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Intelligent Camera App for Noise Reduction

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ABSTRACT: The whole idea behind this is the enormously amplified smartphone cameras these days which are far more superior than many professional cameras. Our solution which will be created by us will aid image quality on all the smartphones with Camera2API, and also to process the images in order to make it easier for user to directly click the photos and upload the images on social media platforms without the need to separately edit them. We are going to achieve this by limiting the ISO and shutter speed to a specific range. We will also be taking inputs from accelerometer in order to set the perfect shutter speed.

It is very crucial to maintain proper balance between shutter speed and ISO to get the best image quality. Using Renderscript hardware acceleration and image computation becomes efficient and simpler which is exactly what we want as the final output

KEYWORDS: renderscript, smartphone, graphic processor, shutter speed, auto mode.

I. INTRODUCTION

Photography is a simple form of art that involves capturing images and showcasing them to the viewers. With the constant advancement of technology, it has been improved in execution and renovated as an art, especially with the modern smartphones. Smartphone cameras while being continuously upgraded over time, have minimized the technical difficulty in photography and made it a much friendlier art to the regular public. With the obvious accessibility and ease to operate, they are being used more and more for photos and videos.

However, nowadays many OEMs provide software which restrict the potential of imaging hardware integrated for any smartphone. This research aims to find out the way smartphone cameras and the content created by them are used in photography nowadays. Additionally, it also provides an insight of the value that consumers associate with their smartphone's camera

We are currently living in a world where the most heavy and strenuous software are expected to run at a speed of light because people don't like waiting. Making something productive which wouldn't take time and yet be functional and effective takes some thinking. We intend to make a small tweak in some of the basic parameters of photography which can induce huge changes if built correctly, because people nowadays click photographs in auto mode and directly upload

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them on any social media platform which isn't wrong but it can be more effective if we can get an input from the smartphones' hardware itself to make the photo into an high-res image.

This hardware acceleration can also completely change the way of not just capturing photos but editing them too as you won't need any specific application just to enhance your image quality, which can also save your overall smartphones' storage space.

II. RELATED WORK

Various approaches have been observed over the years for making image recognition precise by distinct methods such as scene detection which was used in the paper by Myung-JinKim[4].The paper was "Automatically available photographer Robot for controlling composition and taking pictures" imbibing the methodology Using a robot to detect the scene & set the appropriate settings. The detected lines are defined as unnecessary composition lines in an environmental portrait photo. Robot moves by the position of the unnecessary composition line.

In [5]Image denoising was carried out using 3-D Collaborative Filtering in a Multi-Resolution Framework. But by using chrominance images you will get a lot of chromatic noise created by the de-speckle or whatever filter you are using. There should be a percentage slider for chromatic noise to be removed.

While the gradient aspects of images were used in [6]Burst median stacking and Bilateral filter was developed in order to de-noise highISO images. The proposed burst de-noising algorithm relies on separating luminance and chrominance channels. Each image in the burst stack is separated into its respective luminance and chrominance channel.

III. IMPLEMENTATION

A. Methodology

According to a survey conducted by a firm in 2017, it was found that an approximate of 1,200 billion photos were clicked, out of which 85% were taken from a smartphone. From the 85% photos clicked on smartphones, approximate 72% of them were clicked in auto mode, which is simply point and shoot.

The image sensors in smartphones from hardware point of view have improved a lot due to the technological advancements in the field, as a result the sales of DSLRs have seen a decline since 2015. Nowadays many companies have included the scene enhancement modes, in which smartphones will boost the greens and blues in the images with the help of scene recognition algorithms. This has made it easier for users to simply click a photo and directly upload them on social media networks without the need to separately edit the photo.

We're improving the image quality by optimizing the ISO & shutter speed in auto mode and then post-processing them in order to further improve the image quality.

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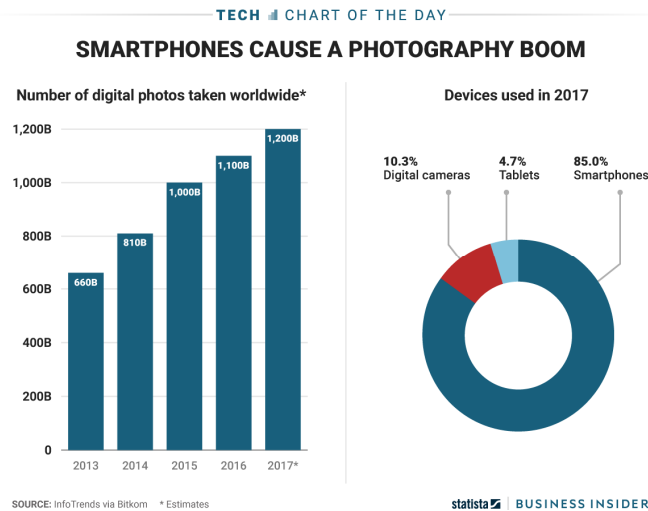


Fig 1: Number of photos taken worldwide [2]

B. Post processing

Most of the mid-range mobiles don't have dedicated image processing processors, to tackle this issue we are using render-script which uses the GPU of the phone instead of the CPU, which makes it faster and power efficient.

The amount of details present in the images is important, but so is the overall look of the image to the average human.

- Firstly, we take a photo captured by the user.
- To make it dynamic we are going to use Camera2API
- The Renderscript [1] will then give us a cleaner and sharper looking image.

In order to improve the quality of the image even further, we've worked on three characteristics:

- **Brightness:** It refers to the overall lightness or darkness of an image, high brightness as well low brightness can result in loss of details, so it needs to be properly balanced.
- **Contrast:** It is the scale of difference between black and white in your images. Without contrast you wouldn't have an image because there wouldn't be any differentiation between light and dark; everything would be black, white, or a single shade of grey somewhere in between.
- **Sharpness:** It refers to an image's overall clarity in terms of both focus and contrast. When the subject of an image is sharp the image appears clear and lifelike, with detail, contrast and texture rendered in high detail. Images which lack sharpness or are 'soft' can appear blurry and lacking in detail.

C. Requirement Analysis

Hardware Requirement

1.0GHz Processor, 200MHz GPU, 1GB Storage, 2GB RAM

Software Requirement

Android 4.1+, Camera2 API

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IV. EXPERIMENTATION

A. Renderscript

Renderscript is an API to access GPU. It is used for high performance in computing and graphics. Computing is performed through FFT Convolution and a bit of Math is involved too. It is also used in signal processing for better equipped and smoother transfer of information. Although it supports graphics it is still not a viable replacement to OpenGL. It works on all GPUs (if supported by SoC) or otherwise multi-core CPUs. Compared to NDK, provides an easy device agnostic way to accelerate GPU performance. Renderscript code is compiled to device independent Bitcode. Bitcode is dynamically interpreted by runtime for specific GPU. Moreover, it also accelerates performance in image processing and encryption.

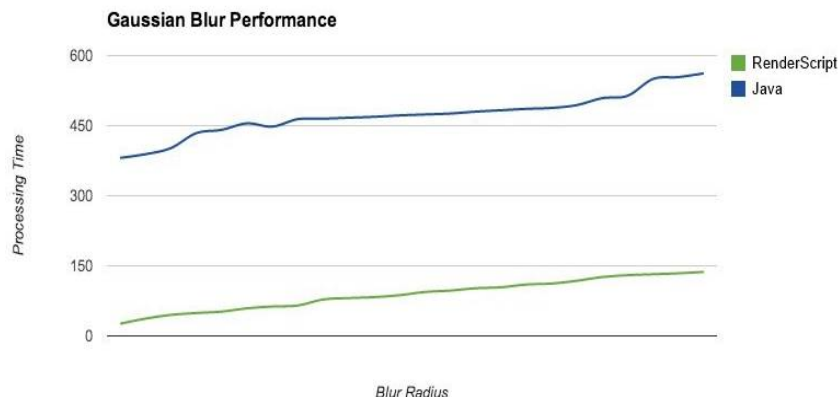
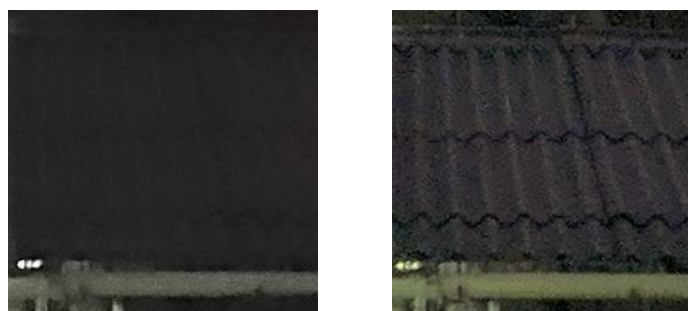


Fig 2: Blur performance (Renderscript v/s Java) [1]

B. Results

As we can clearly observe the magnitude of effect after the post processing takes place.



3(a)

3(b)

Image 3(a) shows noise-laden images of a roof. Image 3(b) show the corresponding sharper version.

ISO of Image 3(a): 4000
Shutter Speed of Image 3(a): 1.4 sec

ISO of Image 3(b): 2568
Shutter Speed of Image 3(b): ¼ sec

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V. CONCLUSION

To create a solution which will aid image quality on all the smartphones with Camera2API, and also to process the images in order to make it easier for user to directly click the photos and upload the images on social media platforms without the need to separately edit them.

Just boosting the greens and blues doesn't in any way improve the amount of details in a photo, but what it does is make it more pleasing to view. Most of the users like to point-shoot-upload which is obviously not a professional approach, but the results can be improved with the use of an optimized system.

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