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ColorAI – Automatic Image Colorisation using CycleGAN

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Abstract -*Image Colorization is the process of automatically colorizing an input grayscale image without manual interference by adding chrominance values to grayscale images. It is an appealing area in the world of image processing. Previous approaches to the colorization of grayscale images needed human intervention and often produce instant results that are not real colorization. Human labor is time-taking, monotonous, and requires a lot of effort and gives unsatisfactory results. We have gone through extensive research, studies multiple models and approaches and loss functions to understand the practices to produce a credible colorization. In this project, we contemplate the problem as an image-to-image translation and propose an effective solution using Cycle Generative Adversarial Networks (CycleGAN). CycleGANs is an approach to training deep CNNs (Convolutional Neural Networks for image translation. It uses an unsupervised approach to learn the mapping between two image domains. We train our model on a hand-picked image dataset curated to incorporate the most common scenarios and propose a general solution that is fast, sustainable, and accurate which can be used to solve mainstream as well as obscure image colorization problems.*

Key Words:*Image Colorisation, Image translation, CycleGAN, GAN.*

1. INTRODUCTION

Image colorization is a very old subject, where in old times manual human labor was needed to add the colors in the grayscale or black and white images which obviously took a lot of time and to finish and the accuracy was very less but after the invention of computers and the growth of machine learning industry. Image Colorization is currently evolving at a rapid speed, with new breakthroughs and solutions using machine learning algorithms, many scientists have successfully succeeded in Colorization of the image using various methods. Here in this paper we have reviewed various papers and we have written our conclusion on them. Some researchers have used neural network and optimization, some researchers took it as a regression problem, and some have used fully automated learning based Colorization algorithm on VGG-16 and a CNN that shows the capacity to colorize automatically grayscale images. After training the various algorithms we noticed that some of the algorithms lacked the accuracy in colour and the accuracy in loss function. Some of the algorithms are just Colorizing the images that are nowhere near to the ground truth.

2.1 LITERATURE REVIEW

Jiancheng An, Kpeyiton Koffi Gagnon, Qingnan Shi,Hongwei, Rui Cao* [1] Their proposed system consists of a automatic approach based on neural networks to color the image in grayscale,In their paper we can see that they have trained a convolutional neural network by noticing that some loss functions can work better that others. And they used the VGG-16 CNN model based on the classification with the loss of cross entropy that is very well to produce a plausible Colorization, however their proposed models produced images with very vibrant colors although plausible to the human eye but with colors far away from the groundtruth, so we can say after reviewing their paper is that it sometimes can correct saturated color undesirable to certain images

Divyang Patel, Shankar parmar with their paper image retrieval based automatic Grayscale Image Colorization [2] Their system consists the pixel to pixel matching which is performed between the input gray scale image and reference source Image source color Image, which is present in the database.in their system the each pixel of the image is matched and then after matching the gray scale image with the reference source image the new image is produced with much accurate color but here for the image colorization process byt their proposed system the source image also needed in the database but for most of the time for Colorization of the gray scale image the reference image is not always available.so the big con of their system is this.

Automated Colorization of a Grayscale Image with Seed Points Propagation by Shaohua wan, Yu Xia, Lianyoung Qi, Yee-Hong Yang, Mohammad Atiquzzaman[3] In their paper they proposed a system which is a fully automated image colorization method for grayscale images using neural network and optimization. In the system for the given training stets gray images and its corresponding color images, the system divides the gray scale images into superpixels,and then extracts features of particular points of interest in each superpixel not the extracted features and their RGB values are given as input for the training Colorization neural network of each pixel. Now upon seeing their results we can see that it only works best for the particular type of pictures and their corresponding PSNR and SSIM values under every method shows the difference.

Yuxuan Xiao, Aiwen Jiang, Changhong Liu, Mingwen Wang with their paper on single image colorization via modified CYCLEGAN Their proposed system is totally

different from the traditional one way *GAN (Generative Adversarial Networks), CYCLEGAN* is a two mirror symmetrical GANs that from a cycle graph structure. It doesn't require the paired data for training nor does it require a reference image. The CYCLEGAN based Colorization framework and modified it to suit the task, their semantic identity loss and color loss enable generation networks to get more reasonable colorful images, However their proposed images produced by their method lacks the effectiveness and the colors are more dull.

Image colorization with local and global consistency by Gaigai Zong, Ying Chen, Guangcheng Cao, Jiawei Dong Their proposed system is an over segmentation- based model and a modified energy function is applied to the image colorization. The process of their proposed Colorization approach is they take a gray-level image and then perform the color scribbles and then it produces the rough image over segmentation and then it produces the image which is colorized. The local and global consistency learning algorithm belongs to the category of the field machine learning. But in their proposed system the color assumption different and sometimes faulty

2.2 EXISTING SYSTEM

Most of the systems studied or seen in literature review are very useful and fast but most of the systems have some of the complications including loss functions, color saturation. Some systems needed a reference image with grayscale image to produce the new colorized output but there are many cases in which the reference image is not available for the Colorization process. For example:- At the start of the 20th century when cameras were invented, the pictures used to be in black white only, like this in some of the cases the reference image is not available.

Complications in Existing System:

1. Requires powerful hardware to run the programs, which in most cases isn't available for everyone.

2. Most of the systems did not have plans for the regular people who can make the use of these systems very easily.

3. Colors do not match the actual ground truth in most of the systems.

4. Requires more and continuous processing.

2.3 PROPOSED SYSTEM

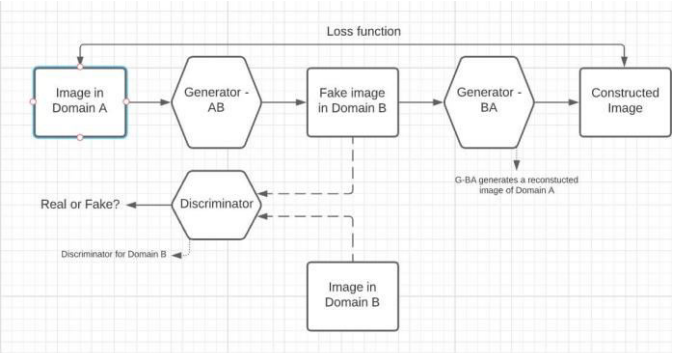

Fig -1: CycleGAN architecture

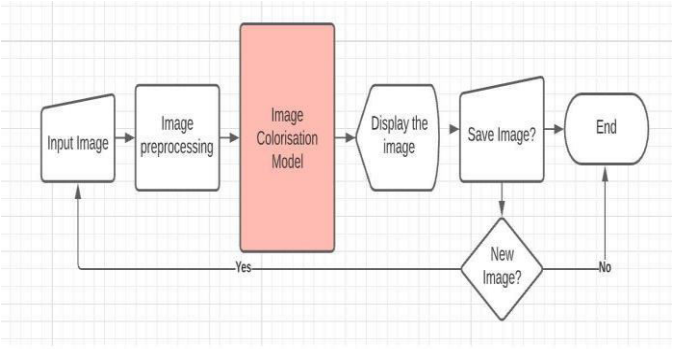

Fig -2: Software architecture

2.4 AIM

The aim of this project is to colorize the gray scale or the black and white images with minimum color loss. And the images which are colorized will be plausible to the human eye.

2.4.1 OBJECTIVES

1. To reduce the time to colorize images with fast process.
2. To make this proposed system useful for normal people..
3. This proposed system can be helpful in crime scenes to colorize the useful evidences like the cctv footages for detectives to solve crime and capture the culprits.
4. To color the monochrome memories.

4. CONCLUSIONS

Upon reviewing various papers and different algorithms for the image to image translation or the image colorization process we can finally say that, A cycleGAN implementation makes the training and testing much more accessible with less constraints and provides a style transfer that is realistic in nature and appropriate in a real world setting which could be beneficial to enriching archival monochrome data be it image or video to appropriately mimic its long lost real life counterpart.

RESULTS

CONCLUSIONS AND FUTURE WORK

Automatic Image Colorization can be used in tasks like restoration of old black-and-white photos, colorization and enhancement of old movies, color amplification of medical images such as X-rays and MRIs for better diagnosis, colorization of low-quality CCTV footages, etc. A cycleGAN implementation makes the training and testing much more accessible with less constraints and provides a style transfer that is realistic in nature and appropriate in a real world setting which could be beneficial to enriching archival monochrome data be it image or video to appropriately mimic its long lost real life counterpart.

ACKNOWLEDGEMENT

The heading should be treated as a 3rd level heading and should not be assigned a number.

REFERENCES

1. [1]COLORIZATION OF GRAYSCALE IMAGES AND VIDEOS USING A SEMI-AUTOMATIC APPROACH Vivek George Jacob and Sumana Gupta department of Electrical Engineering, Indian Institute of Technology Kanpur
2. [2]Fast Colorization of Grayscale Images by Convolutional Neural Network Swathy Titus Computer Science and Engineering SCMS school of engineering and technology Angamaly, India swathytitus1@gmail.com Jency Rena N.M Computer Science and Engineering SCMS school of engineering and technology Angamaly, India jencyrena@scmsgroup.org
3. [3] IMAGE COLORIZATION BASED ON THE MIXED L0/L1 NORM MINIMIZATION Kazunori Uruma1, Katsumi Konishi2, Tomohiro Takahashi1 and Toshihiro Furukawa 1Graduate School of Engineering, Tokyo University of Science, Japan 2Department of Computer Science, Kogakuin University, Japan email: urukaz0308@gmail.com
4. [4] MAGE COLORIZATION VIA COLOR PROPAGATION AND RANK MINIMIZATION Yonggen Ling, Oscar C. Au, Jiahao Pang, Jin Zeng, Yuan Yuan, Amin Zheng The Hong Kong University of Science and Technology, Hong Kong {ylingaa, eeau, jpang, jzengab, yyuanad, amzheng}@ust.hk 978-1-4799-8339-1/15/$31.00 ©2015 IEEE 4228 ICIP 2015
5. [5] Image Colorization with Convolutional Neural Networks An*, Kpeyiton Koffi Gagnon, Qingnan Shi, Hongwei Xie, Rui Cao College of Software Taiyuan University of Technology Taiyuan, China978-1-7281-4852-6/19/$31.00 ©2019 IEEE
6. [6] Image Retrieval Based Automatic Grayscale Image Colorization Divyang Patel Electronics and Communication Dept. Shankersinh Vaghela Bapu Institute of Technology, Gandhinagar-Mansa Road, PO. Vasan, Gandhinagar District, Gujarat, Pin- 382650 Shankar Parmar Electronics and Communication Dept. G. H. Patel College of Engineering & Technology, Bakrol Road, Vallabh Vidyanagar, Gujarat, Pin- 388120
7. [7] The Implementation of Neighbor Embedding on Grayscale Image Colorization Indonesia bedypurnama@telkomuniversity.ac.idAdiwijayTelko University Indonesia adiwijaya@telkomuniversity.ac.id
8. [8] SINGLE IMAGE COLORIZATION VIA MODIFIED CYCLEGAN Yuxuan Xiao Aiwen Jiang* Changhong Liu Mingwen Wang School of Computer and Information Engineering,Jiangxi Normal University,*Corresponding Author: jiangaiwen@jxnu.edu.cn
9. [9] Automated Colorization of a Grayscale Image with Seed Points Propagation Shaohua Wan, Senior Member, IEEE, Yu Xia, Lianyong Qi, Member, IEEE, Yee-Hong Yang, Senior Member, IEEE, and Mohammed Atiquzzaman, Senior Member, IEEE
10. [10] Unpaired Image-to-Image Translation using Cycle-Consistent Adversarial Networks Jun-Yan Zhu∗ Taesung Park∗ Phillip Isola Alexei A. Efros Berkeley AI Research (BAIR) laboratory, UC Berkeley