A Novel Mechanism for Deoldification and Object Detection in An Image

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Abstract - Image colorization is an essential image processing and computer vision branch to colorize images and videos. Recently, deep learning techniques progressed notably for image colorization and object detection. This project presents a comprehensive approach of recent colorization using deep learning algorithm, describing their fundamental block architectures in terms of skip connections, input etc. as well as optimizers, loss functions, training protocols, and training data etc.

Keywords - AI, Colorization, Computer Vision, Object Detection, Multi-Processing, Python, Open CV, UI.

I. INTRODUCTION

Image colorization is process of recovering color information from given only the luminous intensity information. Mathematically we have to create three dimensional RGB data from one dimension intensity data, for each pixel in the target gray image. This information cannot be created on its own, we need to provide some previously learned information. Historical black-and-white images are regarded as irreplaceable, with exceptional artistic value [1]. However, by looking at them it is impossible to fully imagine the actual scene because color is a very important segment of visual representation. The colorization of black-and-white images strongly changes viewers' perspective.

The time gap between the past and the present fades away while making the scene more conceivable. However, the insight in authentic colors of early photographs is frequently non-existent, thus aggravating the satisfactory reconstruction The aim of colorization is to deceive the observer; make them believe in the authenticity of the colorized image, not to accurately reconstruct the color.

The paper is organized in 4 sections as follows: Section II presents the motivation for the system. Section III presets the literature review. Section IV presents the proposed methodology which includes only Software components as the project does not involve any hardware components. In section V results are discussed.

II. MOTIVATION

Primarily to ensure heritage and re-invigoration of ancient and historic photographs and/or video which adds stunning detail and life like imagery to reimagine the scene in full color leaving nothing to the imagination. Especially seen in the re-colorization of World War 1 and 2 images which shows the war as never seen before. Another alternate purpose which is coupled with the implementation of object detection is the need to colorize and detect images to enhance further detail in CCTV images and footage which can lead to the reveal of essential details in a crime seen or any scene for that matter.

III. LITERATURE REVIEW

Image Colorizers as such is already a preexisting concept by utilizing CNN networks, deep coloring [4] and a caffe training model and is only limited in its capacity of use alone without coupling them to another technology it remains miniscule in real life applications and can therefore be further expanded in its use. There is also a large amount of error in the colorization of the images and therefore the model used for training and the accuracy of the system can be further increased to expand its use as well as a reduction in the time taken to perform the training of the model. The real applications of the system are evident when paired with the object detection using custom training datasets and using YOLO training set to detect objects [3] and the classification section of the system which can reveal great details within the image therefore amplifying the total net extraction of details from the image which can be helpful in various scenarios. The unique combination of these two separate technologies greatly increases usefulness of the system in tandem with each other. It is also incased in a user interface further increasing usability and usefulness.

IV. METHODOLOGY

In our proposed system, we have 3 major components – The Image/Video colorizer [1][2], Object Detection [3] and the User Interface [6]. The user of the system can begin by using the user interface provided which has been implemented using Tkinter on python [6]. He or She can upload the black and white image by

pressing on the upload button which opens a file explorer window allowing for the selection of the black and white image or video after which ok is hit and the upload is completed setting the path to the path of the image or video then a button is hit to convert the entered file from black and white to color once the conversion is done the output image is immediately fed to the next module that is object detection.

This operation is performed and it is seen that in the colorized image different objects in the scene are identified and indicators which are usually rectangular frames are seen around the object with an image tag as to which object it is

It is also seen these images that have been detected have automatically been classified by the system and have been separated and segregated into different folders in the file system to enable and ease the analysis of the same objects individually.

Brief working:

1. Operate UI and Upload File.
2. The objects of the uploaded file are colorized and detected.
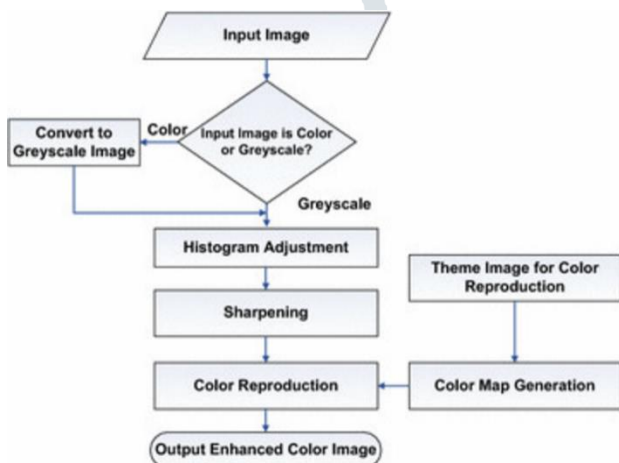3. The detected objects are classified and the final image can be analyzed and interpreted as needed.

Fig. 1: Proposed architecture

4.1 Software Prototype

The software prototype flow chart [5] has been shown in Figure 2
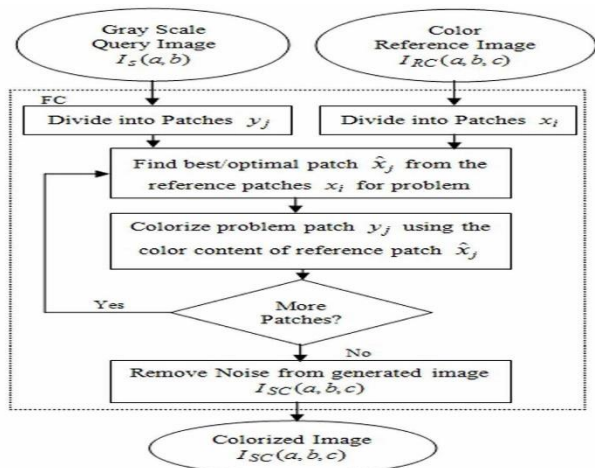

Fig. 2: Flow chart of software Application

The brief working of each screen is presented here. On opening the application, the first screen seen is the Add black and white image along with the button to upload the image names "Upload File" as shown in Figure 3(a).

On doing this the file explorer of your operating system is opened and you can proceed to browse and select any jpg/jpeg or png file as needed by the user this is seen in Figure 3(b).

If any other file is selected then the selection is not allowed and the file is not considered to be uploaded to the application.
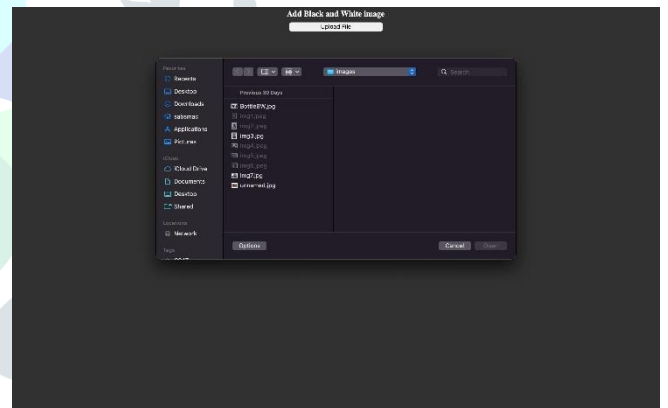

Fig. 3(a)

Fig. 3(b)

Fig. 3: (a) Upload File Screen, (b) Browse Screen

The screen as in figure 4(a) is what is seen after the successful selection of the image and the image has been successfully uploaded it is seen that it is a black and white image that needs to be converted to color [4], it is also seen that the upload file button is greyed out because we have already uploaded and therefore it is not applicable.
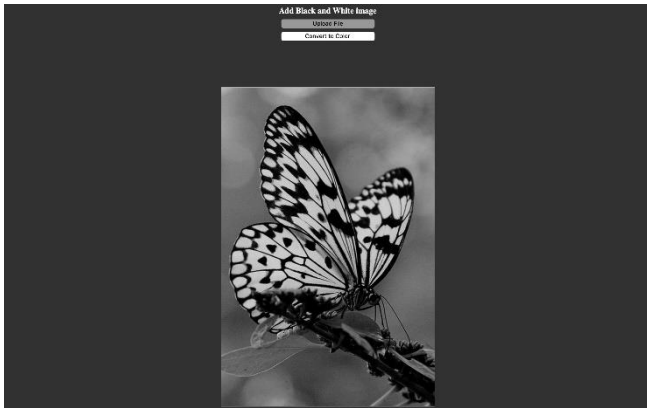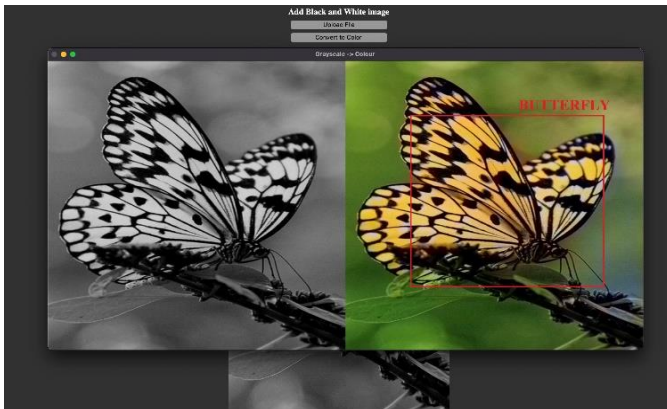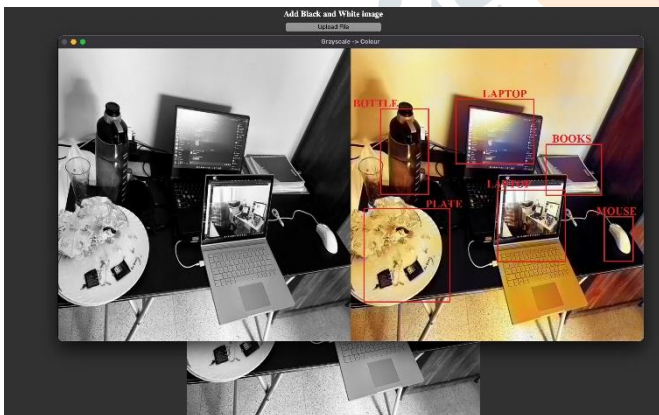
Fig. 4(a)

Fig. 4(b)

Fig. 4(c)

Fig. 4: (a) Uploaded Picture Screen, (b) Conversion before and after screen, (c) A real life image example after colorization and detection

The "Convert To Color" button is pressed next and hen the screen as seen in Figure 4(b) greets the user. Here we can see the black and white image which was uploaded unto the application on the left and the AI colorized image on the right of the frame along with the object indicators in the form of red frames. It is seen that the conversation is extremely accurate and is very fast as well. In the Figure 4(c) we see a real-life image taken with various different objects in the scene and the colorization holds up and the object detection also occurs on various objects in the scene. It is also seen that the "Upload File" button is enabled again which allows us to convert the next image as needed.

V. RESULTS AND DISCUSSION

The working Colorizer and detector are developed. The application was able to output the colorized image and performed accurately and quickly. The main aim was to deliver accurate and fast conversion, detection and classification of various objects in an image/video. Below speed before and after multi-processing [7] has been compared in graphs as seen in the Figure 5 normal python codes execution is seen. In the Figure 5(a) it is seen that serial computing takes a large amount of time to execute and is therefore slow, next threads are used as seen in the Figure 5(b) it is better and utilizes parallel processing but still not fast enough and therefore finally multi-processing is done in the Figure 5(c) which dramatically increases speed of execution and maintains the same accuracy using multi process pools of the system.
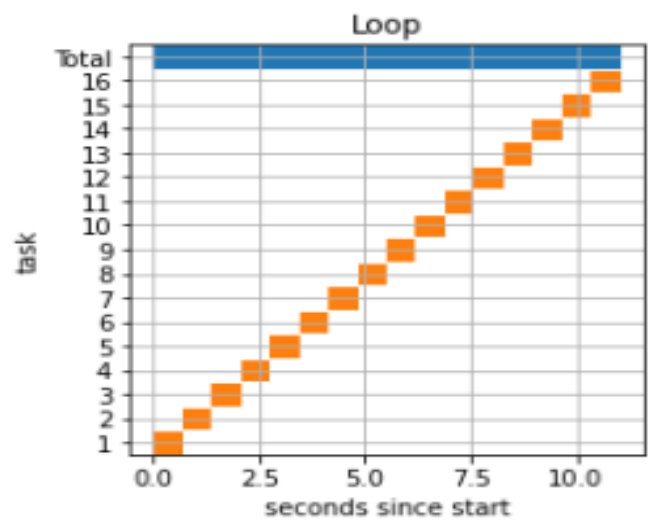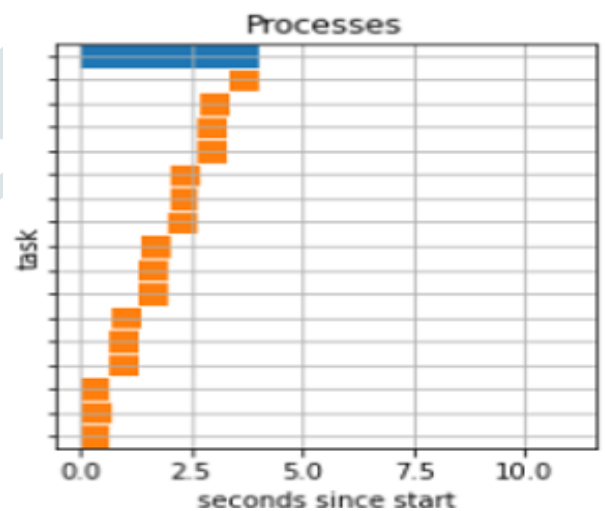

Fig. 5(a) Serial Computing

Fig. 5(c) Multi Process Computing

Although there is further room for improvement in the application like incorporating behavior detection and body language analysis to further aid in investigation and to extract further detail from a said image. It can also be accompanied by a robust real time face id detection system which can identify potential perpetrators in the camera feed leading to direct identification and aid for the user

VI. CONCLUSION

The primary objective of this project was to ensure the proper preservation of old memorabilia and historical artifacts to make them enriched in detail in terms of color and the objective was also to allow aid in image analysis using object detection further helping in investigation and easy decipher of difficult details in a otherwise black and white and un-detected image or video from for example CCTV images or footage and this project achieves that with great accuracy and speed [7].

It is designed for great user experience and aids in the implementation of both casual occasions like colorizing photos of our grand-parents to all the way to aid law enforcement agencies get further information and evidence which helps in saving time and amplifies efficiency and productivity.

VII. REFERENCES

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