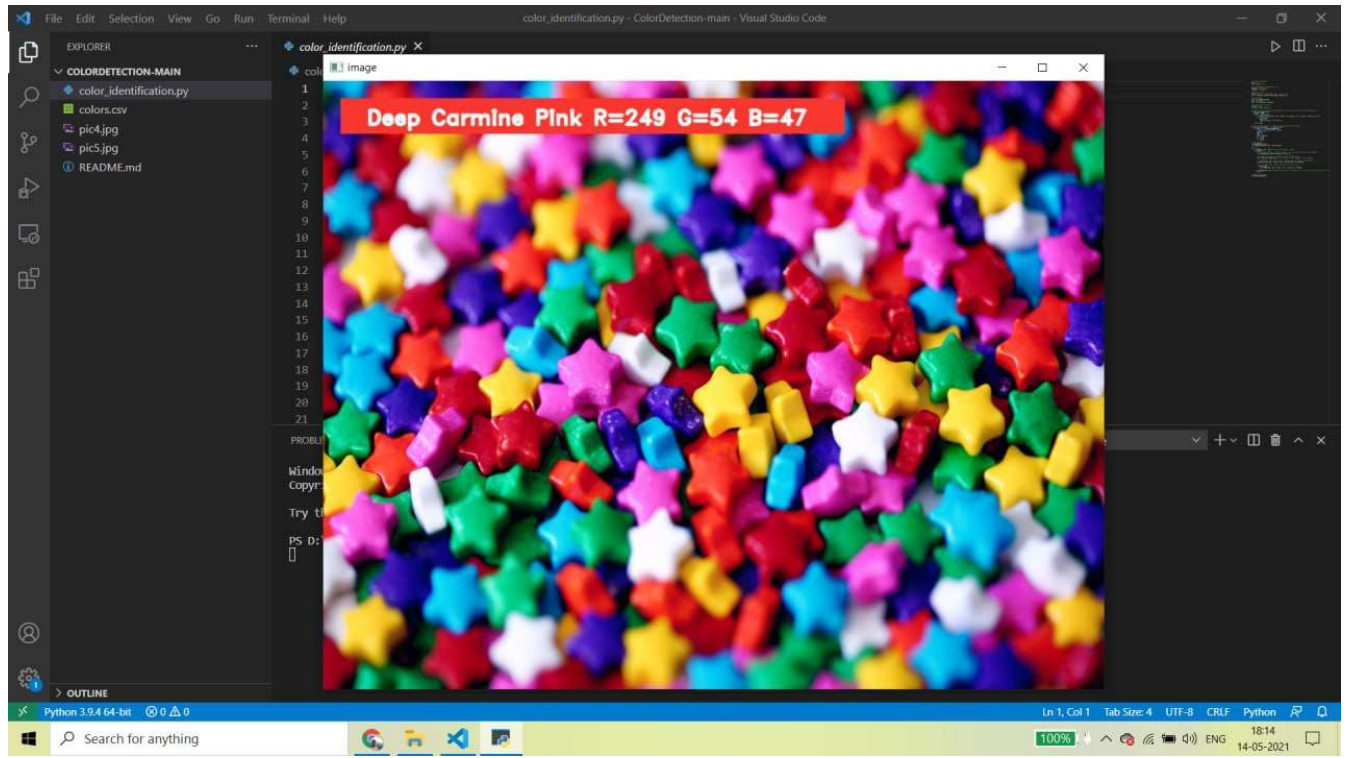


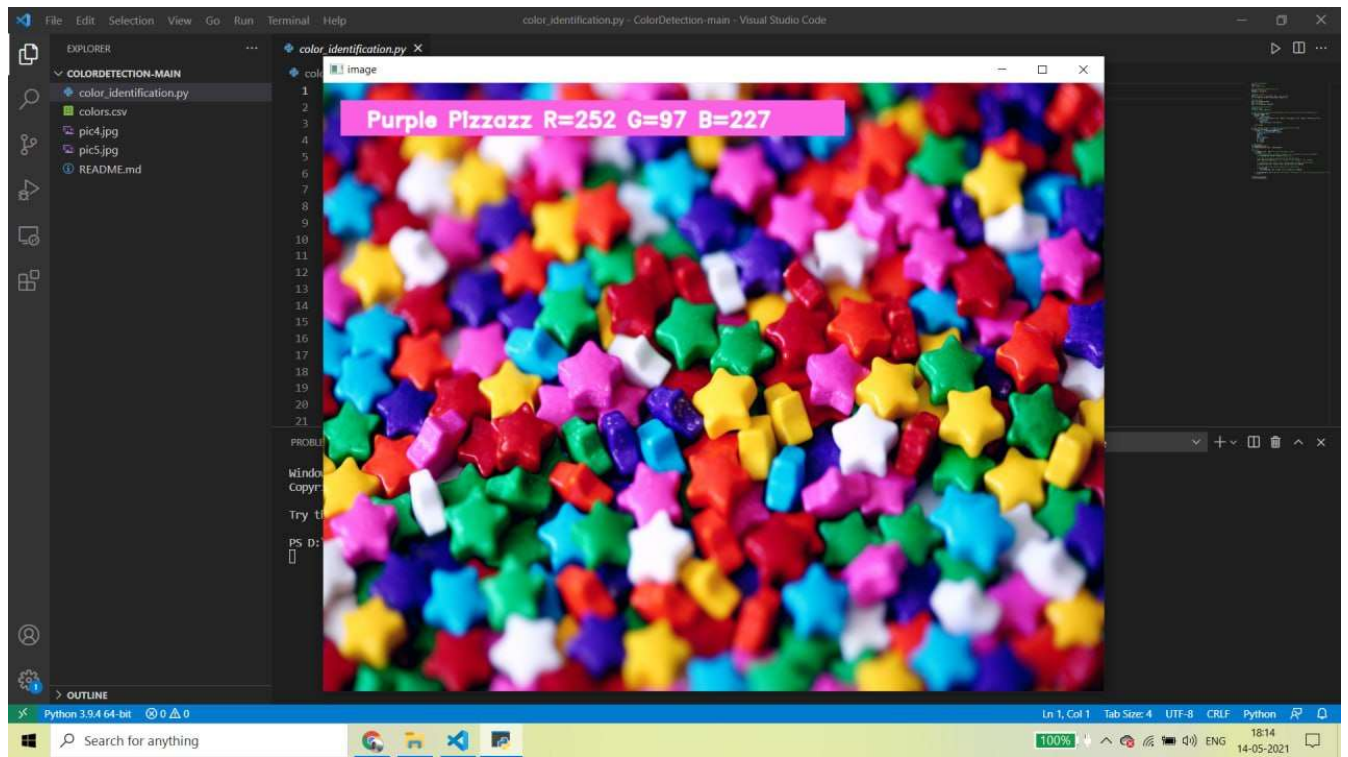












Conclusion

Computer vision can be cast-off to resolve the most fascinating problems with greatest complexity. All the fundamentals concerning the detection technique lengthwayss with dissimilar wayss to attain it have been deeply deliberated. Throughout the course of programming, we can use both Python & MATLAB for Computer Vision, but we favour Python because it takes fewer imitation time than MATLAB. Some1 having prior coding knowledge finds it easy to tool. Contours, shapes & colour were detected in the given sample pictures successfully.

In this Python project with source code, we erudite about colours & how we can excerpt colour RGB values & the colour name of a pixel. We erudite how to grip events like double-clicking on the window & saying how to read CSV files with p&as & achieve processes on data. This is used in many pictures editing & drawing apps.

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