PAPER NAME

itcc2021-1.pdf

AUTHOR

Lianly Rompis

WORD COUNT

2676 Words

CHARACTER COUNT

13856 Characters

PAGE COUNT

7 Pages

FILE SIZE

1.6MB

SUBMISSION DATE

Jun 7, 2023 6:58 AM GMT+8

REPORT DATE

Jun 7, 2023 6:58 AM GMT+8

22% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.

- 22% Internet database

Excluded from Similarity Report

- Publications database
- Crossref Posted Content database
- Small Matches (Less then 20 words)
- Crossref database
- Submitted Works database

Capturing a Clear Image on Computer Screen or LCD Screen Directly using Smartphone Camera

Lianly Rompis
Universitas Katolik De La Salle Manado
lrompis@unikadelasalle.ac.id

ABSTRACT

Digital technology plays an important role in many fields nowadays especially in Education and Telecommunication. Although for some people it becomes a threat for business and human life socialization but if we do know how to choose good technologies and utilize them for solving daily tasks, then it will give a great of benefit that could support better living and humanization purposes. One of the essential digital technologies that people usually used in their life is digital camera. This thing helps people to take and store pictures in digital information. Digital camera is a wonderful invention that ever made in this world and one of the most valuable knowledge treasures in human life. Recently in education and telecommunication fields smartphone cameras are being used for capturing image, part of a learning process and also to support information exchange and green environment. A problem that people mainly deal with is a blurry photo that makes unsuccessful delivery of information. We seldom and almost never got a clear image when taken photo of information displays on a PC monitor or digital devices LCD screen. The electromagnetic wave from PC monitor and LCD screen affects the inside parts of digital camera so it would not give better image resolution. This simple research focuses on this kind of problem to provide a good solution in capturing clear and best images of PC monitor and LCD screen displays. Based on personal experience and problems met in learning processes, a study literature, analysis and observation have been conducted as part of this research methodology. The output shows a promising result where a clear image of PC monitor and LCD screen display can be captured by a smartphone camera using proper hardware, application, and technique.

CCS CONCEPTS

• **Information Systems**; • **Information Systems Applications**; • **Mobile Information Processing System**;

KEYWORDS

Image Capturing, Image Processing, PC Monitor, LCD Screen Display, Information System

ITCC 2021, June 23–25, 2021, Guangzhou, China

ACM ISBN 978-1-4503-8988-4/21/06…$15.00
https://doi.org/10.1145/3473465.3473466

ACM Reference Format:
Lianly Rompis. 2021. Capturing a Clear Image on Computer Screen or LCD Screen Directly using Smartphone Camera. In *2021 3rd International Conference on Information Technology and Computer Communications (ITCC 2021), June 23–25, 2021, Guangzhou, China.* ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3473465.3473466

1 INTRODUCTION

Digital Technology is related to data that consists of text, image, sound, and video. Those parameters are so important in digital information processing and data exchanging [1–3, 6]. The great technology that usually covers those things is mobile phone especially smartphone. Using this we can create text, image, animation, and even high quality video. For the purpose of education and communication, people recently use smartphone camera to capture images that can be putted on social media. The most annoying problem they had was a blurry and line-shaded image when took picture of a digital image shown on PC monitor or LCD screen. People primarily need to take pictures for lecturing, studying, research and information. They have to use smartphone camera to take pictures directly from PC monitor and LCD screen and it happened that the quality of the image was not good and need modification using image editor. This research is a simple research for giving solution or good tips on how to get a clear image using our smartphone camera.

2 METHODOLOGY

Learning from several methodologies from [8, 9], the methodology being used for this research generally is to understand the basic concept of image processing and perform analysis to derive a solution for blurry image capturing problems.

3 LITERATURE STUDY

Related basic concepts were derived to support this research and give essential point of views.

3.1 What is A Clear Image?

Digital or Computer Image is a model of real object scanned by a device and mapped into a data structure in which a light interacts with the model and produces a two-dimensional image for display. In reality, it is a two-dimensional array of numbers which represents the intensity or color of a visible picture element or pixel. A clear image is an ideal form of computer image that has high resolution, perfect intensity, and does not have any noise or unwanted disturbance. The low resolution, inconstant/poor intensity, and noise will change the image structure and projects a blurry image on a monitor or LCD screen [1–3, 13–15]. Figure 1 shows the comparison.

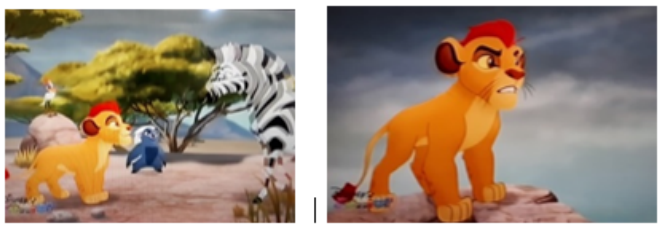

Figure 1: Example of (a) noisy blurry image and (b) clear image

3.2 Electromagnetic Radiation (EMR)

Old monitors use CRT (Cathode Ray Tube) to produce x-rays whereas flat screens such as LCDs and LEDs do not use CRT technology and produce no x-rays. FDA (Food and Drug Administration) sets a safety standard that regulates electronic devices which emit radiation because the smallest amounts of x-rays are also very harmful. Human should avoid and reduce the radiation levels. Do not expose too much to computer and TV screen radiation as those begin to harm human organs if the exposure level above two milliGaus (mG). PC Computer, TV, and laptop screen including their components inside emit powerful EMFs (Electromagnetic Fields). According to research, EMF strength decreases as we move farther from the electronic devices and an 18 inches distance is the safe way to dodge it. Headphones and headsets are also known to be dangerous for human ears if used for a longer period of time [4, 5, 11, 12].

3.3 Pixel Resolution

Pixel resolution represents the computation of a number of pixel in computer image. An image with a height of n pixel and a width of m pixel has m x n resolution. The one that we usually met in digital camera is a kind of pixel resolution called mega pixel. An image which has a width of 2.048 pixel and a height of 1.536 pixel would have total pixel as many as 2.048 x 1.536 = 3.145.728 pixel or 3,1 megapixel [2, 3, 7]. Figure 2 gives example of pixel resolution.

3.3.1 Binary Image. Pixel resolution represents Binary image only has two possibilities for pixel value, i.e. black and white. It is called Black and White or Monochrome Image. There is only need 1 (one) bit to represent the value of each pixel from the image.

3.3.2 Grayscale Image. Grayscale image only has one channel value on each pixel, i.e. value RED = GREEN = BLUE. That value shows the intensity level. The colours are black, gray, and white. The gray level varies from black until white. Grayscale image has 8-bit color depth (256 combinations of gray color).

3.3.3 Color Image (16 bit). It is known as high color image with 2 byte memory (16 bit) for each pixel that gives 65.536 color variation. The first 5-bit stores Red value, the next 6-bit stores Green value, and the last 5-bit stores Blue value. The chosen for 6-bit green value is due to the sensitivity of human sight on green color.

3.3.4 Color Image (24 bit). Each pixel is represented by 24 bit so it has 16.777.216 color variation. Each pixel information (RGB) is stored in 1 byte data. The first 8-bit stores Blue value, the second 8-bit stores Green value, and the last 8-bit for Red value.

3.4 Brightness Adjustment

Pixel intensity brightness adjustment is the easiest pixel operation. The brightness level of an image can be seen by its histogram. All pixels usually concentrated at one side of histogram with specific range of gray level. When we increase the brightness level of an image, the concentration of pixel value will shift to the right side. If we decrease the brightness level then the pixel concentration will shift to the left, as shown in figure 3

3.5 Contrast Stretching

Contrast of an image is a distribution of light and dark pixel. Grayscale image with low contrast will look too dark, too light, or too gray. The histogram of low contrast image will show the concentration of all pixels at the left side, right side, or the center [17]. A high contrast image has a wide dark and light area. Pixel value diagram will show two great peaks, concentrated at the left side and the other one on the right side. A good contrast image will show a wide range of pixel. The histogram uniformly distributed, does not have maximum or minimum peak. Contrast stretching is a simple technique that could be used to repair the contrast of an image especially low contrast image. This technique works well with image that has Gaussian distribution [16]. Figure 4 describes the contrast stretching on images.

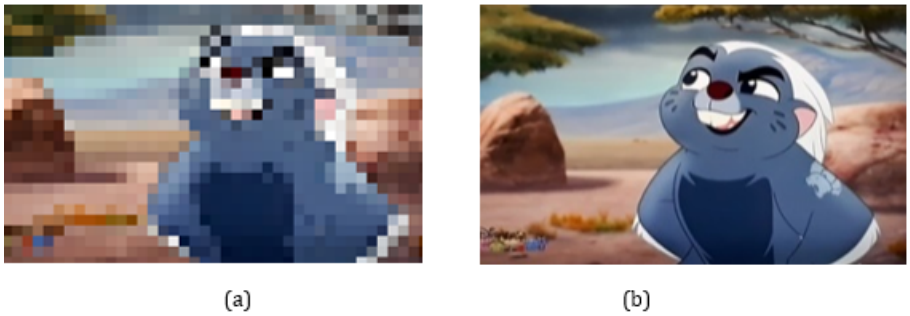

Figure 2: (a) 34 x 49 pixel resolution and (b) 129 x 185 pixel resolution

Figure 3: Image with brightness adjustment

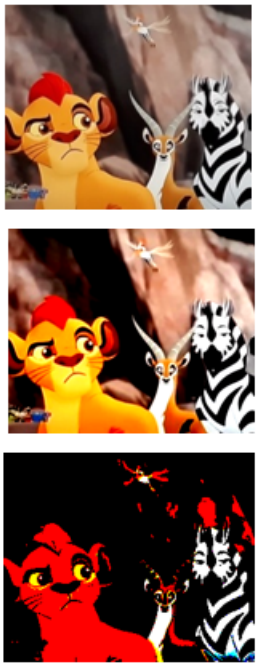

Figure 4: Image with contrast stretching

3.6 Digital Camera

An image can be captured with a digital camera which has light detector inside its body that will catch on the incoming light rays and convert them into electrical signals. There are two types of light detector, a **charge-coupled device (CCD)** and a **CMOS image sensor**. In a digital camera, light from the real object zooms into camera lens. This incoming image strikes the image sensor chip that will break the image up to millions of pixels. Image sensor measures the color and brightness of each pixel and stores it in the form of numbers, describing the properties of each pixel it contains. The important parameters are the size and quality of sensor. Better pictures could be obtained by bigger sensors [1, 10].

4 ANALYSIS AND OBSERVATION

4.1 Analysis

From the basic theories described above, it is necessary to put attention on 4 (four) parameters: distance, high resolution, brightness adjustment, and contrast stretching, in order to get a clear image for pictures display on a PC monitor or LCD screen. A digital camera from Smartphone Samsung J7 Prime was considered applicable to be used as an indicator instrument.

4.2 Observation

4.2.1 Distance. The first observation was conducted to take images from TV screen using smartphone with variations of distance. The results are shown in figure 5

The result gives conclusion that the farther the distance, the clearer image we get.

4.2.2 High Resolution. The second observation was conducted to compare between low resolution and high resolution. The results are shown in figure 6

The result recommends to use high resolution camera. The higher the resolution, the better for getting clear image.

4.2.3 Brightness. The third observation was conducted to control the brightness of image. The results are shown in figure **??**

Good and perfect brightness will remove the lines that showed up in the image that we do not want to appear in it because it gives bad effect.

4.2.4 Contrast. The last observation was conducted to control the contrast of image. The result is shown in figure **??**

Perfect contrast will improve the image so we can get a clear text image that can be easily read. Combining the four parameters and organizing right settings help us to solve the blurry image problem. Capturing a clear image from PC monitor or LCD screen is no longer a problem.

Knowing the good solution that we derived from this research (figure 9), a clear image can be obtained by a digital camera that fulfils all the parameters that can be built into one or several built-in chips or design a mobile application that can be downloaded and used to support our smartphone to take images from PC monitor or LCD screen display.

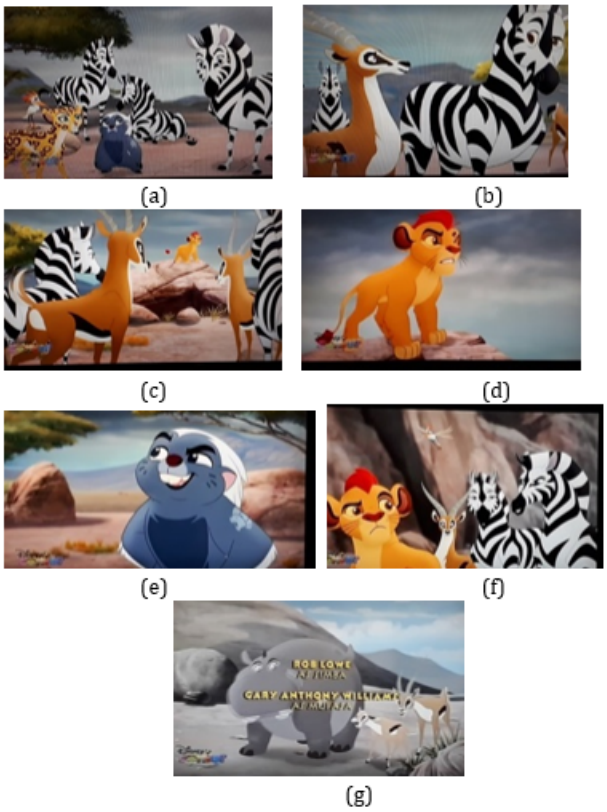

Figure 5: TV screen images taken at a distance of: (a) 10 cm, (b) 20 cm, (c) 30 cm, (d) 50 cm, (e) 1 m, (f) 2 m and (g) 3 m

5 CONCLUSION

A clear image of PC monitor or LCD screen display can be captured using smartphone camera by considering four parameters: distance, resolution, brightness and contrast. A clear image needs farther distance, higher resolution, good brightness, and perfect contrast. These four characteristics should be considered for designing or modifying a smartphone camera for education and telecommunications purposes. An advance research related to screen characteristic and camera technology can be conducted for getting better results.

ACKNOWLEDGMENTS

Author would like to thank profusely to Mr. Yulius C. Raton and Dr. Jozef Raco for their guidance and good supports while together working in Research Department, also Mr. Alexander Patras for positive contribution in technology comparison. Author would also like to thank family and colleagues for giving inspirations in concept development through real case studies related to her research.

REFERENCES

[1] Allan Watt and Fabio Policarpo. 1999. The Computer Image, Addison Wesley Longman, England.
[2] Darma Putra. 2010. Pengolahan Citra Digital, ANDI Publisher, Yogyakarta.
[3] Hendi Hendratman. 2017. Computer Graphic Design. Penerbit Informatika, Jakarta.
[4] Liek Wilardjo. 2015. Gelombang Elektromagnetik. Penerbit Graha Ilmu, Jakarta.
[5] Constantinos M. Koutsojannis (Editor). 2018. Physics Research and Technology: Electromagnetic Radiation – History, Theory and Research. Nova Science Publishers.
[6] Jusak. 2013. Teknologi Komunikasi Data Modern. Andi Publisher, Yogyakarta.
[7] Jean Jiang and Li Tan. 2019. Digital Signal Processing: Fundamentals and Applications. Elsevier Publisher.
[8] Etta Mamang Sangadji and Sopiah. 2010. Metodologi Penelitian: Pendekatan Praktis dalam Penelitian, ANDI Publisher, Yogyakarta.
[9] Conny R. Semiawan and Jozef Raco. 2010. Metode Penelitian Kualitatif: Jenis, Karakteristik, dan Keunggulannya, Penerbit Grasindo, Jakarta.
[10] Chris Woodford, C. 2020. Digital Cameras. Explain That Stuff. Retrieved June 31, 2019 from https://www.explainthatstuff.com/digitalcameras.html
[11] Airesadmin. 2016. Computer Electromagnetic Radiation: Facts. Airestech. Retrieved May, 2019 from https://www.airestech.com/electromagnetic-radiation-emf-computer-laptop/
[12] Dustin Eves. 2020. Do Computer Screens Emit UV Light? eHow UK. Retrieved September, 2020 from https://www.ehow.co.uk/way_5567151_do-screens-emit-uv-light.html
[13] Howstuffworks. 2021. What is All the Flickering when I Try to Record a Television Set Picture with a Video Camera. HowStuffWorks. Retrieved September 2020 from https://electronics.howstuffworks.com/question336.htm
[14] Richard E. Wendt. 1994. Automatic Adjustment of Contrast and Brightness of Magnetic Resonance Images. Journal of Digital Imaging, 7 (May 1994), 95-97. https://doi.org/10.1007/BF03168430
[15] Sonia Lalura'a. 2016. Tugas Akhir: Aplikasi Edutainment Ikan di Taman Laut Bunaken Berbasis Virtual Reality. Universitas Katolik De La Salle Manado.
[16] Yunita Komalig. 2019. Tugas Akhir: Image Smoothing Menggunakan Gaussian Filter. Universitas Katolik De La Salle Manado.
[17] Douglas Cromey. 2018. Image Processing using the Histogram Tool. UA Microscopy Alliance, The University of Arizona, (January 2018), 1-3. http://microscopy.arizona.edu/learn/printable-materials

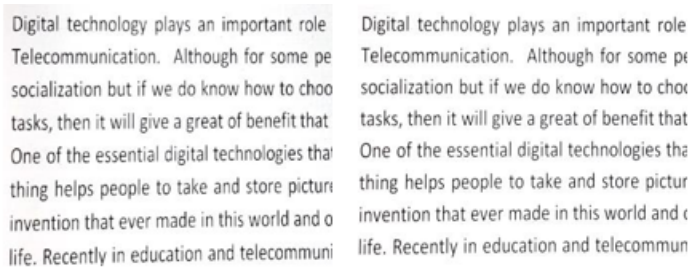

Figure 6: High resolution gives sharpen text to read

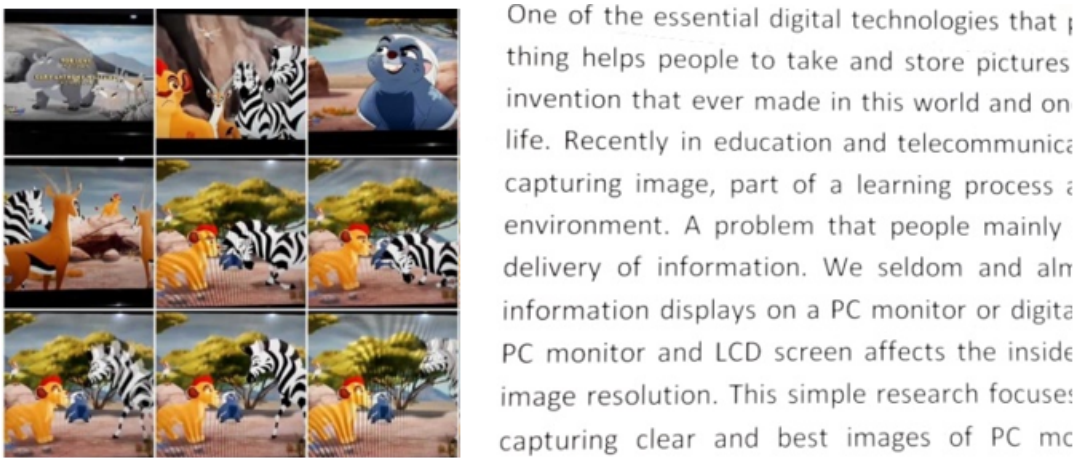

Figure 9: The quality of image depends on distance, resolution, brightness and contrast

22% Overall Similarity

Top sources found in the following databases:

- 22% Internet database

TOP SOURCES

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	**scilit.net** Internet	10%
2	**ijsps.com** Internet	6%
3	**cs.umd.edu** Internet	5%