***Abstract*— The purpose of our project is to understand how image processing can perform on a single board computer such as the Raspberry Pi 3 model B. Here, we will discuss the process of using image processing algorithms and the results we receive from the Pi 3. There is also the importance of analyzing performance metrics and how the relation between the computer architecture of the Raspberry Pi 3 model B. Throughout this document, we will go through the procedure of testing image processing on the Pi 3 and its validity in being able to perform image processing.**

1. Image Processing

Digital image processing is the alteration of images through the use of digital computers. The uses for image processing ranges from entertainment, medicine, remote sensing, and geological mapping. Images can be manipulated through enhancement, restoration, analysis, and compression.

1. Problem Identification

While digital image processing provides many benefits in altering images for better human interpretation, the software and hardware required to perform image processing can be costly. To find a solution for this issue, our team will be testing image processing performance on a cost-effective board, the Raspberry Pi 3. Our team will further cut costs by using free open-source image processing algorithms on OpenCV.

1. Approach of The Project

Our primary goal is to test the performance capabilities of the Raspberry Pi 3 model B on digital image processing. By implementing image processing algorithms from OpenCV, we can determine the quality of images that have been altered through image processing speed, pixel accuracy, edge detection, color analysis, and line accuracy.

1. How Do We Consider This Project Successful

We consider this project successful when we are able to determine whether or not the Raspberry Pi 3 can be utilized as a valid single-board computer for digitally manipulating images. Our goal is to obtain enough data and process enough images to create a conclusive result on the performance and capability of the Raspberry Pi 3 in image processing.

1. Impact

There are many uses for digital image processing that can benefit many industries. Discovering a cheap and cost-effective method to perform image processing can benefit many individuals, companies, and the overall workforce.

1. Raspberry Pi 3

Our team will be testing image processing on a Raspberry Pi 3 model B board. The Raspberry Pi 3 has a quad core 1.2GHz 64-bit CPU, 1GB of RAM, 100 Base Ethernet, 4 USB 2.0 ports, and a HDMI port. The boot device that is being used is a SanDisk micro sd card with a storage of 64gb. The operating system that the single board computer will use is Raspberry Pi OS (Previously known as Raspbian). Due to current circumstances and the price increase of all microcontrollers, our Raspberry Pi 3 board cost our team around $50. This is a cheaper alternative however to other computer devices and image processing software.

1. OpenCV

OpenCV was imported via the Raspberry OS terminal using sudo commands. To begin the testing of the raspberry pi 3 model B, python packages were imported. There were many useful python commands to get information on images such as cv2.imread which could greyscale, colorize or unchange an image that was imported. Furthermore, it was possible to find the dimensions of an image in terms of pixels using the ".shape” command.

1. Evaluation and Conclusion

The implementation of image processing algorithms through OpenCV on the Raspberry Pi 3 Model B was successful. We were able to create resized, blurred, rotated, colored, and grayscale alterations of the original image. Different alterations of the grayscale image were also processed by changing the threshold. The execution time of every process was under 1 second, except the colored image, which had an execution time of 1.261017 seconds. The Raspberry Pi 3 Model B was able to do the image processing pretty quickly and this indicates that the device is viable for image processing and smaller scaled projects. However, it still has some limitations, such as low RAM. OpenCV is also capable of running C++ language; However, due to limited time, hardware limitations and insufficient research, the implementation of C++ language was not a success.

References

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