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Color Detection using Pandas & OpenCV

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Abstract—Color detection [1] is the process of detectingname of the color. Here this is easy task for humans to detect thecolor and choose one. But computer cannot detect the color easily. This is tough task for computer to detect the color easily.So that's why we choose this project. Many of the project and research papers are written on this problem. But we use different techniques for this project. Naive Bayes algorithm, Pandas and OpenCV libraries used in python languages. Naive Bayes may be a simple technique for constructing classifiers: models that assign class labels to problem instances, representedas vectors of feature values, where the category labels are drawnfrom some finite set. There's not one algorithm for training suchclassifiers, but a family of algorithms supported a standard principle: all naive Bayes classifiers assume that the worth of a specific feature is independent of the worth of the other feature,given the category variable. Open Source Computer VisionLibrary. OpenCV was designed for computational efficiency [2] and with a robust specialize in real-time applications. Dedicatedvideo encoding within the cloud. Panda may be a cloud-based platform that gives video and audio encoding infrastructure.

Keywords—color detection, naïve Bayes, pandas, OpenCV, python libraries

I. INTRODUCTION

In this color detection python project. We are going to build the application in python language and get results to usethe naïve bayes classifiers, pandas and OpenCV libraries areused in this project which can automatically detect the nameof the color. So we have a dataset which have color names and its value.

Then we will calculate the distance from each color and find the shortest one. With the advancement of AI Computer vision came into the image in late The 1960s. Its whole purpose was to extend the intellect of the synthetic mechanism available by installing the cameras into them and describe whatever they saw just like humans' sensory systems.

Thus, Computer vision should be ready to detect actual daily-life 3D objects through 2D pictures [4]. Every picture tells us a story, something present now, or what has been going on at a specific time **Fig 1**. We have the r, g and b values. Nowwe need another function which will return us the color namefrom RGB value. To get the color name, we calculate a distance (d) which tells us how close we are to choose the onehaving minimum distance.

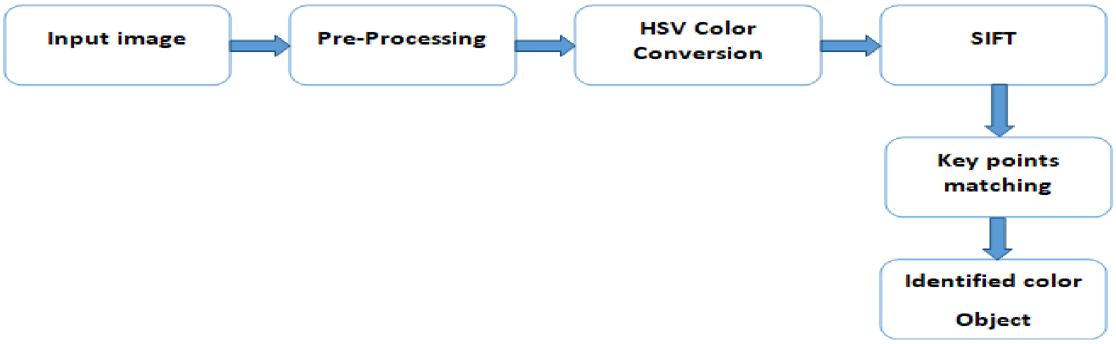

Fig 1: Color Based Object Detection using Python – OpenCV
https://www.google.com/url?sa=i&url=https%3A%2F%2Fww w.pantechsolutions.net%2Fcolor-based-object-detection-using-opencv

II. LITERATURE REVIEW

A. Current Knowdege of OpenCV and Naïve bayes

OpenCV may be a library of programming functionsmainly aimed toward real-time [5] computer vision. In simple language, it's a library used for Image Processing. It's mainlywont to do all the operations associated with Images. You putin the library on your computer.

You begin writing your code which will make use of the various features in OpenCV. You build your code and run it to perform the task you described. OpenCV may be a Computer Vision library with APIs that permit you found outa pipeline for your Computer Vision project.OpenCV-Pythonmay be a library of Python bindings designed to unravel computer vision problems. OpenCV-Python makes use of Numpy, which may be a highly optimized library for numerical operations with a MATLAB-style syntax. All the OpenCV array structures are converted to and from Numpy arrays. Naive Bayes makes the idea that features of measurementare independent of every other. This is often naive because it's (almost) never true. Naive Bayes uses an identical methodto predict the probability of various classes supported variousattributes. This algorithm is usually utilized in text classification and with problems having multiple classes.Naive Bayes is an eager learning classifier [6] and it's sure fast. Thus, it might be used for creating predictions in real- time. Multi-class Prediction: This algorithm is additionally documented for a multi-class prediction feature. Here we willpredict the probability of multiple classes of the target variable.

B. *How we use OpenCV and Pandas for Color detection*

Here we describe how we use OpenCV and pandas libraries. OpenCV, Pandas and numpy are the necessary for this project in python to install them. We are using argparse library to create an argument parser. We can directly given an image path from the command prompt. The panda's library isvery useful when we need to perform various operations on data files like CSV.pd.read_csv () reads the CSV file into thepandas DataFrame.We have assigned each column with a name for easy accessing. OpenCV Library is useful for detect the image and color values and name Fig 2. It will calculate the RGB value of the pixels. The functions the parameters have the event name (X, Y) coordinates of the position. This is called draw function. Which was created by OpenCV and Pandas. Because the OpenCV library functions by optimizing the C code, not only is that the code simple and efficient but it can also fill us of the benefits of multi-core processors. Therefore, this paper uses the Visual C++ development environment and OpenCV technology for video image capture, processing, and display.

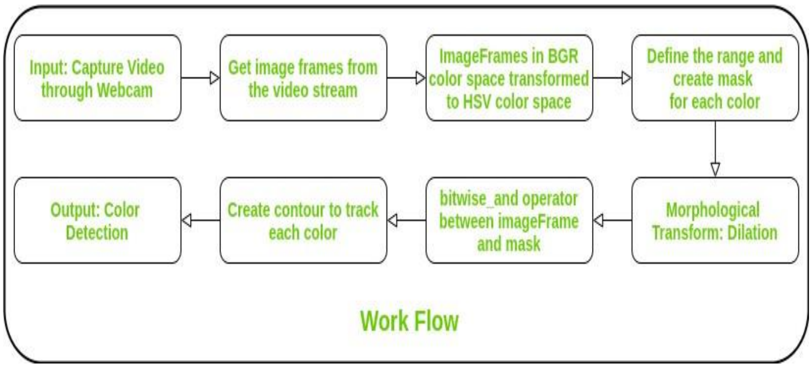
Input: Capture Video through Webcam
Get image frames from the video stream
ImageFrames in BGR color space transformed to HSV color space
Define the range and create mask for each color
Morphological Transform: Dilation
bitwise_and operator between imageFrame and mask
Create contour to track each color
Output: Color Detection
Work Flow

Fig 2. Multiple Color Detection in Real-Time usingPython-OpenCV
https://www.geeksforgeeks.org/multiple-color-detection-in-real-time-using-python-opencv/

III. RESEARCH METHODOLOGY

We have the r, g and b values. Now we need another function which will return us the color name from RGB value.To get the color name, we calculate a distance (d) which tellsus how close we are to choose the one having minimum distance.

A. *Working on Color Detection with OpenCV*

I recently started working on image color detection using python with deep learning and OpenCV use for detection color. When I found [7] OpenCV which allows import and manipulation of images in Python shown in Fig 3, I began to wonder if the knowledge might be extracted out of these images using Machine Learning and utilized in how. We've all seen that we will search online on the idea of certain filters one among which is color. I got inspired to truly write the code which will extract colors out of images and filter the pictures supported those colors. In this research paper, I explain how I understood the fundamentals of OpenCV, extracted colors from images using the Naïve Bayes algorithm, and filtered images from a set of images supported RGB values of colors. The entire notebook is out there at this repository.

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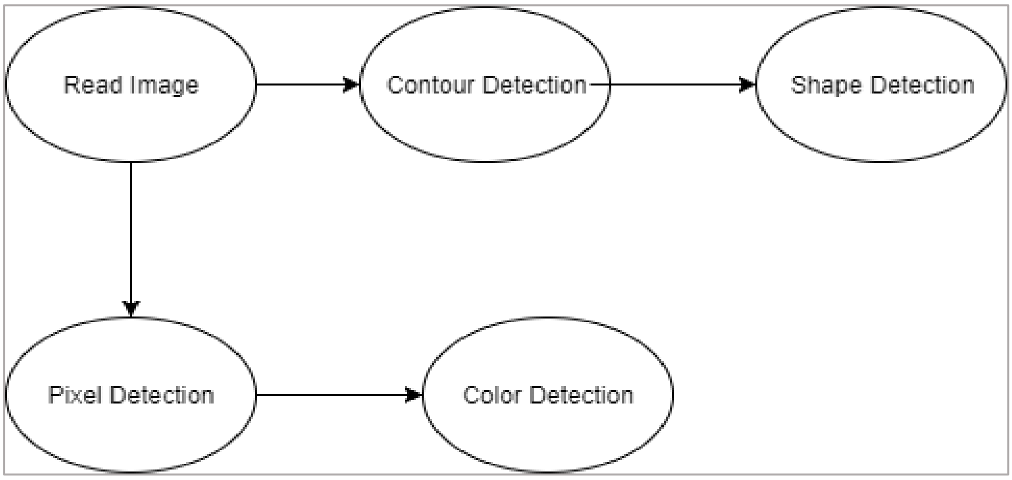

Fig 3. Flow Chart for color detection with OpenCV
https://www.researchgate.net/figure/Flowchart-for-Shape- Color-Detection_fig1_325195384

B. Naïve Bayes Classification on DataSet

It is a classification based technique based on Bayestheorem. In simple terms, a Naïve Bayes classifier assumes that the presences of a particular feature in a **Fig 4**. Class is unrelated to the presence of any feature.

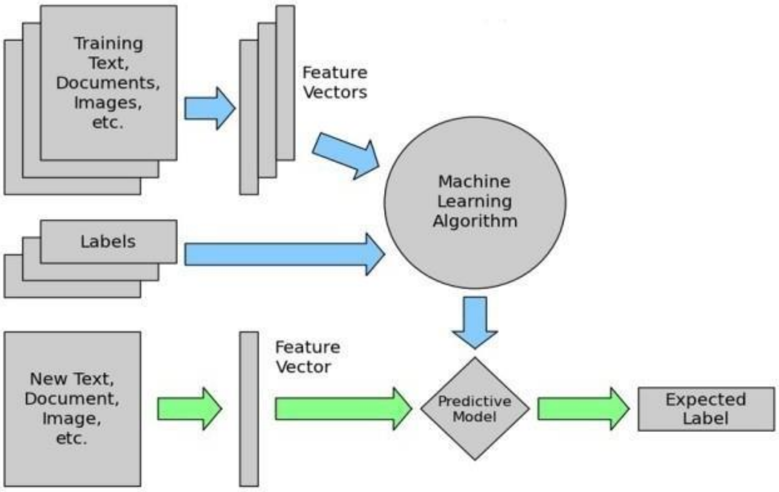
Training Text, Documents, Images, etc.
Feature Vectors
Machine Learning Algorithm
Labels
New Text, Document, Image, etc.
Feature Vector
Predictive Model
Expected Label

Fig 4. Naïve Bayes Classifier Working on Dataset
https://iq.opengenus.org/text-classification-naive-bayes/

A. Is Naïve Bayes Efficient for Dataset Predictions?

Naïve Bayes is the most efficient algorithm of machine learning and data mining. It is competitive performance in classification is surprising because the conditional independence assumption on which it is based is always truein the real world.

B. How do we implement Naïve Bayes Classifier?

Calculate the prior probability for given class labels. Find Likelihood probability with each attribute for each class. Put these value in Bayes Formula [12] and calculate posteriorprobability. We use two different tools for apply this

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algorithm. We put a dataset and apply this algorithm.

C. The DataSet

Colors are made up for 3 primary values RGB, Colors value range is 0 to 255, the three columns have 0 to 255. Thetotal values are based [3] on 256*256*256 = 16,777,216. There are almost 16.5 million different ways to represent these ways. In our dataset 864 color names are include. We will be using a dataset that contains RGB values with their corresponding names.

D. The Scope and Drawbacks of this research area

Colors information plays an important role in image and real time color sensor detection. Which affects the results of video segmentation and correct real time temperature value. According to the color information in RGB color space, the dominant color is determined at first. In the color image segmentation, the primary step is to settle on color space. The color model [9] we all know contains RGB, HSI, HSV, CMYK, CIE, YUV, and so on. The RGB model (**Fig 5**) while the HIS model is that the most ordinarily used color model for color processing. They're often utilized in image processing technology.

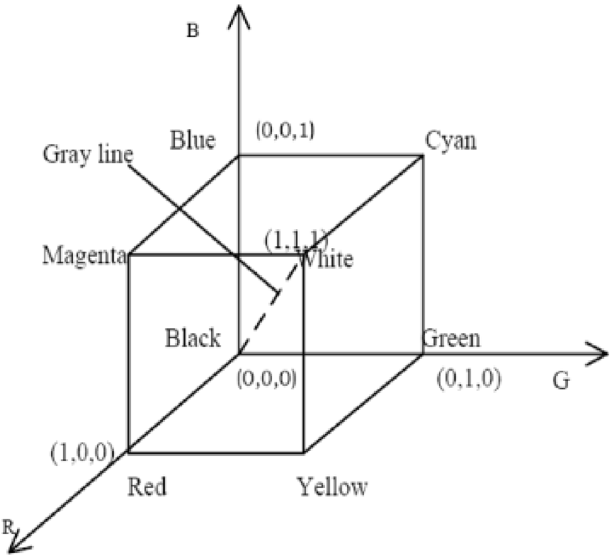

Fig 5. RGB Color Mode

lhttps://jivpeurasipjournals.springeropen.com/articles/10. 1186/s13640-018-0258-x/figures/1

The technology of Color detection is almost poor than image and video surfing quality [10]. Now a days every person want to get best colors in image and videos, but nowwe apply many algorithms and techniques, but the results are not good because of color segmentation. But our effortsto get best results so we apply Naïve Bayes classifier and OpenCV libraries in python language.

IV. RESULTS

This is naïve bayes approached in color detection usingpandas and OpenCV. To run this code we use python language and choose anaconda python tool to compile this code. And get results we apply only naïve bayes classifier andchoose different test options on weka. But we mentioned onlycross validation test mode. Naïve bayes apply on dataset of different coloumn shown below in **Fig 6 and Fig 7**. Here wepresent our results. The results are not more sufficent becausethis technique is used for first time, but in the future we also apply different algorithms and use R language. But here we mentioned our results.

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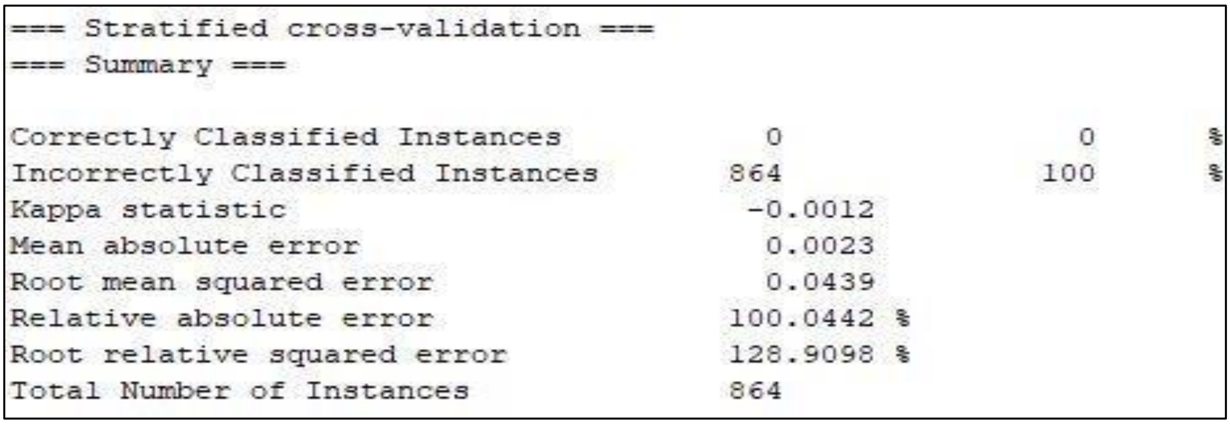
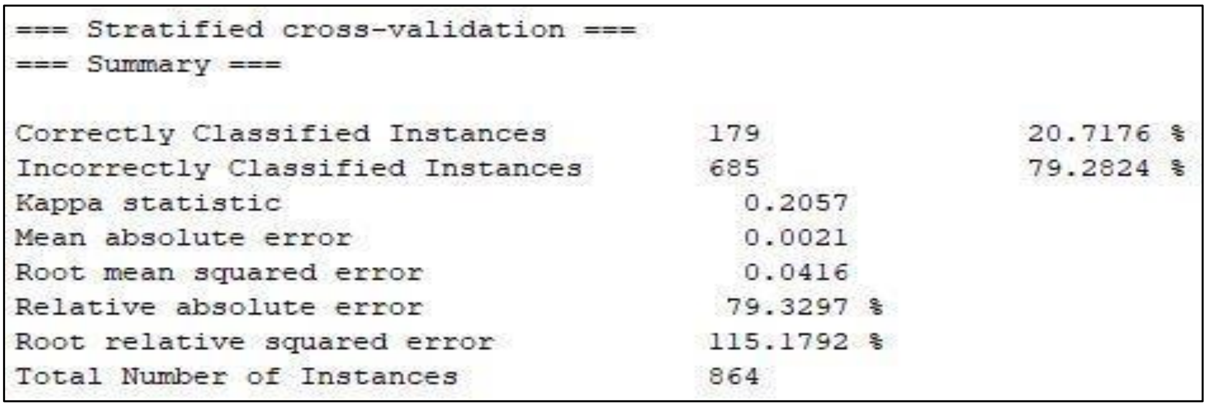


```
=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances            0               0      %
Incorrectly Classified Instances        864             100      %
Kappa statistic                          -0.0012
Mean absolute error                       0.0023
Root mean squared error                   0.0439
Relative absolute error                 100.0442 %
Root relative squared error             128.9098 %
Total Number of Instances               864
```

Fig 6. First column of Color dataset (Air blue_arff)



```
=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances          179               20.7176 %
Incorrectly Classified Instances        685               79.2824 %
Kappa statistic                           0.2057
Mean absolute error                       0.0021
Root mean squared error                   0.0416
Relative absolute error                  79.3297 %
Root relative squared error             115.1792 %
Total Number of Instances               864
```

Fig 7. Second Coloumn of Color dataset (128 Valid)

We use test option for 10 folds the results are shown.

V. CONCULISION

In this Research area with all research methodology, future scope, and results we learned about colors and therefore the way we will extract color RGB values and the color name of a pixel. We learned the way to handle events like double-clicking on the window and saw the way to read ARFF files with Weka and CSV files with pandas and apply the OpenCV library to perform operations on data. this is often utilized in numerous image editing and drawing apps. Here this is easy task for humans to detect the color and choose one. But computer cannot detect the color easily. This is tough task for computer to detect the color easily. So that’s why we choose this project. Many of the project and research papers are written on this problem. But we use different techniques for this project. [11] Naive Bayes algorithm, Pandas and OpenCV libraries used in python languages. Naive Bayes may be a simple technique for constructing classifiers: models that assign class labels to problem instances, represented as vectors of feature values, where the category labels are drawn from some finite set.

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