## THE SEARCH FOR TRUTH: ANDROID PHONES AND SCREEN CAPTURED VS

## CAMERA CREATED IMAGES

by

## ERIKA THURMAN

B.S., Mass Media, Southeast Missouri State University, 2009

A thesis submitted to the

Faculty of the College of Arts & Media of the

University of Colorado in partial fulfillment

of the requirements for the degree of

Master of Science

Media Forensics Program

2023

This thesis for the Master of Science degree by

Erika Thurman has been

approved for the

Media Forensics Program

by

Catalin Grigoras, Chair

Greg Wales

Jeff Smith

Date: December 16, 2023

Thurman, Erika (M.S., Media Forensics Program)

The Search for Truth: Android Phones and Screen Captured vs Camera Created Images Thesis directed by Associate Professor Catalin Grigoras

#### ABSTRACT

This thesis will examine the different information found from Android native camera created images vs screen captured images to detect indications of alteration for the purpose of digital image analysis and authentication.

The form and content of this abstract are approved. I recommend its publication.

Approved: Catalin Grigoras

## DEDICATION

I dedicate this thesis to all of those who have supported this educational journey. This has been an eye-opening, challenging, and truly rewarding experience as well as a launch pad into the forensics field.

## ACKNOWLEDGEMENTS

I would like to acknowledge my NCMF professors and staff, especially my committee members for their insight, instruction, and guidance throughout this program as well as the thesis process. Also, thank you to Leah for your much appreciated assistance. I couldn't have done it without you all.

IAPTER	
I. INTRODUCTION	1
Previous Research	1
II. MATERIALS	4
Data	4
III. METHODOLOGY	5
Methods	5
IV. RESULTS	3
Results1	6
V. CONCLUSIONS	7
Future Research	3
REFERENCES 19	9
APPENDIX	)

## **TABLE OF CONTENTS**

## LIST OF TABLES

## 

3.	Trash Can	13

## LIST OF ABBREVIATIONS

SWGDE - Scientific Working Group on Digital Evidence

FIAS - Forensic Image Analysis System

DSLR - Digital Single Lens Reflex

ASTM - American Society for Testing and Materials International

#### **CHAPTER I**

#### **INTRODUCTION**

Every day, people are utilizing their mobile devices to capture the world around them. Whether for photographic, news, or even cataloging purposes, smartphones are essential parts of our day to day lives. Smartphone cameras in some cases are taking the place of traditional Digital Single Lens Reflex (DSLR) cameras due to ease or convenience. Our phones are also become recording implements for the world we encounter. The images captured on a smartphone, iOS or Android, have been used in law enforcement cases and judicial proceedings as evidence. Yet, forensic examiners are confronted with the challenge of verifying authenticity when it comes to smartphone images. Android image authentication in relation to screenshots vs phone installed camera images and what alteration clues can be deduced from these types of images is an under investigated focus. The topic of my research is image analysis in regards to Android native camera images vs screen capture images and the detection of alteration artifacts.

#### **Previous Research**

The study of mobile device forensics is an exercise in learning in an ever-changing field. One aspect of mobile device forensics that is beginning to get more attention and thereby more critique, is digital imaging and the ability to separate manipulated from original images. Liu et al. (2013) showed how, due to the role digital images play in investigations and public trust, being able to identify not only altered images from unaltered images is crucial, but also pinpointing the source of the image. This fit very well with the topic because due to mobile phone cameras being a convenient and capable alternative to traditional cameras, most digital images are created, edited, and shared via these devices. The need to greater scrutinize the authenticity of such images is fast becoming essential for the forensic community.

As previously mentioned, digital images are being used in legal and law enforcement cases as evidence, prompting the necessity of ensuring that forensic experts can identify integrity issues with images. To achieve that consistently, guidelines and standards are required to be adhered to for the entire forensic community. In the American Society for Testing and Materials International (ASTM) Standard Guide for Forensic Digital Image Processing, the framework for conducting digital image processing investigations is explained succinctly along with how obstacles and outside factors may play a role in the process. Directives on such matters as image enhancement, restoration, and compression standards along with standardized operating procedures are all clearly detailed and outlined to prevent confusion for examiners. (2022).

As research was being conducted on Android image authentication, it was realized that it was unknown what, if any parameters or best practices, were established for the community to adhere to when conducting necessary examinations. The Scientific Working Group on Digital Evidence's (SWGDE) Best Practices for Maintaining the Integrity of Imagery was an immediate source of clarification on how to address this issue. In examining digital images credibility, the article was very explicit in defining such terms as authentication and provenance, but also acknowledging challenges forensic experts may face when seeking to maintain image integrity in the field and investigations. Expectations of proper documentation, watermarking, and methods for evaluating accuracy were provided (2017).

As a continued assessment of the research already conducted on smartphone camera and screen captured images, there was difficulty finding published work pertaining to the exact subject perspective. Next, the subject was widened to include just digital images and see what

2

similarities and correlations were encountered. Popescu et al. (2005) came to notice due to the analysis of how statistical information can be a more effective technique in digital image authentication than previously thought, especially in the absence of watermarks, signatures, or other tamper protection methods. This article pointed out authentication implements that can be used on most smartphones, specifically Android devices.

#### **CHAPTER II**

#### MATERIALS

The study would employ 03 Android phone brands and 1 model per brand (depending on available devices). Anticipated devices to be used in the study would be:

- OnePlus 7
- Samsung Galaxy A11
- Google Pixel 7 Pro

This would allow a comparison between different leading Android brand devices, the similarities, and differences in what is offered in image generated information. This will also allow a comparison of devices based on installed photo elements. Another advantage of the amount devices and amount manufacturers is the ability to critique the changes in the Android smartphone landscape in regard to settings and cameras.

The research would utilize Google Mail or Gmail to export the images from the devices. The programs Hash Checker as well as Microsoft PowerShell would be used for hash verifying means. The program Forensic Image Analysis System (FIAS) is available via the University of Colorado Denver MSMF Remote Desktop.

#### Data

The focus of this research is to identify authentication indicators for Android installed camera derived images as opposed to screenshot images from Android devices. The research would utilize Android smartphones from 2 different manufacturers. First, on each device, compare the preinstalled camera/image settings along with what alterations are available.

4

Camera settings such as: Ultra Shot HDR, scene detection/smart scene recognition, location, etc. Image identifying information such as: serial number, Android version, build number, and camera type will be recorded for each device by manufacturer and model/series. Create SHA256 image hashes utilizing the Hash Checker application available for download via the Google Play Store on each device for each image created.

Next, with each device, capture images of the same subject with the same standard settings (no flash, no timer, wide-angle lens) and save the image as well as record the generated image information. Then, with each device, generate screenshot images of the same subject while recording what, if any, alteration options are available and record the image information created for each device. After accumulating the data for camera created images and screen captured images, compare while focusing on definitive delineations between the two types of created images.

#### **CHAPTER III**

#### **METHODOLOGY**

The experiment would start with collecting all the various smartphones. Once the devices are gathered, take a picture with each phone utilizing the preinstalled camera application of the same subject to compare photo information. The critical data to collect include image identification, image resolution, file size, if the maker and model of the device is identified, and the image histogram. Next, screenshots need to be created from the camera created image on each device. The process to create a screenshot on most Android devices is done in one of two ways, either pressing the power/lock screen button and the volume down button simultaneously or press and hold the power/lock screen button for a few seconds, then tap screenshot. Once the screen captures are created on each device, compare the screenshot image with the camera created image for variances and record the findings.

#### Methods

When considering which email services to use, Google Mail or Gmail was selected due to uniformity across devices and brand manufacturers. Next, with each separate device, select the screenshot of the camera image taken in the previous segment of the experiment and export it via email with Google. Once the exporting process has been completed, access the image information, compare the screenshot image with the downloaded exported image for variances and record the findings. Beyond critiquing just the images themselves for alteration, the research would also collect information on image identification, image resolution, file size, hashes, and the image histogram (if possible). Lastly, compare the available image information via the device installed gallery application (if possible) and Google Photos. A table would be generated for each image subject, showing image name, whether camera or screenshot created, where information was gleaned and available information.

## CHAPTER IV

## RESULTS

The experiment began with the Samsung Galaxy A11 smartphone. One image taken and analyzed was of hand sanitizer bottles.

Image Name	Camera /Screenshot Image	Location (Gallery/Google Photos)	Information
20230821_112924	Camera	Gallery	11:43 ♥ V II ♥ V II       No III AII         < Details
Screenshot_20230821- 113051Gallery_Download	Screenshot	Photos	12:01 (* ■ ● ● (* ■ *1 * ■ ●         ←       Info         DFTAILS       □         Screenshots       /storage/emulated/0/DCIM/ Screenshots/Screenshot_2023 0821-113051_Gallery.jpg         □       Aug 21, 2023 Mon 11:30 AM         □       Screenshot_20230821-113 051_Gallery.jpg         1.1MP • 720 x 1560 • 409 kB

Table 1. Hand	Sanitizer Bottles	S
---------------	-------------------	---

## Table 1. Continued

Hash Checker		×		Ĥ	lash Checker	- 🗆 ×
20230	> 0821_112924.jpg 4 MB	< ,			Screensl	K hot_20230821-113051_GalleryWo rking.jpg 400 KB
SHA256 ~				0	SHA256 🗸	
4622d1500c3d37414f3c3 d16cbfdefd9a	1750a1eb14a0a6	a55a3a1b01ff58fc7		80	d4ce6e9e2079a 3f1484ca3fcb	244d17d1b8431f3ab60f7886629d3c7547c23
Compare		Paste		-	Compare	Paste
PS F:\Thesis Mat Algorithm	cerial∖The Hash 	sis Photos\S	amsungGalaxyA11\0	CameravsScreenshot>	Get-File	Hash .\BottlesCamera.jpg Path 
SHA256	4622D1500	C3D37414F3C3	1750A1EB14A0A6A55	5A3A1BØ1FF58FC7D16CB	BFDEFD9A	F:\Thesis Materi
PS F:∖Thesis Mat Pg	erial\The	sis Photos∖S	amsungGalaxyA11\(	CameravsScreenshot>	Get-File	Hash .\BottlesScreenshot.j
Algorithm	Hash					Path
SHA256	SDACEGEOE	207002440170	1884315348605788	60003C7547C0343E148	ACABECE	F.) Thesis Materi
ExifTool Version Nu File Name Directory File Size File Modification [ File Access Date/Ti	umber Date/Time ime	: 12.61 : BottlesCam : . : 4.2 MB : 2023:10:23 : 2023:10:24	era.jpg 17:08:43-06:00 16:00:47-06:00	ExifTool Version Numb File Name Directory	ber	: 12.61 : BottlesScreenshot.jpg : .
ile Creation Date/ ile Permissions ile Type ile Type Extension MIME Type Exif Byte Order	/Time	: 2023:10:24 : -rw-rw-rw- : JPEG : jpg : image/jpeg : Big-endian	15:55:46-06:00	File Size File Modification Dat File Access Date/Time File Creation Date/Ti	te/Time e ime	: 409 kB : 2023:10:23 17:08:44-06:00 : 2023:10:24 16:30:11-06:00 : 2023:10:24 16:29:57-06:00
Camera Model Name Drientation Modify Date Focal Length Exposure Time		: SM-A115U : Rotate 90 : 2023:08:21 : 3.6 mm : 1/25	CW 11:29:24	File Permissions File Type File Type Extension		: -rw-rw-rw- : JPEG : jpg
lash ISO White Balance Aperture Value		: No Flash : 194 : Auto : 1.9		MIME Type JFIF Version Resolution Unit		: image/jpeg : 1.01 : None
Make JFIF Version Resolution Unit K Resolution Y Resolution		: samsung : 1.01 : None : 1 : 1		X Resolution Y Resolution Image Width		: 1 : 1 : 720
Image Width Image Height Encoding Process Bits Per Sample Color Components		: 4160 : 3120 : Baseline D : 8 : 3	CT, Huffman coding	Image Height Encoding Process Bits Per Sample		: 1560 : Baseline DCT, Huffman coding : 8
/ Cb Cr Sub Samplir Aperture Image Size Megapixels Shutter Speed	ng	: YCbCr4:2:0 : 1.9 : 4160x3120 : 13.0 : 1/25	(2 2)	Color Components Y Cb Cr Sub Sampling Image Size		: 5 : YCbCr4:2:0 (2 2) : 720x1560
Focal Length Light Value		: 3.6 mm : 5.5		Megapixels		: 1.1

Next, we analyzed the images from the OnePlus 7 Pro. One such image was of a ceiling fan.

Image Name	Camera /Screenshot Image	Location (Gallery/Google Photos)	Information
IMG_20231010_140219	Camera	Gallery	<ul> <li>Information</li> <li>PHOTO INFORMATION</li> <li>File name: IMG, 20231010, 140219.</li> <li>Tame: Oct. 10, 2023 14.02.20.</li> <li>Resolution: 1824.v4.000.</li> <li>File size: 115 MB</li> <li>Maker: OnePlus</li> <li>Model: GM9155</li> <li>Filash: No flash</li> <li>Focal Length: A</li> <li>Focal Length: A</li> <li>Focal Length: A</li> <li>Posoure time: 1/100</li> <li>File Size: 160</li> <li>File Size: 160</li> <li>File Size: 160</li> <li>File Size: 160</li> <li>File Size: 1700</li> <li>File Size: 1700</li></ul>
Screenshot_20231010- 140729	Screenshot	Gallery	PHOTO INFORMATION File name: Screenshot_20231010-140729 Time: Oct 10, 2023 14:07:33 Resolution: 14:04:3120 File size: 1:03 MB MAGE HISTOGRAM OTHER Path. /storage/emulated/0/Pictures/Screenshots/ Screenshot_20231010-140729.jpg

Table 2. Ceiling Fan

## Table 2. Continued

Hash Checker		- 0 ×	ſ	Hash Checker — — — ×	12
		×		Ň	
IMG_202	2 <b>31010_140219W</b> 1 MB	orking.jpg		Screenshot_20231010-140729Working.jp g 1 MB	
SHA256 ~				SHATES	
c6933c27952d54e8a a8bef1836be32	130cfad97a63d81	df13ce91ea0ec079220		7ddfc4749ce856f39285f5998f05879bb9633a6b5cc76e8f237b be2b2e2c412b	<b>1</b> .0
Compare		Paste		Compare Paste	Ĵ
PS F:\Thesis	Material\T	hesis Photos∖OnePlus7Pro∖	CameravsScreenshot> Get	-FileHash .\CeilingFanCamera.jpg	
Algorithm	Hash			Path	
SHA256	C6933C2	7952D54E8A130CFAD97A63D81	DF13CE91EA0EC079220A8BE	F1836BE32 F:\Thesis Materi	
PS F:\Inesis	material()	nesis Photos UnePius/Pro	cameravsscreensnot> Get	-riienasn .(Ceilingranscreensnot.jp	5
Algorithm	Hash			Path 	
SHA256	7DDFC47	49CE856F39285F5998F05879B	B9633A6B5CC76E8F237BBE2I	B2E2C412B F:\Thesis Materi	
			File Name	: CeilingFanScreenshot.ing	
File Name Directory		: CeilingFanCamera.jpg	Directory	· · · · · · · · · · · · · · · · · · ·	
File Size	A	: 1202 kB	File Size File Modification Date/Time	: 1081 KB : 2023:10:23 17:06:51-06:00	
File Access Date/	Date/lime Time	: 2023:10:23 17:06:49-06:00	File Access Date/Time	: 2023:10:25 19:41:49-06:00	
File Creation Date	e/Time	: 2023:10:25 18:56:12-06:00	File Creation Date/Time File Permissions	: 2023:10:25 19:41:24-06:00 : -rw-rw-rw-	
File Permissions		: -rw-rw-rw-	File Type	: JPEG	
File Type Extension	on	: jpg	File Type Extension	: jpg	
MIME Type		: image/jpeg	JFIF Version	: image/jpeg : 1.01	
Y Resolution		: Big-endian (Motorola, MM) : 72	Resolution Unit	: None	
X Resolution		: 72	X Resolution	: 1	
Camera Model Name Make		: GM1915 : OnePlus	Profile CMM Type	1	
Y Cb Cr Positioni	ng	: Centered	Profile Class	: 2.1.0	
Exif Version		: 0220	Color Space Data	: RGB	
Scene Type		: Directly photographed	Profile Connection Space	: XYZ	
Exposure Compensa	tion	: 0	Profile File Signature	: 0000:00:00 00:00:00 : aCSD	
Color Space		: sRGB	Primary Platform	: Unknown ()	
Max Aperture Valu	e	: 1.6	CMM Flags Device Manufacturer	: NOT Embedded, Independent :	
Brightness Value		: 2.5	Device Model	1	
Date/Time Origina	1	: 2023:10:10 14:02:20	Rendering Intent	: Reflective, Glossy, Positive, Color : Media-Relative Colorimetric	
Sub Sec Time Orig	inal	: 422741	Connection Space Illuminant	: 0.9642 1 0.82491	
White Balance	Taday	: Auto	Profile ID	: 0	
Exposure Mode	LINDEA	: Auto	Profile Description	: sRGB	
Exposure Time		: 1/100	Red Matrix Column Green Matrix Column	: 0.43607 0.22249 0.01392 : 0.38515 0.71687 0.09708	
Sub Sec Time		: 422741	Blue Matrix Column	: 0.14307 0.06061 0.7141	
F Number		: 1.6	Red Tone Reproduction Curve Green Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract) : (Binary data 40 bytes, use -b option to extract)	
ISO		: 160	Blue Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)	
Components Config	uration	: Y, Cb, Cr, -	Media White Point	: 0.9642 1 0.82491	
Sub Sec Time Digi	tized	: 422741	Image Width	: 1440	
Create Date	1550340	: 2023:10:10 14:02:20	Image Height	: 3120	
Shutter Speed Val Metering Mode	ue	: 1/100 : Multi-segment	Bits Per Sample	: Baseline DCF, Huttman Coding : 8	
Focal Length		: 4.8 mm	Color Components	: 3	11
Scene Capture Typ	e	: Standard	Y Cb Cr Sub Sampling Image Size	: YCDCr4:2:0 (2 2) : 1440x3120	
Sensing Method		: Not defined	Megapixels	: 4.5	
Orientation		: Rotate 90 CW			

## Table 2. Continued

Resolution Unit	:	inches
Modify Date	:	2023:10:10 14:02:20
XMP Toolkit	:	Adobe XMP Core 5.1.0-jc003
Capture Mode	:	Photo
Lens Facing	:	Back
Scene Detect Result Ids	:	[0, 0, 0]
Scene Detect Result Confidences	:	[0.0, 0.0, 0.0]
Scene	:	AutoHDR
Is HDR Active	4	True
Is Night Mode Active	:	False
Is Bokeh Active	:	False
Image Width	:	4000
Image Height	4	1824
Encoding Process	:	Baseline DCT, Huffman coding
Bits Per Sample	;	8
Color Components	:	3
Y Cb Cr Sub Sampling	\$	YCbCr4:2:0 (2 2)
Aperture	:	1.6
Image Size	:	4000x1824
Megapixels	:	7.3
Scale Factor To 35 mm Equivalent	11	5.7
Shutter Speed	:	1/100
Create Date	:	2023:10:10 14:02:20.422741
Date/Time Original	:	2023:10:10 14:02:20.422741
Modify Date	\$	2023:10:10 14:02:20.422741
Circle Of Confusion	:	0.005 mm
Field Of View	;	67.4 deg
Focal Length	:	4.8 mm (35 mm equivalent: 27.0 mm)
Hyperfocal Distance	\$	2.59 m
Light Value	:	7.4

Lastly, analyzed the images from the Google Pixel 7 Pro, which does not have an installed Camera Gallery, instead all images are directly saved on Google Photos. One such image was of a trash can.

Image Name	Camera /Screenshot Image	Location (Gallery/Google Photos)	Information
PXL_20230821_163926622	Camera	Google Photos	<ul> <li>← Info</li> <li>DETAILS</li> <li>Camera /storage/emulated/0/DCIM/Camera/ PXL_20230821_163926622.jpg</li> <li>Aug 21, 2023 Mon 12:39 PM</li> <li>■ PXL_20230821_163926622.jpg 12.5MP - 3072 x 4080 · 2.28 MB</li> <li>④ Pixel 7 Pro f/1.85 · 1/24 · 6.81mm · ISO2331</li> </ul>
Screenshot_20230821-	Screenshot	Google Photos	
			<ul> <li>✓ Info</li> <li>DETAILS</li> <li>C Screenshots /storage/emulated/0/Pictures/Screenshots/ Screenshot_20230821-125045.png</li> <li>✓ Aug 21, 2023 Mon 12:50 PM</li> <li>✓ Screenshot_20230821-125045.png 2.5MP • 1080 x 2340 • 1.84 MB</li> </ul>

Table 3. Trash Can

## Table 3. Continued

		-		×
[		×		
PXL_202308	21_163926 2 MB	622.jpg		
SHA256 ~				
				- 70-
2b1b4eb0ea5a11400ea126 1b1fd15a038	5c5b5fe16e9	ee15532	et8tted8	a/9a

ц X
ı.
e32e6d609
Paste

PS F:\Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHash	n .∖TrashCanCamera.jpg
Algorithm	Hash	Path
SHA256	92B1B4EB0EA5A11400EA126C5B5FE16E9CE15532EF8FFED8A79AE1B1FD15A038	F:\
PS F:∖Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHash	n .\TrashCanScreenshot.png
Algorithm	Hash	Path

FIAS Report
Nate & Time: 29-Oct-2023 18:9:44
Fyidence
Evidence file: TrashCanScreenshot nng
5H4256: d7d75chfc@fdabe@54a67d@91612@5144e8ae2b31e32e6d6@993be791da@fc79
Eorensic Working Conv.
Working copy: TrashCanScreenshot.png
5HA256: d7d75cbfc0fdabe054a67d09161205144e8ae2b31e32e6d60993be791da0fc79
vidence and working copy have same SHA256.
References:
[1] NIST Policy on Hash Functions
Lagust 5, 2015
https://csrc.nist.gov/Projects/Hash-Functions/NIST-Policy-on-Hash-Functions
Structure Analysis
)ate & Time: 29-Oct-2023, 18:9:48
Offset: 73 -> Android
Offset: 137 -> Android
Compression Analysis
Date & Time: 29-Oct-2023, 18:9:49
ile: CLA-512.txt
HA256: 38f23c713950e4687d1720a21206553850476a5b79148cf9bd3e1e935ee124
Date & Time: 29-Oct-2023, 18:9:49
ile: CLA-512-cep.txt
HA256: deca9ef5c09d4bfafce5f0cd5069975300c740d5fe5778839d207c81df749f
Date & Time: 29-Oct-2023. 18:9:51
ile: CLA-512.png
H4256: chf791262fd3eff6e76e8824c00a790h2c7ahf62a8a62a4h4c27ef17466418
Color Filter Array Analysis
ate & Time: 29-Oct-2023 18:9:52
ile: CFA nng
1421 CLAPPS
late & Time: 29_0ct_2023 18:0:52
tila (rativ)
140, C.
TDC DCT Man Analysis
Date & Time: 20 Oct 2022 18:10:50
/σιε α (1000, 27-000-2023, 18:10:50
THE: DET-MBP-DE.PNB
MA256; 15C9C/56652D849D0986809D83DDT80D003C8C803T55D0D42D6TD2596001110

## Table 3. Continued

File Name	: TrashCanCamera.jpg		
Directory			
File Size	: 2.3 MB		
File Modification Date/Time	: 2023:10:23 17:03:52-06:00		
File Access Date/Time	: 2023:10:29 17:50:12-06:00		
File Creation Date/Time	: 2023:10:29 17:49:58-06:00		
File Permissions	: -rw-rw-rw-		
File Type	: JPEG		
File Type Extension	: ipg		
MIME Type	: image/ipeg	Image Width	: 3072
Exif Byte Order	: Little-endian (Intel. II)	Image Height	: 4080
Make	: Google	Encoding Process	: Baseline DCT, Huffman coding
Camera Model Name	: Pixel 7 Pro	Bits Per Sample	: 8
Orientation	: Horizontal (normal)	Color Components	3
X Resolution	: 72	Y CD Cr SUD Sampiing	: YLDLF4:2:0 (2 2) : (Binary data 42628 butes use b option to extract)
Y Resolution	. 72	Shot Log Data	(Binary data 555 bytes, use -b option to extract)
Resolution Unit	: inches	Aperture	: 1.9
Software	: HDR+ 1 0 5401047677d	Image Size	3072x4080
Modify Date	· 1017 1.0.340104/0/20	Megapixels	: 12.5
V Ch Cn Positioning	. 2025.00.21 12.55.20	Scale Factor To 35 mm Equivalent:	: 3.5
Firegues Time	. Lenter eu	Shutter Speed	: 1/24
Exposure rime	. 1/24	Create Date	: 2023:08:21 12:39:26.622-04:00
F NUMBER	: 1,9 : December 45	Date/Time Original	2023:08:21 12:39:26.622-04:00
Exposure Program	: Program AE	Thumbrail Image	(Rinary data 20664 bytes use _b option to extract)
150	: 2331	Circle Of Confusion	: 0.009 mm
Exit Version	: 0232	Depth Of Field	: 0.07 m (0.28 - 0.35 m)
Date/Time Original	: 2023:08:21 12:39:26	Field Of View	: 73.7 deg
Create Date	: 2023:08:21 12:39:26	Focal Length	: 6.8 mm (35 mm equivalent: 24.0 mm)
Offset Time	: -04:00	Hyperfocal Distance	: 2.94 m
Offset Time Original	: -04:00	Light Value	
Offset Time Digitized	: -04:00	Lens ID	: Pixel / Pro back camera 6.81mm f/1.85
Components Configuration	: Y, CD, Cr, -		
Shutter Speed Value	: 1/24		
Aperture Value	: 1.9		
Brightness Value	: -3.19		
Exposure Compensation	: 0		
Max Aperture Value	: 1.9		
Subject Distance	: 0.311 m		
Metering Mode	: Center-weighted average		
Flash	: Off, Did not fire		
Focal Length	: 6.8 mm		
Sub Sec Time	: 622		
Sub Sec Time Original	: 622		
Sub Sec Time Digitized	: 622		
Flashpix Version	: 0100		
Color Space	: sRGB		
Exif Image Width	: 3072		
Exif Image Height	: 4080		
Lens Make	: Google		
Lens Model	: Pixel 7 Pro back camera 6.	.81mm f/1.85	
Composite Image	: Composite Image Captured V	while Shooting	
GPS Img Direction Ref	: Magnetic North		
GPS Img Direction	: 60		
compression	; JPEG (OIG-STYle)		

#### Results

After compiling, critiquing, and comparing all the information as well as images, a few things became very apparent. One, the way an image is created drives how it is labeled and where it is stored in Android phone devices. So, regardless of where the consumer may want to store the image, it will automatically characterize itself as a camera image if created via the installed camera or as a screenshot if created as such. Also, the difference in supplied information for camera created vs screenshot is eye-opening. Along with the variety in provided details about the images varying based on the manner of creation, the variety in Android devices in conjunction with the diversity in installed camera systems identify a true difference maker in regard to the ease for image analysis. When considering the three different manufacturers, timeframe of creation, and other factors, the information to be gleaned from each device is based largely on the type and age of said device. Lastly, with the abilities of Android devices to successfully have information forensically extracted, even if an image was tampered with or allocated to a destination not naturally expected, the extraction would provide definitive clues for diagnosing the truth.

#### **CHAPTER V**

#### CONCLUSIONS

When this research was begun on this topic, it was immediately apparent that a research problem pertaining to the lack of established data on Android smartphones and image authentication existed. The researcher especially was curious about how the method by which an image is captured affects the information that is created and can be examined. Also, the inability to find a great deal of research on what happens to an image when it's been sent via different means was present. While there is a good amount of attention being paid to image analysis and authentication overall, only a small measure of research has been paid to mobile devices, especially smartphones and even less on Android specifically. This is important and necessary because with so many different Android devices, and settings, we as forensic examiners need to be more aware and adept at recognizing telltale signs of image manipulation. For instance, when someone is missing and images are shared with the intention of spreading awareness and locating them, we must be sure that the image being presented is accurate to the person and not one that's been altered indiscriminately to ensure maximum success. Another example is when Android images are used as evidence in criminal or civil cases. If forensic examiners are not able to confidently and expertly separate unaltered images from altered images as well as explain whether they were screenshots or camera images, then the credibility of not just that specific examiner but the entire multimedia forensic community will be called into question.

#### **Future Research**

An area of future research is really digging into the different Android manufacturers and their systems for alteration clues that may be found in each device that is offered via that manufacturer. Such brands to study would possibly be Samsung or Google, due to the reach and standing of the brands in the Android world. There are also other issues affecting Android image authentication that will continue to be brought to the forefront, especially in conjunction with social media. Additional possible future research would be to create a camera image and then create a screenshot of the camera image. Next, perform some type of modification or edit on the original camera-created image and then critique the three different images for signs of alterations.

## REFERENCES

- American Society for Testing and Materials (ASTM) International. (2019). Standard Guide for Forensic Digital Image Processing (E2825-19). <u>https://astm.org/Standards/E2825.htm</u>
- LIU, Q., COOPER, P. A., CHEN, L., CHO, H., CHEN, Z., QIAO, M, SU, Y., WEI, M, & SUNG, A. H. (2013). Detection of JPEG double compression and identification of smartphone image source and post-capture manipulation: Frontiers of applied intelligence. *Applied Intelligence (Dordrecht, Netherlands), 3*(4), 705-526. <u>https://doi.org/10.1007/s10489-013-0430-z</u>
- Popescu, A. C., & Farid, H. (2005). Exposing digital forgeries by detecting traces of resampling. *IEEE Transactions on Signal Processing*, 53(2), 758-767. <u>https://doi.org/10.1109/TSP.2004.839932</u>
- Scientific Working Group on Digital Evidence. (2017). SWGDE Best Practices for Maintaining the Integrity of Imagery. <u>https://drive.google.com/file/d/10wuCTEZJcMiqiS3Blp1iZgoW22BhlrwJ/view</u>

## APPENDIX

## \*GOOGLE PIXEL 7 PRO ADDITIONAL IMAGES, HASH VERIFICATIONS, AND FIAS REPORTS



PS F:∖Thesis	Material\Thesis Photos\GooglePixe17Pro\CameravsScreenshot> Get-FileHash	.\FramedMaskCamera.jpg
Algorithm	Hash	Path
SHA256	B03B0098D93288087341705C574A3B0940736F5C0382D6021BD395C13885B466	F:\
PS F:\Thesis	Material\Thesis Photos\GooglePixe17Pro\CameravsScreenshot> Get-FileHash	.\FramedMaskScreenshot.png
Algorithm	Hash	Path
SHA256	235A9044B07FEF1A4D96CCA13A78C96A25BBFA38538E61C02A907435BD460B4A	F:\
PS F:∖Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-Fi	leHash .∖ShoeCamera.jpg
Algorithm	Hash	Path
SHA256	B761D7A641D05B40F382C4C7B81EBE2F93888680BF7D23BF74F7286A1B4C6A	24 F:\
PS F:∖Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-Fi	leHash .\ShoeScreenshot.png
Algorithm	Hash	Path
SHA256	DD975C12155A330C0AAD352E0924E485C557D95950E2372D7DEEA21DAA927F	 BB F:∖
PS F:\Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-File	eHash .\PlugCamera.jog
Algorithm	Hash	Path
SHA256	 DA9ED0961ACF967820600923B9E962B5703B02B0331162D6C5E0A44AD87ABDF4	 ↓ F:\
PS F:∖Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-File	eHash .\PlugScreenshot.png
Algorithm	Hash	Path
SHA256	9F31D660112024AFDB09AF0B68AB03776243C222BFAE284AACDC229186DE2B9	F F:\
PS F:\Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-File	Hash .\MicCamera.jpg
Algorithm	Hash	Path
SHA256	26A862F1918D1243E07E8E050D2CAA0D1B977DF539F596B023D21E3B782622DE	F:\
PS F:\Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-File	Hash .\MicScreenshot.png
Algorithm	Hash	Path
SHA256	B45D7B07D0BA8F29414EA36FD137F9F615D242FE0169A0FDC468C47950AA6ED1	F:\
PS F:∖Thesis	Material\Thesis Photos\GooglePixe17Pro\CameravsScreenshot> Get-File	Hash .\RemoteCamera.ipg
Algorithm	Hash	Path
SHA256	 8EAF2689D836B73B746AA53827DB389011CC0C9542AFC72510B571ECF7D378A3	F:\
PS F:\Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-File	Hash .\RemoteScreenshot.png
Algorithm	Hash	Path
SHA256	D25B6C42F39183D134F387B46C0275DF82AC84AADCCE7F2391AC28D287EAC407	F:\

PS F:\Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHash	.\ClothesStackCamera.jpg
Algorithm	Hash	Path
SHA256	EABCBCBC4308DE57CBCF8D2C1A3CE223F2C69CB08E6EBE2BE8E3041D8F452E33	 F:\
PS F:\Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHash	.\ClothesStackScreenshot.png
Algorithm	Hash	Path
SHA256	C18BECF40DCE904262E4FC65CFE38A21D8397D8BF25ECB0E3E0BCE494F5C57B7	F:\

PS F:\Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHas	h .\CombatCamera.jpg
Algorithm	Hash	Path
SHA256	93178A0EF6156660D9A25C0494FB0BB0E7C0B2D28B4AD9EE41A3BC2B1D514F27	F:\
PS F:∖Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHas	n .\CombatScreenshot.png
Algorithm	Hash	Path
SHA256	9165E79A6F5D569E2EF079E522B51EFD414B74D4AA4501309A8B42D99200CA8F	F:\

Algorithm	Hash	Path
SHA256	685221FEF3C4F350B8F5602171F10EABB4F3EC46778E8F2C1DE6905825B6BA03	F:\
PS F:\Thesis	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHas	1 .∖ToteScreenshot.png
PS F:∖Thesis Algorithm	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHas Hash	n .\ToteScreenshot.png Path
PS F:\Thesis Algorithm	Material\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHas Hash 	n .\ToteScreenshot.png Path 

ITTHESIS PHOLOS (doogIePixei/Pro(CameraVSSCreenshot) det-FileHash	∩.\Rhoya19Camera.jpg
	Path
3D9E37DC1BACBE6AFEBBD1F33A1DEBF52756BF0F77B956F433A61932F7A3	F:\
l\Thesis Photos\GooglePixel7Pro\CameravsScreenshot> Get-FileHash	∩.\Rhoyal9Screenshot.png
	Path
A708EACAE680EA545E6E4E0708AC2206AC76E57C60A88EDD42144A805AEE	 E•\
	3D9E37DC1BACBE6AFEBBD1F33A1DEBF52756BF0F77B956F433A61932F7A3 1\Thesis Photos\GooglePixe17Pro\CameravsScreenshot> Get-FileHash A708EAC4F6B9FA545E6E4F0708AC2206AC76E57C69A88FDD42144A805AEE

File Name
Directory
File Slac
File Access Date/Time
File Creation Date/Time
File Creation Date/Time
File Creation Date/Time
File Type
File Type
Extension
MIME Type
Extf Byte Order
Make
Camera Model Name
Orientation
X Resolution
Resolution
Resolution
Resolution
Resolution
Resolution
Resolution
Resolution
Y Resolution
Resolution
Resolution
Resolution
Create Date
Y Cb Cr Positioning
Exposure Time
Fixmber
Fixmber
Fixmber
Create Date
Offset Time Original
Create Date
Offset Time Original
Create Date
Subject Distance
Metering Mode
Flash
Focal Length
Sub Sec Time Original
Sub Sec Time Origi

: FramedMaskCamera.jpg FIAS Report : 1991 kB 2023:10:23 17:04:26-06:00 Date & Time: 27-Oct-2023, 9:54:3 2023:10:27 20:05:55-06:00 2023:10:27 20:05:51-06:00 -----Evidence------rw-rw JPEG Evidence file: CombatScreenshot.png jpg image/jpeg Little-endian (Intel, II) SHA256: 9165e79a6f5d569e2ef079e522b51efd414b74d4aa4501309a8b42d99200ca8f -----Forensic Working Copy-----Google Pixel 7 Pro Working copy: CombatScreenshot.png Horizontal (normal) SHA256: 9165e79a6f5d569e2ef079e522b51efd414b74d4aa4501309a8b42d99200ca8f 72 -----HDR+ 1.0.5401047672d 2023:10:15 13:59:55 Evidence and Working copy have same SHA256. -----Compression Analysis-----: Centered : 1/47 Date & Time: 27-Oct-2023, 9:54:10 : 1.9 File: CLA-512.txt : Program AE : 5221 SHA256: 1328551e50996f66bcf608fad0df11957b95a8f91a76a6e89a9e4bb1cc4378c9 · 0232 : 0232 : 2023:10:15 13:59:55 : 2023:10:15 13:59:55 : -04:00 : -04:00 : -04:00 : -04:00 Date & Time: 27-Oct-2023, 9:54:10 File: CLA-512-cep.txt SHA256: 92194fde5bf7fd692f4f9398828ea05512344698fd87c4aa1f8476dde5e0b1b3 : Y, Cb, Cr, -: 1/47 Date & Time: 27-Oct-2023, 9:54:12 File: CLA-512.png : 1.9 : -3.37 SHA256: a33f32691425017e2438b4cb734ef364ee64162704fadd62bbc9171a66244f7f 9 1.9 0.153 m Center-weighted average Off, Did not fire 6.8 mm : 737 : 737 : 737 : 737 : 0100 SRGR 3072 1972 4880 R98 - DCF basic file (sRGB) 8100 One-chip color area Directly photographed Contered Custom : Auto Auto 0 : 0 : 24 mm : Standard : Normal : Normal : Macro : Google Google : Pixel 7 Pro back camera 6.81mm f/1.85

FIAS Report
Date & Time: 29-Oct-2023, 8:5:4
EvidenceEvidence
Evidence file: PlugScreenshot.png
SHA256: 9f31d660112024afdb09af0b68ab03776243c222bfae284aacdc229186de2b9f
Forensic Working Copy
Working copy: PlugScreenshot.png
SHA256: 9f31d660112024afdb09af0b68ab03776243c222bfae284aacdc229186de2b9f
Evidence and Working copy have same SHA256.

File Name	: PlugCamera.jpg
Directory	:.
File Size	: 3.0 MB
File Modification Date/Time	: 2023:10:23 17:04:44-06:00
File Access Date/Time	: 2023:10:29 07:41:32-06:00
File Creation Date/Time	: 2023:10:29 07:41:26-06:00
File Permissions	: -rw-rw-rw-
File Type	: JPEG
File Type Extension	: jpg
MIME Type	: image/jpeg
Exif Byte Order	: Little-endian (Intel, II)
Make	: Google
Camera Model Name	: Pixel 7 Pro
Orientation	: Horizontal (normal)
X Resolution	: 72
Y Resolution	: 72
Resolution Unit	: inches
Software	: HDR+ 1.0.540104767zd
Modify Date	: 2023:10:15 14:05:00
Y Cb Cr Positioning	: Centered
Exposure Time	: 1/25
F Number	: 1.9
Exposure Program	: Program AE
150	: 110
Exit Version	: 0232
Date/Time Original	: 2023:10:15 14:05:00
Create Date	: 2023:10:15 14:05:00
Officer Time Opticiant	1 -04:00
Offset Time Original	: -04:00
Offset Time Digitized	: -04:00
Components Contiguration	: Y, CD, CP, -
Shutter Speed Value	: 1/25
Apercure value	: 1.9
Brightness value	: 1.2/
Max Ameriuma Value	. 1 0
Subject Dictance	. 4.5 . 6.530 m
Matering Mode	Center-weighted average
Flach	: Off Did not fire
Foral Length	: 6.8 mm
Sub Ser Time	. 797
Sub Sec Time Original	: 797
Sub Ser Time Digitized	. 797
Flashpix Version	: 0100
Color Space	- SRGR
Exif Image Width	: 3072
Exif Image Height	: 4080
Interoperability Index	: R98 - DCF basic file (sRGB)
Interoperability Version	: 0100
Sensing Method	: One-chip color area
Scene Type	: Directly photographed
Custom Rendered	: Custom
Exposure Mode	: Auto
White Balance	: Auto
Digital Zoom Ratio	: 2.91
Focal Length In 35mm Format	: 48 mm
Scene Capture Type	: Standard
Contrast	: Normal
Saturation	: Normal
Sharpness	: Normal
Subject Distance Range	: Macro
Lens Make	: Google
Lens Model	: Pixel 7 Pro back camera 6.81mm f/1.85
Composite Tease	. Composite Tesas Continued Mills Chantle

-----Compression Analysis------Date & Time: 29-Oct-2023, 8:5:12 File: CLA-512.txt SHA256: e47cd87de3734627587f5ed1b3a322570bc65461ec73730f94280d1d7bd6bd50 Date & Time: 29-Oct-2023, 8:5:13 File: CLA-512-cep.txt File: CLA-512-Cep.Cxt SHA256: c62687C0a7c45f1bcffe8fa7cb9bd62204b7691d2e0ca4900da56cea7f8ce705 Date & Time: 29-Oct-2023, 8:5:15 File: CLA-512.png SHA256: cf998497352acb8c3ad94c9d64cbbd95ac0a56120be590f4cb45f23309ee2800

#### FIAS Report

. . . . . . . . . . . . . . . . ..... Date & Time: 29-Oct-2023, 16:22:54 -----Evidence-----Evidence file: ShoeScreenshot.png SHA256: dd975c12155a330c0aad352e0924e485c557d95950e2372d7deea21daa927fbb ------Forensic Working Copy------Working copy: ShoeScreenshot.png SHA256: dd975c12155a330c0aad352e0924e485c557d95950e2372d7deea21daa927fbb ------Evidence and Working copy have same SHA256. -----Compression Analysis-----Date & Time: 29-Oct-2023, 16:22:57 File: CLA-512.txt SHA256: fe2a89dd352a177307d6aff5c054cbde0c16de45e07ed821690924a6a5bd7762 Date & Time: 29-Oct-2023, 16:22:57 File: CLA-512-cep.txt SHA256: 9549352f37837a14cda42fc59e3bbcfca5c558c1c884bdf4234d7b829bf09a09 Date & Time: 29-Oct-2023, 16:22:59 File: CLA-512.png SHA256: d407156124307a037ef99ab6f708ecfe8ef54fb32805b124b8520be1eeef6764 File Name : ShoeCamera.jpg File Name Directory File Size File Modification Date/Time File Access Date/Time File Creation Date/Time File Permissions File Type File Type Extension MTME Type Exif Byte Order Make : . : 2.7 MB : 2023:10:23 17:05:26-06:00 : 2023:10:29 15:59:18-06:00 : 2023:10:29 15:59:14-06:00 : -rw-rw-rw-: jpg : image/jpeg : Little-endian (Intel, II) Make Make Camera Model Name Orientation X Resolution Y Resolution Resolution Unit : Google : Pixel 7 Pro Horizontal (normal) 72 72 : inches HDR+ 1.0.540104767zd Software Software Modify Date Y Cb Cr Positioning Exposure Time F Number Exposure Program : 2023:10:15 14:02:25 : Centered : 1/24 : 1.9 : Program AE : 211 Exposure Frogram ISO Exif Version Date/Time Original Create Date Offset Time Original Offset Time Digitized Components Configuration Shutter Speed Value Aperture Value Brightness Value Exposure Compensation Max Aperture Value Subject Distance Metering Mode Flash Focal Length Sub Sec Time ISO : 0232 : 2023:10:15 14:02:25 : 2023:10:15 14:02:25 : -04:00 : -04:00 · -84.88 : -04:00 : Y, Cb, Cr, -: 1/24 : 1.9 : 0.27 0 : 1.9 : 0.353 m : Center-weighted average : Off, Did not fire Focal Length Sub Sec Time Original Sub Sec Time Digitized Flashpix Version Color Space Exif Image Width Exif Image Height Interoperability Index Interoperability Version Sensing Method Scene Type Custom Rendered Exposure Mode 6.8 mm : 175 : 175 : 175 : 0100 : sRGB : 3072 4080 R98 - DCF basic file (sRGB) 0100 One-chip color area Directly photographed Custom Custom Rendered Exposure Mode White Balance Digital Zoom Ratio Focal Length In 35mm Format Scene Capture Type Auto Auto 24 mm Standard Normal Normal Normal Macro Google Contrast Saturation Sharpness Subject Distance Range Lens Make Lens Model : Pixel 7 Pro back camera 6.81mm f/1.85

FIAS Report

Date & Time: 29-Oct-2023, 14:44:4 ------Evidence------Evidence file: RemoteScreenshot.png SHA256: d25b6c42f39183d134f387b46c0275df82ac84aadcce7f2391ac28d287eac407 -----Forensic Working Copy-----Working copy: RemoteScreenshot.png SHA256: d25b6c42f39183d134f387b46c0275df82ac84aadcce7f2391ac28d287eac407 Evidence and Working copy have same SHA256. -----Compression Analysis-----Date & Time: 29-Oct-2023, 14:44:12 File: CLA-512.txt SHA256: a6fa8c9fb9d577c0b14d8a0b25d3d04e0b9e44e971f593885569787fbecc97bd Date & Time: 29-Oct-2023, 14:44:12 File: CLA-512-cep.txt SHA256: c48b452a4373b9827b1f9ceeb441c853d6763317cccd429741e13edfa51cc7f7

Date & Time: 29-Oct-2023, 14:44:14 File: CLA-512.png

SHA256: 7c3b2001238cebc98be9f8921c99620abdc7e72d4ad09878244976ae52beeca4

File Name Directory File Size : RemoteCamera.jpg File SIZE File Modification Date/Time File Access Date/Time File Creation Date/Time File Permissions File Tore : -rw-rw-rw-: JPEG File Type File Type Extension MIME Type Exif Byte Order Make Camera Model Name Orientation X Resolution Y Resolution Resolution Unit : 72 : 72 : inches Software Software Modify Date Y Cb Cr Positioning Exposure Time F Number Exposure Program Exposure Time F Number F Number Frogram ISO Exif Version Date/Time Original Create Date Offset Time Original Offset Time Original Offset Time Digitized Components Configuration Shutter Speed Value Aperture Value Brightness Value Exposure Compensation Max Aperture Value Brightness Value Exposure Compensation Max Aperture Value Subject Distance Metering Mode Flash Focal Length Sub Sec Time Original Sub Sec Time Original Sub Sec Time Original Sub Sec Time Digitized Flashpix Version Color Space Exif Image Meddth Exif Image Meddth Exif Image Method Scene Type Custom Rendered Exposure Mode White Balance Digital Zoom Ratio Focal Length In 35cm Format Scene Capture Type Contrast Saturation Sharpness Subject Distance Range : 1.9 : 2023:10:15 1 : -04:00 : -04:00 : -04:00 : Y, Cb, Cr, -: 1/64 : 1.9 : -0.8 : 0 : 1.9 0.248 m 562 562 0100 SRGB 3072 4888 Custom Auto Auto 0 24 mm Standard Normal Normal Sharpness Subject Distance Range Lens Make Lens Model Normal

2023:10:23 17:04:55-06:00 2023:10:29 09:35:17-06:00 2023:10:29 09:35:05-06:00 : JFEG : jFE : image/jpeg : Little-endian (Intel, II) : Google : Pixel 7 Pro : Horizontal [normal] : 72 : HDR+ 1.0.540104767zd : MDR+ 1.0.34010470720 : 2023:10:15 14:03:30 : Centered : 1/65 : 1.9 : Program AE : 1206 : 0232 : 2023:10:15 14:03:30 : 2023:10:15 14:03:30 Center-weighted average Off, Did not fire 6.8 mm 562 R98 - DCF basic file (sRGB) 0100 One-chip color area Directly photographed : Macro : Macro : Google : Pixel 7 Pro back camera 6.81mm f/1.85

```
FIAS Report
```

..... Date & Time: 29-Oct-2023, 15:16:45 -----Evidence-----Evidence file: Rhoyal9Screenshot.png SHA256: c769a708eac4f6b9fa545e6e4f0708ac2206ac76e57c69a88fdd42144a805aee -----Forensic Working Copy-----Working copy: Rhoyal9Screenshot.png SHA256: c769a708eac4f6b9fa545e6e4f0708ac2206ac76e57c69a88fdd42144a805aee Evidence and Working copy have same SHA256. -----Compression Analysis-----Date & Time: 29-Oct-2023, 15:17:26 File: CLA-512.txt SHA256: 5fd6af3da950d8e150892d00617333458912a4168d9a48e4ee5fa216296a45c2 Date & Time: 29-Oct-2023, 15:17:26 File: CLA-512-cep.txt SHA256: 60828a84f211296cbb2a30775337ae57f22bac4e356bc1d82101d8653e1470b6 Date & Time: 29-Oct-2023, 15:17:28 File: CLA-512.png

SHA256: 49e08dbe8b5dfcfa08b6151ddd433d38cdab2f6cb3f864696c24865325e6a4e9

File Name : Rhoyal9Camera.jpg Directory File Size File Modification Date/Time : 6.1 MB : 2023:10:23 17:05:14-06:00 File Access Date/Time File Creation Date/Time : 2023:10:29 14:54:33-06:00 : 2023:10:29 14:54:30-06:00 : -rw-rw-rw-: 3PEG File Permissions File Permit File Type File Type Extension MIME Type Exif Byte Order : jpg : image/jpeg : Little-endian (Intel, II) Make Camera Model Name Orientation : Google : Pixel 7 Pro : Horizontal (normal) : HD IIOncal (Hormal) : 72 : 72 : inches : HDR+ 1.0.540104767zd X Resolution Y Resolution Resolution Unit Software Modify Date Y Cb Cr Positioning : 2023:10:15 14:00:49 : Centered Exposure Time F Number Exposure Program : 1/47 : 1.9 : Program AE : 144 : 0232 : 2023:10:15 14:00:49 ISO Exif Version Date/Time Original Create Date Offset Time : 2023:10:15 14:00:49 : -04:00 : -04:00 Offset Time Original Offset Time Digitized : -04:00 Components Configuration Shutter Speed Value : Y, Cb, Cr, -: 1/47 Aperture Value Brightness Value Exposure Compensation Max Aperture Value : 1.9 : 0 : 1.9 Subject Distance Metering Mode : 0.227 m : Center-weighted average Flash Focal Length : Off, Did not fire : 6.8 mm Sub Sec Time Sub Sec Time Original Sub Sec Time Digitized Flashpix Version : 914 : 914 : 914 : 0100 Color Space Exif Image Width : SRGB : 3072 Exif Image Height Interoperability Index Interoperability Version Sensing Method : 4080 : R98 - DCF basic file (sRGB) : 0100 : One-chip color area Scene Type Custom Rendered : Directly photographed : Custom Exposure Mode White Balance · Auto : Auto Digital Zoom Ratio Focal Length In 35mm Format : 0 : 24 mm Scene Capture Type : Standard Contrast Normal Saturation Normal Saturation Sharpness Subject Distance Range Lens Make Lens Model : Normal : Macro : Google : Pixel 7 Pro back camera 6.81mm f/1.85 FIAS Report

Date & Time: 29-Oct-2023, 17:44:22 -----Evidence-----Evidence file: ToteScreenshot.png SHA256: 5154b72a39313840871d763f0c1b790b9f8ea43c3d69d41498eb0efb46405a32 -----Forensic Working Copy------Working copy: ToteScreenshot.png SHA256: 5154b72a39313840871d763f0c1b790b9f8ea43c3d69d41498eb0efb46405a32 -----Evidence and Working copy have same SHA256. ----------Compression Analysis-----Date & Time: 29-Oct-2023, 17:44:44 File: CLA-512.txt SHA256: 3758e69dc899b1151f5b9dc02d05d62ea5f1b8586854a9a73885c79106a4224d Date & Time: 29-Oct-2023, 17:44:44 File: CLA-512-cep.txt SHA256: bfbe0126782179f6dd87da38edac41f20263dbe78c07aa70687e1d933f3cbc6b Date & Time: 29-Oct-2023, 17:44:46 File: CLA-512.png SHA256: 44f45e21d331ee23a53c97e91bee9083e667eda38bf9a7564ba86297e272991d

File Name : ToteCamera.jpg File Name Directory File Size File Modification Date/Time File Access Date/Time File Creation Date/Time File Permissions File Type File Type Extension MIME Type Exif Byte Order Make : 2.3 MB : 2023:10:23 17:03:44-06:00 : 2023:10:29 16:59:14-06:00 : 2023:10:29 16:58:54-06:00 : -rw-rw-rw-: JPEG : -Tw-Fw-Fw-: JPEG : JPEG : JPEG : Little-endian (Intel, II) : Google : Pixel 7 Pro : Morizontal (normal) : 72 : 72 : Inches : MDR+ 1.0.540104767zd : 2023:08:21 12:39:12 : Centered : 1.40 : 1.79 : Program AE : 1766 : 0232 : 2023:08:21 12:39:12 : 2023:08:21 12:39:12 : 2023:08:21 12:39:12 : -04:00 : -04:00 : -04:00 : V. Ch. Cm. MIME Type Exif Byte Order Make Camera Model Name Orientation X Resolution Y Resolution Notify Date Y Cor Positioning Exposure Program ISO Exif Version Date/Time Original Create Date Offset Time Original Offset Time Original Offset Time Original Offset Time Digitized Components Configuration Shutter Speed Value Aperture Value Ergosure Compensation Max Aperture Value Subject Distance Metering Mode Flash Focal Length : -04:00 : Y, Cb, Cr, -: 1/40 : 1.9 : -2 0 : 0 : 1.9 : 0.386 m : Center-weighted average : Off, Did not fire : 6.8 mm : 909 Subject Distance Metering Mode Flash Focal Length Sub Sec Time Orginal Sub Sec Time Orginal Sub Sec Time Orginal Sub Sec Time Orginized Flashpix Version Color Space Exif Image Width Exif Image Width Exif Image Width Interoperability Index Interoperability Index Interoperability Version Sensing Method Scene Type Custom Rendered Exposure Mode White Balance Digital Zoom Ratio Focal Length In 35mm Format Scene Capture Type Contrast Saturation Sharpness : 909 : 909 : 0100 sRGB 3072 : 4080 : 4400 : R98 - DCF basic file (sRGB) : 0100 : One-chip color area : Directly photographed Custom Auto Auto : 0 : 24 mm Standard Normal Normal Sharpness : Normal Subject Distance Range Lens Make Lens Model : Macro : Google : Pixel 7 Pro back camera 6.81mm f/1.85

## \*ONEPLUS 7 PRO ADDITIONAL IMAGES, HASH VERIFICATIONS, AND FIAS REPORTS



File Name	: BatteryCamera.jpg	File Name	: BattervScreenshot.jpg
Directory		Directory	
File Size	: 3.1 MB	sile size	
File Access Date/Time	: 2023:10:23 1/:05:40-05:00	File Size	; 2.3 MB
File Access Date/Time	1 2023:10:24 15:10:22-00:00	File Modification Date/Time	: 2023:10:23 17:06:46-06:00
File Dermissions	. 2023.10.24 13.05.43-00.00	File Access Date/Time	: 2023:10:24 15:14:34-06:00
File Type	· TPFG	File Creation Date/Time	: 2023:10:24 15:14:26-06:00
File Type Extension	: 108	File Dermissions	Pat Pat Pat
MIME Type	: image/jpeg		· - I W-I W-I W-
Exif Byte Order	: Big-endian (Motorola, MM)	File Type	: JPEG
Y Resolution	: 72	File Type Extension	; jpg
X Resolution	: 72	MIME Type	: image/jpeg
Camera Model Name	: GM1915	JFIF Version	: 1.01
Make V Ch Co Decitionies	: OneFlus	Resolution Unit	· None
Fyif Version	· A77A	Kesolution onle	. None
Aperture Value	1.6	X RESOLUTION	. 1
Scene Type	: Directly photographed	Y Resolution	: 1
Exposure Compensation	: 0	Profile CMM Type	1
Exposure Program	: Program AE	Profile Version	: 2.1.0
Color Space	: sRGB	Profile Class	· Display Device Profile
Max Aperture Value	: 1.6	Colon Conce Data	· DEP
Exif Image Height	: 1824	COTOL Shace para	: Kub
Brightness Value	2022.40.40.44.04.55	Profile Connection Space	: XYZ
Date/Time Original	1 2023:10:10 14:01:50	Profile Date Time	: 0000:00:00 00:00:00
Sub Sec Time Original	· 708471	Profile File Signature	: acsp
White Balance	: Auto	Primary Platform	· Unknown ()
Interoperability Index	: R98 - DCF basic file (sRGB)	CMM Slags	Nat Embaddad Tadanandant
Exposure Mode	: Auto	CHM FIGES	: Not Embeuded, Independent
Exposure Time	: 1/17	Device Manufacturer	
Flash	: Off, Did not fire	Device Model	
Sub Sec Time	: 708471	Device Attributes	: Reflective, Glossy, Positive, Color
F Number	: 1.6	Rendering Intent	: Media-Relative Colorimetric
Exit image width	2500	Connection Space Illuminant	· 0 0642 1 0 02401
Components Configuration	· V Ch. Cr	Connection Space IIIominant	0.2042 1 0.02421
Focal Length In 35mm Format	: 27 mm	Profile Creator	10-10-9
Sub Sec Time Digitized	: 708471	Profile ID	: 0
Create Date	: 2023:10:10 14:01:56	Profile Description	: SRGB
Shutter Speed Value	: 1/17	Red Matrix Column	: 0.43607 0.22249 0.01392
Metering Mode	: Spot	Green Matrix Column	· 0 30515 0 71607 0 00700
Focal Length	: 4.8 mm	Blue Meteria Column	. 0.1007 0.0007 0.00700
Scene Capture Type	: Standard	Blue Matrix Column	: 0.1430/ 0.06061 0./141
Light Source Sensing Method	: DD5 • Not defined	Red Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Orientation	· Potate OB CM	Green Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Resolution Unit	: inches	Blue Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Modify Date	: 2023:10:10 14:01:56	Media White Point	· 0 9642 1 0 82491
XMP Toolkit	: Adobe XMP Core 5.1.0-jc003	Profile Convert	. 0.0042 1 0.02401
Capture Mode	: Photo	Profile copyright	; GOOGLE THC. 2016
Lens Facing	: Back	Image Width	: 1440
Scene Detect Result Ids	: [0, 0, 0]	Image Height	: 3120
Scene Detect Result Confidences	: [0.0, 0.0, 0.0]	Encoding Process	: Baseline DCT, Huffman coding
Te WDD Artive	· Falca	Bits Per Sample	: 8
Ts Night Mode Active	· False	Color Components	
Is Bokeh Active	: False	coror components	
Image Width	: 4000	Y CD Cr SUD Sampling	: YCDCP4:2:0 (2 2)
Image Height	: 1824	Image Size	: 1440x3120
Encoding Process	: Baseline DCT, Huffman coding	Megapixels	: 4.5
Bits Per Sample	: 8	and the state of the state	
Color Characteria			

esis Materi
reenshot.jpg
esis Materi

Algorithm	Hash	Path
5HA256	FAC87838D71F3DC305937B5D935C937DB6EF4D10E061195926DA9C94ABB6ED7B	F:\Thesis Materi
PS F:∖Thesis	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash .\C	oorScreenshot.jpg
PS F:∖Thesis Algorithm	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash .\C Hash	oorScreenshot.jpg Path

File Name	: DreamcatherCamera.jpg	File Name	: DreamcatherScreenshot.jpg
Directory		Directory	
File Size	: 1718 kB	File Size	1000 VD
File Modification Date/Time	: 2023:10:23 17:07:04-06:00	File Medification Date/Time	, 1050 KD
File Access Date/Time	: 2023:10:27 19:15:36-06:00	File Modification Date/Time	: 2023:10:23 1/:0/:10-06:00
File Creation Date/Time	: 2023:10:27 19:15:33-06:00	File Access Date/Time	: 2023:10:27 19:22:47-06:00
File Permissions	: -rw-rw-rw-	File Creation Date/Time	: 2023:10:27 19:22:44-06:00
File Type	: JPEG	File Permissions	: -rw-rw-rw-
File Type Extension	: jpg	File Type	1956
MIME Type	: image/jpeg	file Type	, area
Exif Byte Order	: Big-endian (Motorola, MM)	FILE Type Extension	· JbR
Y Resolution	: 72	міме туре	: image/jpeg
X Resolution	: 72	JFIF Version	: 1.01
Camera Model Name	: GM1915	Resolution Unit	: None
Make	: OnePlus	X Resolution	: 1
Y Cb Cr Positioning	: Centered	V Recolution	
Exif Version	: 0220	T RESOLUCION	. 1
Aperture Value	: 1.6	Profile CMM Type	1
Scene Type	: Directly photographed	Profile Version	: 2.1.0
Exposure Compensation	:0	Profile Class	: Display Device Profile
Exposure Program	: Program AE	Color Space Data	: RGB
Color Space	: sRGB	Profile Connection Space	. 202
Max Aperture Value	: 1.6	Profile Connección Space	
Exif Image Height	: 1824	Profile Date lime	: 0000:00:00 00:00:00
Brightness Value	: -3.1	Profile File Signature	: acsp
Date/Time Original	: 2023:10:10 14:01:49	Primary Platform	: Unknown ()
Flashpix Version	: 0100	CMM Flags	: Not Embedded. Independent
Sub Sec Time Original	: 922149	Device Manufacturer	
White Balance	: Auto	Device Honoroccurer	
Interoperability Index	: R98 - DCF basic file (sRGB)	Device Model	
Exposure Mode	: Auto	Device Attributes	: Reflective, Glossy, Positive, Color
Exposure Time	: 1/20	Rendering Intent	: Media-Relative Colorimetric
Flash	: Off, Did not fire	Connection Space Illuminant	: 0.9642 1 0.82491
Sub Sec Time	: 922149	Profile Creator	
FNumber	: 1.6	Profile TP	
Exit Image Width	: 4000	Profile ID	: 0
150	: 1600	Profile Description	: SRGB
Components Configuration	: Y, CD, Cr, -	Red Matrix Column	: 0.43607 0.22249 0.01392
Focal Length In 35mm Format	: 2/ mm	Green Matrix Column	: 0.38515 0.71687 0.09708
Sub Sec Time Digitized	2022.40.40.44.04.40	Blue Matrix Column	: 0.14307 0.06061 0.7141
Create Date	: 2023:10:10 14:01:49	Red Tone Reproduction Curve	(Pinary data 40 bytes use h option to extract)
Shutter speed value	: 1/20	Red Tone Reproduction Corve	(Bindry data 40 bytes, use -b option to extract)
Feesl Length	: cencer-weighted average	Green Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Focal Length	: 4.8 mm	Blue Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Light Source	· DES	Media White Point	: 0.9642 1 0.82491
Eight Source	. DDS . Not defined	Profile Convright	: Google Inc. 2016
Delentation	. Not detined	Tmage Width	1449
Desclution Unit	inches	Timbge Widen	. 1440
Medify Date	· 2022-10-10 14-01-40	Image Height	: 3120
WD Toolkit	. Adobe VMD Core 5 1 8-1/893	Encoding Process	: Baseline DCT, Huffman coding
Capture Made	Dhoto	Bits Per Sample	: 8
Lans Excing	Back	Color Components	: 3
Scone Detect Pecult Tds	· [0 0 0]	V Ch Co Sub Sampling	· VChCc4:2:0 (2 2)
Scene Detect Result fonfidences	. [0, 0, 0]	Trees Cise	. 1000141210 (2 2)
Crana	· AutoMDP	Image Size	: 1440X3120
Ts HDR Active	· False	Megapixels	: 4.5
Te Night Mode Active	False		
Ts Rokeh Artive	False		
Image Width	4999		
Image Height	1824		
Encoding Process	Baseline DCT, Huffman coting		
Rite Dan Sample	· R		

PS F:\Thesis Algorithm	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash Hash	.\DreamcatherCamera.jpg Path
SHA256	AF788DF5BD86DB280EFA4FC09B53300AB8C125600F9027CE9AFF46F2C572127C	 F:\Thesis Materi
PS F:\Thesis	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash	.\DreamcatherScreenshot.jpg
Algorithm	Hash	Path
SHA256	 5B2706786AA47B7BB0AC87B3A2C030246643E271D096C1523392D2CFA5691FEF	 F:\Thesis Materi

File Name	: FlowerBoxScreenshot.jpg
Directory	
File Size	: 2.4 MB
File Modification Date/Time	: 2023:10:23 17:07:21-06:00
File Access Date/Time	: 2023:10:27 19:48:34-06:00
File Creation Date/Time	: 2023:10:27 19:48:29-06:00
File Permissions	: -rw-rw-rw-
File Type	: JPEG
File Type Extension	; jpg
MIME Type	: image/jpeg
JFIF Version	: 1.01
Resolution Unit	: None
X Resolution	: 1
Y Resolution	: 1
Profile CMM Type	
Profile Version	: 2.1.0
Profile Class	: Display Device Profile
Color Space Data	: RGB
Profile Connection Space	: XYZ
Profile Date Time	: 0000:00:00 00:00:00
Profile File Signature	: acsp
Primary Platform	: Unknown ()
CMM Flags	: Not Embedded, Independent
Device Manufacturer	
Device Model	Analysis along the second second second
Device Attributes	: Reflective, Glossy, Positive, Color
Rendering Intent	: Media-Relative Colorimetric
Connection Space Illuminant	: 0.9642 1 0.82491
Profile Creator	
Profile ID	: 0
Profile Description	: SRGB
Red Matrix Column	: 0.43607 0.22249 0.01392
Green Matrix Column	: 0.38515 0.71687 0.09708
Blue Matrix Column	: 0.14307 0.06061 0.7141
Red Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Green Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Blue Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Media White Point	: 0.9642 1 0.82491
Profile Copyright	: Google Inc. 2016
Image Width	: 1440
Image Height	: 3120
Encoding Process	: Baseline DCT, Huffman coding
Bits Per Sample	: 8
Color Components	: 3
Y Cb Cr Sub Sampling	: YCbCr4:2:0 (2 2)
Image Size	: 1440x3120
Megapixels	: 4.5

NAMES AND A DESCRIPTION OF A DESCRIPTION	
File Name	: FlowerBoxCamera.jpg
Directory	1.
File Size	: 2.1 MB
File Modification Date/Time	· 2023-10-23 17-07-14-06-00
File Access Date/Time	· 2023-10-27 19-35-57-06-00
File Creation Date/Time	· 2023-10-27 10-35-44-06-00
File Dermissions	- 2023.10.27 13.33.44-00.00
File Tene	
File Type	. JPEG
File Type Extension	: JPg
MIME Type	: image/jpeg
Exit Byte Order	: Big-endian (Motorola, MM)
Y Resolution	: 72
X Resolution	: 72
Camera Model Name	: GM1915
Make	: OnePlus
Y Cb Cr Positioning	: Centered
Exif Version	: 0220
Aperture Value	: 1.6
Scene Type	: Directly photographed
Exposure Compensation	:0
Exposure Program	: Program AF
Color Space	S RGR
Max Ameriture Value	: 1.6
Evif Teans Mainht	1 1934
Printpage Walue	. 1824
Brightness value	-0.84
Date/lime Original	: 2023:08:21 12:12:11
Flashpix version	: 0100
Sub Sec Time Original	: 56561/
White Balance	: Auto
Interoperability Index	: R98 - DCF basic file (sRGB)
Exposure Mode	: Auto
Exposure lime	: 1/50
Flash	: Off, Did not fire
Sub Sec Time	: 565617
F Number	: 1.6
Exif Image Width	: 4000
ISO	: 320
Components Configuration	: Y, Cb, Cr, -
Focal Length In 35mm Format	: 27 mm
Sub Sec Time Digitized	: 565617
Create Date	: 2023:08:21 12:12:11
Shutter Speed Value	: 1/50
Metering Mode	: Center-weighted average
Focal Length	: 4.8 mm
Scene Capture Type	: Standard
Light Source	: D65
Sensing Method	: Not defined
Orientation	: Rotate 90 CW
Resolution Unit	: inches
Modify Date	: 2023:08:21 12:12:11
XMP Toolkit	Adobe XMP Core 5 1 8-1(883
Canture Mode	· Photo
Lens Facing	Back
Scene Detect Pecult Tric	· [0 0 0]
Scene Detect Result Confidences	. [0, 0, 0]
Scene Detect Result Confidences	. [0.0, 0.0, 0.0]
Te HDD Action	- Autonom
To Night Mode Active	. False
To Bakah Active	· Falca
Texas Uldth	. 1000
Tenage Width	. 1934
Image neight	- 1024
Pite Dep Carola	: Baseline DCT, Huttman Coding
BILS PER Sample	

File Name	: DoorCamera.jpg			
Directory	:.	File Name	1 00	anCompanybat ing
File Size	: 1857 kB	File Name	: 00	orscreensnot.jpg
File Modification Date/Time	: 2023:10:23 17:06:56-06:00	Directory	1.	
File Access Date/Time	: 2023:10:27 10:07:23-06:00	File Size	: 19	99 kB
File Creation Date/Time	: 2023:10:27 10:07:14-06:00	File Modification Date/Time	; 20	23:10:23 17:07:00-06:00
File Permissions	: -rw-rw-rw-	File Access Date/Time	. 20	23-10-27 19-00-53-06-00
File Type	: JPEG	File Access Doce/ File	. 20	23.10.27 13.00.35-00.00
File Type Extension	: ipg	File Creation Date/Time	: 20	23:10:2/ 19:00:45-06:00
MIME Type	: image/jpeg	File Permissions	: -n	w-rw-rw-
Exif Byte Order	: Big-endian (Motorola, MM)	File Type	: JP	EG
Y Resolution	: 72	File Type Extension	; jp	g
X Resolution	: 72	MTME Type	im	e age/ineg
Camera Model Name	: GM1915	JETE Vancion	1 100	of the second seco
Make	: OnePlus	JELE VERSION	; 1.	61
Y Cb Cr Positioning	: Centered	Resolution Unit	: NO	ne
Exif Version	: 0220	X Resolution	: 1	
Aperture Value	: 1.6	Y Resolution	: 1	
Scene Type	: Directly photographed	Profile CMM Tune	1	
Exposure Compensation	:0	Profile Unities	1 .	
Exposure Program	: Program AE	Profile version	: 2.	1.0
Color Space	: sRGB	Profile Class	: Di	splay Device Profile
Max Aperture Value	: 1.6	Color Space Data	: RG	В
Exif Image Height	: 1824	Profile Connection Snace	: XY	7
Brightness Value	: -2.75	Profile Data Time	. 00	-
Date/Time Original	: 2023:10:10 14:02:08	FIOTILE Date Time	. 00	00.00.00 00.00.00
Flashpix Version	: 0100	Profile File Signature	: ac	sp
Sub Sec Time Original	: 944148	Primary Platform	: Un	known ()
White Balance	: Auto	CMM Flags	: NO	t Embedded. Independent
Interoperability Index	: R98 - DCF basic file (sRGB	Device Manufacturer		
Exposure Mode	: Auto	Device Handractarch	1	
Exposure Time	: 1/20	Device Model	1 NG	
Flash	: Off, Did not fire	Device Attributes	: Re	flective, Glossy, Positive, Color
Sub Sec Time	: 944148	Rendering Intent	: Me	dia-Relative Colorimetric
F Number	: 1.6	Connection Space Illuminant	: 0.	9642 1 0.82491
Exif Image Width	: 4000	Profile Creator		
ISO	: 1250	Profile TP	1.0	
Components Configuration	: Y, Cb, Cr, -	Profile ID	: 0	
Focal Length In 35mm Format	: 27 mm	Profile Description	: SR	GB
Sub Sec Time Digitized	: 944148	Red Matrix Column	: 0.	43607 0.22249 0.01392
Create Date	: 2023:10:10 14:02:08	Green Matrix Column	: 0.	38515 0.71687 0.09708
Shutter Speed Value	: 1/20	Plue Matrix Column	. 0	14207 0 00001 0 7141
Metering Mode	: Center-weighted average	BIDE PIBLITA COTUMIT	. 0.	1450/ 0.00001 0./141
Focal Length	: 4.8 mm	Red Tone Reproduction Curve	: (B	inary data 40 bytes, use -b option to extract
Scene Capture Type	: Standard	Green Tone Reproduction Curve	: (B	inary data 40 bytes, use -b option to extract
Light Source	: D65	Blue Tone Reproduction Curve	: (B	inary data 40 bytes, use -b option to extract
Sensing Method	: Not defined	Media White Point	: 0.	9642 1 0.82491
Orientation	: Rotate 90 CW	Profile Convoight	1 60	oglo Inc. 1010
Resolution Unit	: inches	Profile copyright	; 60	OBIE TUC. 2010
Modify Date	: 2023:10:10 14:02:08	Image Width	; 14	40
XMP Toolkit	: Adobe XMP Core 5.1.0-1c003	Image Height	: 31	20
Capture Mode	: Photo	Encoding Process	: Ba	seline DCT, Huffman coding
Lens Facing	: Back	Rits Per Sample		a management of the second
Scene Detect Result Ids	: [61, 0, 0]	Colon Components		
Scene Detect Result Confidences	: [0.91231614, 0.0, 0.0]	color components	: 5	r en el en en el
Scene	: AutoHDR	Y Cb Cr Sub Sampling	: YC	bCr4:2:0 (2 2)
Is HDR Active	: False	Image Size	: 14	40x3120
Is Night Mode Active	: False	Megapixels	: 4.	5
Is Bokeh Active	: False	00185F.0007/07	100.00	5×1
Image Width	: 4000			
Image Height	: 1824			
Encoding Process	: Baseline DCT. Huffman codi	ng		
Bits Per Sample	: 8			
and the second sec				

---

PS F:\Thesis	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash	.\FlowerBoxCamera.jpg
Algorithm	Hash	Path
SHA256	626338990191E01D450E8E7FF4C8775FEE1D2A1C68F283A5868FFE6991A4F6E4	F:\Thesis Materi
PS F:\Thesis	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash	.\FlowerBoxScreenshot.jpg
Algorithm	Hash	Path
SHA256	3AB5CEBE796F7D0061E11E5E95D690611B327F2602F198CBA662F12191C657E1	F:\Thesis Materi

File Name Directory : KnobCamera.jpg : .658 kB : 2023:10:23 17:07:24-06:00 : 2023:10:27 20:45:46-06:00 : 2023:10:27 20:45:41-06:00 File Size File Modification Date/Time File Access Date/Time File Creation Date/Time File Permissions -rw-rw-rw-JPEG File Type File Type Extension MIME Type Exif Byte Order : jpg : image/jpeg : Big-endian (Motorola, MM) Y Resolution : 72 : 72 : GM1915 X Resolution Camera Model Name Make Y Cb Cr Positioning Exif Version : OnePlus : Centered : 0220 Aperture Value .... 1.6 Scene Type Exposure Compensation Exposure Program Directly photographed : 0 : Pr Program AE Color Space Max Aperture Value : sRGB : 1.6 Exif Image Height Brightness Value : 1824 -0.52 2 Brightness Value Date/Time Original Flashpix Version Sub Sec Time Original White Balance Interoperability Index Exposure Mode Exposure Time Flash 2023:10:10 14:03:22 : : 0100 : 225559 : Auto : R98 - DCF basic file (sRGB) : Auto 1/50 Off, Did not fire 225559 : Flash : Sub Sec Time : F Number Exif Image Width : 1.6 4000 640 Y, Cb, Cr, -27 mm 225559 150 ÷ Components Configuration : Focal Length In 35mm Format Sub Sec Time Digitized 4 2023:10:10 14:03:22 Create Date Shutter Speed Value : 1/50 Metering Mode Focal Length Scene Capture Type Light Source : Spot : 4.8 mm Standard D65 : .. Sensing Method Orientation Not defined Rotate 90 CW . inches 2023:10:10 14:03:22 Resolution Unit : Modify Date XMP Toolkit : Adobe XMP Core 5.1.0-jc003 Photo : Capture Mode : Back [0, 0, 0] [0.0, 0.0, 0.0] AutoHDR Lens Facing : Scene Detect Result Ids : Scene Detect Result Confidences : Scene Is HDR Active Is Night Mode Active Is Bokeh Active False : False : False False Image Width Image Height : 4000 : 1824 : Baseline DCT, Huffman coding : 8 Encoding Process Bits Per Sample

Algorithm	Hash	Path
SHA256	179C131DD11E00D903732B77BC73D4DD4D21D946E73E596D1D67853D9924F36E	F:\Thesis Materi
PS F:∖Thesis	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash .\	KnobScreenshot.jpg
PS F:∖Thesis Algorithm	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash .\ Hash	KnobScreenshot.jpg Path
PS F:\Thesis Algorithm 	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash .\ Hash 	KnobScreenshot.jpg Path 

Prational reloant number	1 44194
File Name	: KnobScreenshot.jpg
Directory	· ·
File Size	: 1883 kB
File Modification Date/Time	: 2023:10:23 17:07:28-06:00
File Access Date/Time	: 2023:10:28 06:46:55-06:00
File Creation Date/Time	: 2023:10:28 06:46:50-06:00
File Permissions	: -rw-rw-rw-
File Type	: JPEG
File Type Extension	: jpg
MIME Type	: image/ipeg
JFIF Version	: 1.01
Resolution Unit	: None
X Resolution	:1
Y Resolution	: 1
Profile CMM Type	
Profile Version	: 2.1.0
Profile Class	: Display Device Profile
Color Snace Data	: RGR
Profile Connection Snace	· YV7
Profile Date Time	. 0000:00:00 00:00:00
Profile File Signature	1 3650
Primary Platform	: Linknown ()
CMM Elage	Not Embedded Independent
Com Flags Device Manufacturer	. Not embedded, independent
Device Model	
Device Model	, Poflactiva, Classy, Pasitiva, Calan
Bendening Intent	. Media Balativa Calapimetric
Connection Conce Tiluminant	
Connection Space IIIuminant	. 0.9042 1 0.82491
Profile TP	
Profile Description	
Profile Description	: SKUB
Red Matrix Column	: 0.43607 0.22249 0.01392
Green Matrix Column	: 0.38515 0./168/ 0.09/08
Blue Matrix Column	: 0.1430/ 0.06061 0./141
Red Tone Reproduction Curve	: (Binary data 40 bytes, use -D option to extract)
Green Tone Reproduction Curve	: (Binary data 40 bytes, use -D option to extract)
Blue Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Media White Point	: 0.9642 1 0.82491
Profile Copyright	: Google Inc. 2016
Image Width	: 1440
Image Height	: 3120
Encoding Process	: Baseline DCT, Huffman coding
Bits Per Sample	: 8
Color Components	1 3
Y Cb Cr Sub Sampling	: YCbCr4:2:0 (2 2)
Image Size	: 1440x3120
Megapixels	: 4.5

Parameters and a second s		File Name	: LightSwitchScreenshot.jpg
File Name	: LightSwitchCamera.jpg	Directory	1.
Directory	: .	File Size	1000 kp
File Size	: 1690 kB	File Medification Date/Time	· 2000 (0 47:07:25 00:00
File Modification Date/Time	: 2023:10:23 17:07:31-06:00	File MOUITICALION Date/Time	: 2023:10:23 1/:0/:35-06:00
File Access Date/Time	: 2023:10:29 05:18:52-06:00	File Access Date/Time	: 2023:10:29 05:26:38-06:00
File Creation Date/Time	: 2023:10:29 05:18:45-06:00	File Creation Date/Time	: 2023:10:29 05:26:35-06:00
File Permissions	: -rw-rw-rw-	File Permissions	: -rw-rw-rw-
File Type	: JPEG	File Type	: JPEG
MTME Type	- JPS : image/ineg	File Type Extension	ing
Exif Bute Order	· Rig-endian (Metorola MM)	MINE THE	· JPE
Y Resolution	. 72	мітме туре	: Image/lbeg
X Resolution	72	JFIF Version	: 1.01
Camera Model Name	: GM1915	Resolution Unit	: None
Make	: OnePlus	X Resolution	: 1
Y Cb Cr Positioning	: Centered	Y Resolution	: 1
Exif Version	: 0220	Profile CWM Ture	
Aperture Value	: 1.6	Profile Vension	
Scene Type	: Directly photographed	Profile version	: 2.1.0
Exposure Compensation	: 0	Profile Class	: Display Device Profile
Exposure Program	: Program AE	Color Space Data	: RGB
Color Space	: sRGB	Profile Connection Space	: XYZ
Max Aperture Value	: 1.6	Profile Date Time	. 0000.00.00 00.00.00
Exif Image Height	: 1824	Profile File Signature	
Brightness Value	: -1.72	Profile File Signature	: acsp
Date/Time Original	: 2023:10:10 14:03:39	Primary Platform	: Unknown ()
Flashpix Version	: 0100	CMM Flags	: Not Embedded, Independent
Sub Sec Time Original	: 091212	Device Manufacturer	
White Balance	: Auto	Device Model	
Interoperability Index	: R98 - DCF basic file (sRGB)	Device Attributes	Peflective Clossy Positive Color
Exposure Mode	: Auto	Device Attributes	. Nedia Balativa Calaminataia
Exposure line	: 1/33	Rendering intent	: Media-Relative Colorimetric
Fidsh Sub Sec Time	. OTT, DIG NOE TIFE	Connection Space Illuminant	: 0.9642 1 0.82491
E Number	1.6	Profile Creator	
Fyif Tmaga Width	1000	Profile ID	: 0
TSO	1999	Profile Description	: SRGB
Components Configuration	: Y. Ch. Cr	Red Matrix Column	· 0 42607 0 22240 0 01202
Focal Length In 35mm Format	: 27 mm	Keu Pider IX Column	0.45007 0.22245 0.01552
Sub Sec Time Digitized	: 091212	Green Matrix Column	: 0.38515 0./168/ 0.09/08
Create Date	: 2023:10:10 14:03:39	Blue Matrix Column	: 0.14307 0.06061 0.7141
Shutter Speed Value	: 1/33	Red Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Metering Mode	: Spot	Green Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Focal Length	: 4.8 mm	Blue Tone Reproduction Curve	(Binary data 40 hytes use -h ontion to extract)
Scene Capture Type	: Standard	Media White Doint	
Light Source	: D65	Predid White Foint	. 0.5042 1 0.02451
Sensing Method	: Not defined	Profile Copyright	: Google Inc. 2016
Orientation	: Rotate 90 CW	Image Width	: 1440
Resolution Unit	: inches	Image Height	: 3120
Modify Date	: 2023:10:10 14:03:39	Encoding Process	: Baseline DCT, Huffman coding
XMP Toolkit	: Adobe XMP Core 5.1.0-jc003	Rits Per Sample	
Capture Mode	: Photo	Calan Companyate	
Lens Facing	: Back	coror components	1 3 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Scene Detect Result Ids	: [0, 0, 0]	Y Cb Cr Sub Sampling	: YCbCr4:2:0 (2 2)
Scene Detect Result Confidences	: [0.0, 0.0, 0.0]	Image Size	: 1440x3120
To HDD Active	- Autonok	Megapixels	: 4.5
To Night Mode Active	· Falca	121300-002-0023-0023-0023-0023-0023-0023	
Te Bokah Active	· Falco		
Teage Width	1000		
Tmage Height	1824		
Encoding Process	Baseline DCT, Huffman codir	ag .	
Bits Per Sample	: 8	2	
ACTUAL TO A CONTRACT OF A CONT	Contraction of the Contraction o		

PS F:\Thesis	<pre>Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot&gt; Get-FileHash .\</pre>	LightSwitchCamera.jpg
Algorithm	Hash	Path
SHA256	4F1A10F8C285B379C590E844F73F10803F23FABA7D4A45E366B7A7C9D8057944	F:\Thesis Materi
PS F:\Thesis	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash .\	LightSwitchScreenshot.jpg
Algorithm	Hash	Path
SHA256	6C7CA11185E8C48CC8FA04927CA2E015B2F99C89BAE31593868CE0AF83F89809	F:\Thesis Materi

	File Name	: RoundCaseCamera.jpg	
	Directory	•••	
	File Size	: 2.2 MB	
	File Access Date/Time	: 2023:10:29 15:23:13-06:0	3
	File Creation Date/Time	: 2023:10:29 15:23:11-06:0	3
	File Permissions	: -rw-rw-rw-	
	File Type	: JPEG	
	MIME Type	· JPS · image/ipeg	
	Exif Byte Order	: Big-endian (Motorola, MM	
	Y Resolution	: 72	
	X Resolution	: 72	
	Camera Model Name	: GM1915	
	Y Ch Cr Positioning	: Centered	
	Exif Version	: 0220	
	Aperture Value	: 1.6	
	Scene Type	: Directly photographed	
	Exposure Program	: Program AF	
	Color Space	: sRGB	
	Max Aperture Value	: 1.6	
	Exif Image Height	: 1824	
	Brightness Value	: -1.16	
	Elashnix Version	· 2023:08:21 12:11:43	
	Sub Sec Time Original	: 285821	
	White Balance	: Auto	
	Interoperability Index	: R98 - DCF basic file (sR	5B)
	Exposure Mode	: Auto	
	Exposure lime Flash	: 1/50 : Off. Did not fire	
	Sub Sec Time	: 285821	
	F Number	: 1.6	
	Exif Image Width	: 4000	
	ISO Components Configuration	: 400	
	Focal Length To 35mm Format	: Y, CD, CF, -	
	Sub Sec Time Digitized	: 285821	
	Create Date	: 2023:08:21 12:11:43	
	Shutter Speed Value	: 1/50	
	Metering Mode	: Center-weighted average	
	Scene Capture Type	: Standard	
	Light Source	: D65	
	Sensing Method	: Not defined	
	Orientation	: Rotate 90 CW	
	Resolution Unit	: inches	
	XMP Toolkit	: 2023:08:21 12:11:43	33
	Capture Mode	: Photo	
	Lens Facing	: Back	
	Scene Detect Result Ids	: [61, 0, 0]	
	Scene Detect Result Confidences	s : [0.82978994, 0.0, 0.0]	
	Is HDR Active	: False	
	Is Night Mode Active	: False	
	Is Bokeh Active	: False	
	Image Width	: 4000	
	Image Height Encoding Descass	: 1824 Bacaline DCT Hoffman co	ting
	Bits Per Sample	: 8	11.6
	Color Consideration		
PS F:\Thesis	Material\Thesis_Photos\OnePlus7Pro\Camera	vsScreenshot> Get-FileHash \P	oundCaseCamera ing
15 II (IIICS15			oundedseedmen at JbB
A constant			Dette
Algorithm	hasn		Path
201000000			
SHA256	7A2F919DC7385F3300FC0070259AC27BED3495	9539ACA941352E97E8B64BA803	F:\Thesis Materi
PS F:\Thesis	Material\Thesis Photos\OnePlus7Pro\Camera	vsScreenshot> Get-FileHash .\R	oundCaseScreenshot.jpg
19 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9			4=11
Algorithm	Hash		Path
SHA256	6DB98E804E95522866233166914DF91498A105	5F1016EF52076DF8DD3CB3B3B0	F:\Thesis Materi
and the second s			

File Name	: TableCordsCamera.jpg
Directory	1.1
File Size	: 2.2 MB
File Modification Date/Time	: 2023:10:23 17:07:49-06:00
File Access Date/Time	: 2023:10:29 16:28:50-06:00
File Creation Date/Time	: 2023:10:29 16:28:47-06:00
File Permissions	: -rw-rw-rw-
File Type	: JPEG
File Type Extension	: ipg
MIME Type	: image/ipeg
Exif Byte Order	: Big-endian (Motorola, MM)
Y Resolution	: 72
X Resolution	: 72
Camera Model Name	· GM1915
Make	: OnePlus
Y Ch Cr Positioning	Centered
Fxif Version	. 0220
Anerture Value	1.6
Scene Tune	Directly photographed
Exposure Compensation	A A A A A A A A A A A A A A A A A A A
Exposure Degreen	· Decoream AF
Color Space	· FT OBT DIM AL
Max Appetune Value	
Fulf Teage Height	. 1014
Exit image Height	. 1824
Brightness value	2022.00.24 42.44.54
Date/Time Original	: 2023:08:21 12:11:54
Flashpix version	: 0100
Sub Sec Time Original	: 491261
White Balance	: AUEO
Interoperability Index	: R98 - DCF Dasic file (sRGB)
Exposure Mode	: Auto
Exposure lime	: 1/33
Flash	: Off, Did not fire
Sub Sec Time	: 491261
F Number	: 1.6
Exif Image Width	: 4000
ISO	: 500
Components Configuration	: Y, Cb, Cr, -
Focal Length In 35mm Format	: 27 mm
Sub Sec Time Digitized	: 491261
Create Date	: 2023:08:21 12:11:54
Shutter Speed Value	: 1/33
Metering Mode	: Center-weighted average
Focal Length	: 4.8 mm
Scene Capture Type	: Standard
Light Source	: 065
Sensing Method	: Not defined
Orientation	: Rotate 90 CW
Resolution Unit	: inches
Modify Date	: 2023:08:21 12:11:54
XMP Toolkit	: Adobe XMP Core 5.1.0-jc003
Capture Mode	: Photo
Lens Facing	: Back
Scene Detect Result Ids	: [0, 0, 0]
Scene Detect Result Confidences	: [0.0, 0.0, 0.0]
Scene	: AutoHDR
Is HDR Active	: False
Is Night Mode Active	: False
Is Bokeh Active	: False
Image Width	: 4000
Image Height	: 1824
	Description DCT Hafford and have
Encoding Process	* Kaseline 18 L. Buttman Coultro

PS F:\Thesis Algorithm	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash Hash	.\TableCordsCamera.jpg Path
SHA256	 DCB8DC9B075E9647A0517F3320BBDDBB34893CAFFB02169D7026A176ADE7CE3A	F:\Thesis Materi
PS F:\Thesis	Material\Thesis Photos\OnePlus7Pro\CameravsScreenshot> Get-FileHash	.\TableCordsScreenshot.jpg
Algorithm	Hash	Path
SHA256	DAE6AF6D619FCF7A24986641BF339E7197FC10947AF328BB3C975E5196C1E2D7	 F:∖Thesis Materi

File Name	: TableCordsScreenshot.jpg
Directory	
File Size	: 2.4 MB
File Modification Date/Time	: 2023:10:23 17:07:54-06:00
File Access Date/Time	: 2023:10:29 16:46:55-06:00
File Creation Date/Time	: 2023:10:29 16:46:51-06:00
File Permissions	: -rw-rw-rw-
File Type	: JPEG
File Type Extension	: jpg
MIME Type	: image/jpeg
JFIF Version	: 1.01
Resolution Unit	: None
X Resolution	: 1
Y Resolution	: 1
Profile CMM Type	:
Profile Version	: 2.1.0
Profile Class	: Display Device Profile
Color Space Data	: RGB
Profile Connection Space	: XYZ
Profile Date Time	: 0000:00:00 00:00:00
Profile File Signature	: acsp
Primary Platform	: Unknown ()
CMM Flags	: Not Embedded, Independent
Device Manufacturer	
Device Model	:
Device Attributes	: Reflective, Glossy, Positive, Color
Rendering Intent	: Media-Relative Colorimetric
Connection Space Illuminant	: 0.9642 1 0.82491
Profile Creator	
Profile ID	: 0
Profile Description	: sRGB
Red Matrix Column	: 0.43607 0.22249 0.01392
Green Matrix Column	: 0.38515 0.71687 0.09708
Blue Matrix Column	: 0.14307 0.06061 0.7141
Red Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Green Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Blue Tone Reproduction Curve	: (Binary data 40 bytes, use -b option to extract)
Media White Point	: 0.9642 1 0.82491
Profile Copyright	: Google Inc. 2016
Image Width	: 1440
Image Height	: 3120
Encoding Process	: Baseline DCT, Huffman coding
Bits Per Sample	: 8
Color Components	: 3
Y Cb Cr Sub Sampling	: YCbCr4:2:0 (2 2)
Image Size	: 1440x3120
Megapixels	: 4.5

	File Name Directory	: TotemCamera.jpg	
	File Size	: 1851 kB	
	File Modification Date/Time	: 2023:10:23 17:08:00-06:00	
	File Access Date/Time	: 2023:10:29 17:18:46-06:00	
	File Permissions	: -FW-FW-FW-	
	File Type	: JPEG	
	File Type Extension	: jpg	
	MIME Type	: image/jpeg	
	Exit Byte Order	: Big-endian (Motorola, MM)	
	X Resolution	: 72	
	Camera Model Name	: GM1915	
	Make	: OnePlus	
	Y Cb Cr Positioning	: Centered	
	Exit Version	: 0220	
	Scene Type	· Directly photographed	
	Exposure Compensation	: 0	
	Exposure Program	: Program AE	
	Color Space	: sRGB	
	Max Aperture Value	: 1.6	
	Exit image Height Brightness Value	1.75	
	Date/Time Original	: 2023:10:10 14:03:53	
	Flashpix Version	: 0100	
	Sub Sec Time Original	: 405434	
	White Balance	: Auto	120
	Interoperability Index	: R98 - DCF basic file (sRG	3)
	Exposure Time	: AUCO	
	Flash	: Off. Did not fire	
	Sub Sec Time	: 405434	
	F Number	: 1.6	
	Exif Image Width	: 4000	
	ISO	: 400	
	Focal Length In 35mm Format	· · · 27 mm	
	Sub Sec Time Digitized	: 405434	
	Create Date	: 2023:10:10 14:03:53	
	Shutter Speed Value	: 1/33	
	Metering Mode	: Spot	
	Focal Length Scene Contine Time	: 4.8 mm	
	Light Source	· D65	
	Sensing Method	: Not defined	
	Orientation	: Rotate 90 CW	
	Resolution Unit	: inches	
	Modify Date	: 2023:10:10 14:03:53	
	XMP Toolkit	: Adobe XMP Core 5.1.0-jc00	
	Lens Facing	: Back	
	Scene Detect Result Ids	: [61, 0, 0]	
	Scene Detect Result Confidences	: [0.9125388, 0.0, 0.0]	
	Scene	: AutoHDR	
	Is HDR Active	: False	
	Is Night Mode Active	· False	
	Image Width	: 4000	
	Image Height	: 1824	
	Encoding Process	: Baseline DCT, Huffman cod:	ing
	Bits Per Sample	: 8	
PS F:\Thesis	Material\Thesis Photos\OnePlus7Pro\CameravsScreet	eenshot> Get-FileHash .\T	otemCamera.jpg
Algorithm	Hash		Path
SHA256	B849631E2AA77A8BC7BC3E03B144099D852E5CC5DA9	8F8A91FBB4714BC26DBB6	F:\Thesis Materi.
	Natarial) There is Deaters (Orap)	analysis out of all all and an	at an Canada a bat day
PS F:\Thesis	material(Inesis Photos(OnePlus/Pro(CameravsScre	eenshot> Get-FileHash .\T	otemscreenshot.jpg
			A2007
Algorithm	Hash		Path
SHA256	0BAFD1074B47C70D3B5E4D05614B892FAD92480C0C57	7AA23E9C4890A6BF9A4AD	F:\Thesis Materi

File Name : TotemScreenshot.jpg Directory : 2.2 MB File Size File Modification Date/Time : 2023:10:23 17:06:32-06:00 File Access Date/Time File Creation Date/Time : 2023:10:29 17:39:38-06:00 : 2023:10:29 17:39:05-06:00 : 2023:10:29 17:39:05-06:00 File Permissions -rw-rw-rw-: File Type File Type Extension MIME Type : JPEG : jpg : image/jpeg JFIF Version Resolution Unit : 1.01 : None X Resolution : 1 Y Resolution Profile CMM Type : 1 Profile Version : 2.1.0 : Display Device Profile : RGB Profile Class Color Space Data Profile Connection Space : XYZ Profile Date Time Profile File Signature : 0000:00:00 00:00:00 : acsp : Unknown () : Not Embedded, Independent Primary Platform CMM Flags Device Manufacturer Device Model Device Attributes . : Reflective, Glossy, Positive, Color : Media-Relative Colorimetric Rendering Intent Connection Space Illuminant Profile Creator : 0.9642 1 0.82491 Profile ID : 0 Profile Description : SRGB Red Matrix Column : 0.43607 0.22249 0.01392 Green Matrix Column Blue Matrix Column : 0.38515 0.71687 0.09708 : 0.14307 0.06061 0.7141 Red Tone Reproduction Curve (Binary data 40 bytes, use -b option to extract) Green Tone Reproduction Curve Blue Tone Reproduction Curve (Binary data 40 bytes, use -b option to extract) (Binary data 40 bytes, use -b option to extract) Media White Point 0.9642 1 0.82491 Profile Copyright Image Width : Google Inc. 2016 : 1440 Image Height : 3120 : Baseline DCT, Huffman coding Encoding Process Bits Per Sample : 8 Color Components : 3 Y Cb Cr Sub Sampling : YCbCr4:2:0 (2 2) Image Size : 1440x3120 Megapixels : 4.5

# \*SAMSUNG GALAXY A11 ADDITIONAL IMAGES, HASH VERIFICATIONS, AND FIAS REPORTS



File Name : BlackGirlMagicCamera.jpg Directory : . File Size : 4.2 MB 

 File Size
 : 4.2 MB

 File Modification Date/Time
 : 2023:10:23 17:08:25-06:00

 File Access Date/Time
 : 2023:10:24 15:20:47-06:00

 File Creation Date/Time
 : 2023:10:24 15:20:05-06:00

 File Permissions
 : -rw-rw-rw 

 File Type
 : JPEG

 File Type: JPEGFile Type Extension: jpgMIME Type: image/jpegExif Byte Order: Big-endian (Motorola, MM)Camera Model Name: SM-A115UOrientation: Rotate 90 CWModify Date: 2023:10:10 08:04:50Focal Length: 3.6 mmExposure Time: 1/13 Focal Length Exposure Time : No Flash Flash : 3017 ISO White Balance : Auto Aperture Value : 1.9 Make : samsung JFIF Version : 1.01 MakeJFIF Version: 1.01Resolution Unit: NoneX Resolution: 1Y Resolution: 1Image Width: 4160Image Height: 3120Encoding Process: Baseline DCT, Huffman codingBits Per Sample: 8Color Components: 3Y Cb Cr Sub Sampling: YCbCr4:2:0 (2 2)Aperture: 1.9: 4160x3120 Megapixels : 13.0 Shutter Speed Focal Length : 1/13 : 3.6 mm Light Value : 0.6 : BlackGirlMagicScreenshot.jpg File Name Directory : . File Size : 576 kB File Modification Date/Time : 2023:10:23 17:08:26-06:00 File Access Date/Time : 2023:10:24 15:33:28-06:00 : 2023:10:24 15:32:43-06:00 File Creation Date/Time File Permissions : -rw-rw-rw-File Type : JPEG File Type Extension : jpg JFIF Version : image/jpeg : 1.01 Resolution Unit : None X Resolution : 1 Y Resolution : 1 Image Width : 720 Image Height : 1560 Encoding Process : Baseline DCT, Huffman coding Bits Per Sample : 8 Color Components : 3 Y Cb Cr Sub Sampling : YCbCr4:2:0 (2 2) Image Size : 720x1560 Megapixels : 1.1 Megapixels : 1.1

PS F:\Thesis a.jpg	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHas	sh .\BlackGirlMagicCamer
Algorithm	Hash	Path
SHA256	0DE92368E00B85AE198C971D0D5F1384F0750E833D4A0E5AE5411BA96F091C3B	F:\Thesis Materi
PS F:∖Thesis nshot.jpg	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHa	sh .\BlackGirlMagicScree
Algorithm	Hash	Path
SHA256	2235BB5C42FABA66339B5F84DB5684AF7A2054918DE7EF32858B75FEA49E0E18	F:\Thesis Materi

File Name			BookcaseCamera	a.jpg
Directory	:		•	
File Size	:		4.2 MB	
File Modific	ation Date/Time :		2023:10:23 17:	:08:34-06:00
File Access	Date/Time :		2023:10:24 15:	:40:02-06:00
File Creatio	on Date/Time :		2023:10:24 15:	:37:52-06:00
File Permiss	ions :		-rw-rw-rw-	
File Type			JPEG	
File Type Ex	tension :		jpg	
MIME Type			image/jpeg	10 DE 1020
Exif Byte Or	der :		Big-endian (Mo	otorola, MM)
Camera Model	Name :		SM-A1150	
Urientation			Rotate 90 CW	20.11
Modity Date			2023:08:21 11:	:30:11
Focal Length			5.0 mm	
Exposure Till	ie :		1/14 No Elsch	
TSO			2224	
White Balanc			2004 Auto	
Apartura Val			1 0	
Make			samsung	
JETE Version			1 01	
Resolution U	Init		None	
X Resolution			1	
Y Resolution			1	
Image Width			4160	
Image Height			3120	
Encoding Pro	cess :		Baseline DCT.	Huffman coding
Bits Per Sam	ple :		8	
Color Compon	ients :		3	
Y Cb Cr Sub	Sampling :		YCbCr4:2:0 (2	2)
Aperture			1.9	20-
Image Size			4160x3120	
Megapixels			13.0	
Shutter Spee	ed :		1/14	
Focal Length	. :		3.6 mm	
Light Value	:		1.1	
	File Name		: Bo	ookcaseScreenshot.jpg
	Directory		÷ .	222023
	File Size	ne	: 52	20 kB
	File Modification Dat	te	/Time : 20	023:10:23 17:08:35-06:00
	File Access Date/Time	2	: 26	023:10:24 15:50:52-06:00
	File Creation Date/Ti	1 11	ie : 26	023:10:24 15:49:43-06:00
	File Permissions		: -1	rw-rw-rw-
	File Type		: 11	PEG
	File Type Extension		: 76	Pg
	PIME Type		: 11	mage/jpeg
	Decolution Unit		: 1. . No	.01
	X Pacalution		: NC	one
	V Pasolution		: 1	
	Tmage Width		. 1	20
	Image Height		. 14	560
	Encoding Process		· 1.	aseline DCT. Huffman coding
	Bits Per Sample		: 8	aserance sery narringin couring
	Color Components			
	Y Cb Cr Sub Sampling		: 10	CbCr4:2:0 (2 2)
	Image Size		: 72	20x1560
	Megapixels		: 1.	.1

PS F:\Thesis	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHas	sh .\BookcaseCamera.jpg
Algorithm	Hash	Path
SHA256	9B9C7AE71054DD58AF4AF8951CF942793B913A526264D19728EE7C2CD4C5C333	F:\Thesis Materi
PS F:∖Thesis jpg	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHas	sh .\BookcaseScreenshot.
Algorithm	Hash	Path
SHA256	 BDE02F7466E7FCD2B6E4F1EADCDEA76893EAA1D007730A2239529219F9890620	F:\Thesis Materi

File Name : BoxesCamera.jpg Directory : . : 2.1 MB File Size : 2023:10:23 17:08:48-06:00 File Modification Date/Time : 2023:10:24 16:44:55-06:00 File Access Date/Time : 2023:10:24 16:44:31-06:00 File Creation Date/Time File Permissions : -rw-rw-rw-File Type : JPEG File Type Extension : jpg : image/jpeg MIME Type : Big-endian (Motorola, MM) Exif Byte Order : SM-A115U Camera Model Name : Rotate 90 CW Orientation : 2023:08:21 11:29:47 : 3.6 mm Modify Date Focal Length : 1/25 Exposure Time : No Flash : 363 Flash ISO White Balance : Auto : 1.9 : samsung : 1.01 : None Aperture Value Make JFIF Version Resolution Unit X Resolution : 1 : 1 : 4160 : 3120 : Baseline DCT, Huffman coding : 8 Y Resolution Image Width Image Height Encoding Process Bits Per Sample : 3 : YCbCr4:2:0 (2 2) Color Components Y Cb Cr Sub Sampling : 1.9 Aperture Image Size : 4160x3120 : 13.0 Megapixels : 1/25 Shutter Speed : 3.6 mm Focal Length : 4.6 Light Value

Algorithm	Hash	Path
SHA256	 7B22F941F297286FC4BEDB1EF4563D330CA4C8BFDF485C9145DA65A0504F3DC7	 F:\Thesis Materi
PS F:∖Thesis	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHa	sh .\BoxesScreenshot.jpg
PS F:∖Thesis Algorithm	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHa Hash	sh .\BoxesScreenshot.jpg Path

File Name : LooneyTunesCamera.jpg Directory : . File Size : 8.4 MB 

 File Modification Date/Time
 : 2023:10:23 17:09:00-06:00

 File Access Date/Time
 : 2023:10:29 05:30:25-06:00

 File Creation Date/Time
 : 2023:10:29 05:30:19-06:00

 File Permissions
 : -rw-rw-rw 
 : -rw-rw-rw-: JPEG : jpg : image/jpeg : Big-endian (Motorola, MM) : SM-A115U : Rotate 90 CW : 2023:10:15 13:28:37 : 3.6 mm : 1/15 : No Flash : 2382 File Type File Type Extension Exif Byte Order MIME Type Camera Model Name Orientation Modify Date Focal Length Exposure Time Flash : 2382 ISO : Auto : 1.9 : samsung : 1.01 White Balance Aperture Value Make JFIF Version Resolution Unit : None : None : 1 : 1 : 4160 : 3120 : Baseline DCT, Huffman coding : 8 : 3 : YCbCr4:2:0 (2 2) : 1.9 : 4160x3120 : 13.0 X Resolution Y Resolution Image Width Image Height Encoding Process Bits Per Sample Color Components Y Cb Cr Sub Sampling Aperture Image Size Megapixels : 13.0 : 1/15 : 3.6 mm : 1.1 Shutter Speed Focal Length Light Value : LooneyTunesScreenshot.jpg : . File Name Directory 

 Directory
 : .

 File Size
 : 485 kB

 File Modification Date/Time
 : 2023:10:23 17:09:01-06:00

 File Access Date/Time
 : 2023:10:29 05:42:10-06:00

 File Creation Date/Time
 : 2023:10:29 05:42:08-06:00

 File Permissions
 : -rw-rw-rw 
 File Permissions File Type : JPEG File Type Extension : jpg : image/jpeg : 1.01 : None MIME Type JFIF Version Resolution Unit : 1 : 1 : 720 : 1560 X Resolution Y Resolution Image Height Image Width : 1560 : Baseline DCT, Huffman coding : 8 : 3 : YCbCr4:2:0 (2 2) : 720x1560 : 1 1 Image Height Encoding Process Bits Per Sample Color Components Y Cb Cr Sub Sampling Image Size : 1.1 Megapixels

File Name	: MouseCamera.jpg
Directory	
File Size	: 4.2 MB
File Modification Date/Time	: 2023:10:23 17:09:13-06:00
File Access Date/Time	: 2023:10:29 06:10:55-06:00
File Creation Date/Time	: 2023:10:29 06:10:47-06:00
File Permissions	: -rw-rw-rw-
File Type	: JPEG
File Type Extension	: jpg
MIME Type	: image/jpeg
Exif Byte Order	: Big-endian (Motorola, MM)
Camera Model Name	: SM-A115U
Orientation	: Horizontal (normal)
Modify Date	: 2023:10:10 08:04:28
Focal Length	: 3.6 mm
Exposure Time	: 1/11
Flash	: No Flash
ISO	: 3318
White Balance	: Auto
Aperture Value	: 1.9
Make	: samsung
JFIF Version	; 1.01
Resolution Unit	: None
X Resolution	: 1
Y Resolution	: 1
Image Width	: 4160
Image Height	: 3120
Encoding Process	: Baseline DCI, Huttman coding
Bits Per Sample	: 8
Color Components	: 3
Y CD Cr Sub Sampling	: YCDCr4:2:0 (2 2)
Aperture	: 1.9
Image Size	: 4160X3120
Shutton Speed	: 15.0
Shutter Speed	: 1/11 . 3.6 mm
Focal Length	: 5.0 mm
Light value	. 0.2
File Name	· MouseScreenshot ing
Directory	i nousesereensnoerjpg
File Size	· 279 kB
File Modification Date/Time	: 2023:10:23 17:09:14-06:00
File Access Date/Time	: 2023:10:29 06:45:42-06:00
File Creation Date/Time	: 2023:10:29 06:45:37-06:00
File Permissions	: -rw-rw-rw-
File Type	: JPEG
File Type Extension	: ipg
MIME Type	: image/jpeg
JFIF Version	: 1.01
Resolution Unit	: None
X Resolution	: 1
Y Resolution	; 1
Image Width	: 720
Image Height	: 1560
Encoding Process	: Baseline DCT, Huffman coding
Bits Per Sample	: 8
Color Components	: 3
Y Cb Cr Sub Sampling	: YCbCr4:2:0 (2 2)
Image Size	: 720×1560
Megapixels	: 1.1

Algorithm	Hash	Path
SHA256	D28CA0FEA80AC4026574AA6D653696AC5FB978D2D21AF4EE8656913E8FDD0F68	F:\Thesis Materi
		h MaussEspanshot ing
PS F:\Thesis	Material(Thesis Photos(SamsungGalaxyAll(CameravsScreenshot> Get-FileHas	n .(Mousescreensnot.jpg
PS F:\Thesis Algorithm	Material(Inesis Photos(SamsungualaxyAll(CameraVsScreenshot) Get-FileHas	Path

PS F:∖Thesis pg	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHas	h .\LooneyTunesCamera.j
Algorithm	Hash	Path
SHA256	 603551118B5523B042A86307004EE277924B40B55ED8CD1661DB3F27E273E084	F:\Thesis Materi
PS F:\Thesis ot.jpg	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHas	h .\LooneyTunesScreensh
Algorithm	Hash	Path
SHA256	 85B62BE2F2D1642D9A7DA285301F0F595B7EC98B84D39F3CA64A7565DA3CDBBD	F:\Thesis Materi

File Name : NLBaseballCamera.jpg Directory : . : 8.4 MB File Size 
 File Modification Date/Time
 : 2023:10:23 17:09:27-06:00

 File Access Date/Time
 : 2023:10:29 06:51:14-06:00
 : JPEG File Type File Type: JPEGFile Type Extension: jpgMIME Type: image/jpegExif Byte Order: Big-endian (Motorola, MM)Camera Model Name: SM-A115UOrientation: Rotate 90 CWModify Date: 2023:10:10 08:05:16Focal Length: 3.6 mmExposure Time: 1/15Flash: No FlashTSO: 1715 ISO: 1715White Balance: AutoAperture Value: 1.9Make: samsungJFIF Version: 1.01Resolution Unit: NoneX Resolution: 1Y Resolution: 1Image Width: 4160Image Height: 3120Encoding Process: Baseline DCT, Huffman codingBits Per Sample: 8Color Components: 3Y Cb Cr Sub Sampling: YCbCr4:2:0 (2 2)Aperture: 1.9Image Size: 4160x3120 ISO : 1715 Some -: 4160×3120 Image Size Megapixels : 13.0 Shutter Speed Focal Length : 1/15 : 3.6 mm Light Value : 1.6 File Name: NLBaseballScreenshot.jpgDirectory: .File Size: 593 kBFile Modification Date/Time: 2023:10:23 17:09:28-06:00File Access Date/Time: 2023:10:29 07:36:08-06:00File Creation Date/Time: 2023:10:29 07:36:01-06:00File Permissions: -rw-rw-rw-File Access Date/Time: 2023:10:29 07:36:01-06:00 File Permissions : JPEG File Type File Type Extension MIME Type : jpg : image/jpeg : 1.01 JFIF Version : None Resolution Unit X Resolution : 1 X Resolution : 1 Y Resolution : 1 Image Width : 720 Image Height : 1560 Encoding Process : Baseline DCT, Huffman coding Bits Per Sample : 8 Color Components : 3 Y Cb Cr Sub Sampling : YCbCr4:2:0 (2 2) Image Size : 720x1560 Megapixels : 1.1

PS F:∖Thesis g	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHash	.\NLBaseballCamera.jp
Algorithm	Hash	Path
SHA256	148FD9A5D1C3C5450916F7851C3AACC52DBEA14A1F9266D15355A86019191705	F:\Thesis Materi
PS F:∖Thesis t.jpg	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHash	.\NLBaseballScreensho
Algorithm	Hash	Path
SHA256	 143073EB9A7E1FF012E698B2E553354E856C06D96F42E4B36762CF456BB67BC4	 F:\Thesis Materi

File Name : RaidCamera.jpg File Size : 8.4 MB File Modification Date/Time : 2023:10:23 17:09:45-06:00 File Access Date/Time : 2023:10:29 08:12:01-06:00 File Creation Date/Time : 2023:10:29 08:11:52-06:00 File Permissions : -rW-rW-File Turc Directory 1 . File Type : JPEG File Type Extension : jpg MIME Type: jpgExif Byte Order: image/jpegExif Byte Order: Big-endian (Motorola, MM)Camera Model Name: SM-A115UOrientation: Rotate 90 CWModify Date: 2023:10:10 08:06:52Focal Length: 2 6 mm Focal Length Exposure Time : 3.6 mm : 1/17 : No Flash : 1857 Flash IS0 White Balance Aperture Value : Auto : 1.9 : samsung : 1.01 Make Make: samsungJFIF Version: 1.01Resolution Unit: NoneX Resolution: 1Y Resolution: 1Image Width: 4160Image Height: 3120Encoding Process: Baseline DCT, Huffman codingBits Per Sample: 8Color Components: 3Y Cb Cr Sub Sampling: YCbCr4:2:0 (2 2)Aperture: 1.9Image Size: 4160x3120 Make JFIF Version Resolution Unit X Resolution Y Resolution Image Size : 4160x3120 Megapixels : 13.0 Shutter Speed : 1/17 Focal Length : 3.6 mm : 1.7 Light Value File Name : RaidScreenshot.jpg Directory · :... File F F F F F F

File Size	: 456 KB
File Modification Date/Time	: 2023:10:23 17:09:46-06:00
File Access Date/Time	: 2023:10:29 08:37:24-06:00
File Creation Date/Time	: 2023:10:29 08:35:02-06:00
File Permissions	: - rw- rw- rw-
File Type	: JPEG
File Type Extension	: jpg
MIME Type	: image/jpeg
JFIF Version	: 1.01
Resolution Unit	: None
X Resolution	: 1
Y Resolution	: 1
Image Width	: 720
Image Height	: 1560
Encoding Process	: Baseline DCT, Huffman coding
Bits Per Sample	: 8
Color Components	: 3
Y Cb Cr Sub Sampling	: YCbCr4:2:0 (2 2)
Image Size	: 720x1560
Megapixels	: 1.1

PS F:\Thesis	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHa	sh .\RaidCamera.jpg
Algorithm	Hash	Path
SHA256	545031764D7A69969FC3F132B29D58E7E83F8D80A5F3055635483C0A06A6D56E	F:\Thesis Materi
PS F:\Thesis	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHa:	sh .\RaidScreenshot.jpg
Algorithm	Hash	Path
SHA256	 A7207FCF2C9E5C8D2B4BF57D05FC0138C77766E51A98609B48A3928AC961E215	F:\Thesis Materi

File Name : RecordTableCamera.jpg Directory : . File Size : 4.2 MB File Modification Date/Time : 2023:10:23 17:09:52-06:00 
 File Access Date/Time
 : 2023:10:29 08:41:13-06:00

 File Creation Date/Time
 : 2023:10:29 08:41:05-06:00

 File Permissions
 : -rw-rw-rw File Type : JPEG File Type File Type Extension File Type Extension: jpgMIME Type: image/jpegExif Byte Order: Big-endian (Motorola, MM)Camera Model Name: SM-A115UOrientation: Horizontal (normal)Modify Date: 2023:10:15 13:29:33Focal Length: 3.6 mmExposure Time: 1/20 Modity Date Focal Length Exposure Time : No Flash Flash : 1275 ISO White Balance : Auto Aperture Value : 1.9 Make : samsung JFIF Version : 1.01 Resolution Unit : None X Resolution : 1 Y Resolution : 1 Image Width : 4160 Image Height : 3120 Encoding Process : Baseline DCT, Huffman coding Bits Per Sample : 8 Color Components : 3 Y Cb Cr Sub Sampling : YCbCr4:2:0 (2 2) Aperture : 1.9 Toron Size : 4160x3120 TSO : 4160x3120 : 13.0 Megapixels Shutter Speed Focal Length : 1/20 : 3.6 mm Light Value : 2.5 File Name : RecordTableScreenshot.jpg Directory : . File Size : 304 kB File Modification Date/Time : 2023:10:23 17:09:53-06:00 File Access Date/Time : 2023:10:29 09:32:16-06:00 : 2023:10:29 09:32:09-06:00 : -rw-rw-rw-File Access Date/Time File Creation Date/Time File Permissions File Permissions: -rw-rw-rw-File Type: JPEGFile Type Extension: jpgMIME Type: image/jpegJFIF Version: 1.01Resolution Unit: NoneX Resolution: 1Y Resolution: 1Image Width: 720Image Height: 1560Encoding Process: Baseline DCT, Huffman codingBits Per Sample: 8Color Components: 3Y Cb Cr Sub Sampling: YCbCr4:2:0 (2 2)Image Size: 720x1560Megapixels: 1.1

Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHas	sh .∖RecordTableCamera.j
Hash	Path
9A92C4E26CA765B2162D6BA8CFA8D531EA071476002E52954F2FD594DEE2102F	F:\Thesis Materi
Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHas	sh .\RecordTableScreensh
Hash	Path
 5A606886ACFDB5982F14A3E3ED046E704B2C862E1A3E8A950BDD1BE66D0A74F7	F:\Thesis Materi
	<pre>Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot&gt; Get-FileHas Hash 9A92C4E26CA765B2162D6BA8CFA8D531EA071476002E52954F2FD594DEE2102F Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot&gt; Get-FileHas Hash 5A606886ACFDB5982F14A3E3ED046E704B2C862E1A3E8A950BDD1BE66D0A74F7</pre>

File Name :	: WeightVestCamera.jpg		
Directory :			
File Size :	8.4 MB		
File Modification Date/Time :	2023:10:23 17:10:06-06:00		
File Access Date/Time :	2023:10:29 18:15:24-06:00		
File Creation Date/Time :	2023:10:29 18:15:19-06:00		
File Permissions :	-rw-rw-rw-		
File Type :	JPEG		
File Type Extension :	jpg		
MIME Type :	image/jpeg		
Exif Byte Order :	Big-endian (Motorola, MM)		
Camera Model Name :	SM-A115U		
Orientation :	: Rotate 90 CW		
Modify Date :	2023:10:10 08:03:51		
Focal Length :	3.6 mm		
Exposure Time :	1/20		
Flash :	No Flash		
ISO ::	1431		
White Balance :	Auto		
Aperture Value :	1.9		
Make :	samsung		
JFIF Version :	1.01		
Resolution Unit :	None		
X Resolution :	1		
Y Resolution :	1		
Image Width :	4160		
Image Height :	3120		
Encoding Process :	Baseline DCT, Huffman coding		
Bits Per Sample :	8		
Color Components :	3		
Y Cb Cr Sub Sampling :	YCbCr4:2:0 (2 2)		
Aperture :	1.9		
Image Size :	4160x3120		
Megapixels :	13.0		
Shutter Speed :	1/20		
Focal Length :	3.6 mm		
Light Value :	2.3		

File Name	: WeightVestScreenshot.jpg
Directory	1.
File Size	: 458 kB
File Modification Date/Time	: 2023:10:23 17:08:16-06:00
File Access Date/Time	: 2023:10:29 18:37:45-06:00
File Creation Date/Time	: 2023:10:29 18:37:37-06:00
File Permissions	: -rw-rw-rw-
File Type	: JPEG
File Type Extension	: jpg
MIME Type	: image/jpeg
JFIF Version	: 1.01
Resolution Unit	: None
X Resolution	: 1
Y Resolution	: 1
Image Width	: 720
Image Height	: 1560
Encoding Process	: Baseline DCT, Huffman coding
Bits Per Sample	: 8
Color Components	: 3
Y Cb Cr Sub Sampling	: YCbCr4:2:0 (2 2)
Image Size	: 720x1560
Megapixels	: 1.1

PS F:∖Thesis g	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHash	n .\WeightVestCamera.jp
Algorithm	Hash	Path
SHA256	1057C61E91A3AD21EA04D76BEA32B2E95978D9244A64AC17C234DADC64481490	F:\Thesis Materi
PS F:∖Thesis t.jpg	Material\Thesis Photos\SamsungGalaxyA11\CameravsScreenshot> Get-FileHash	∩.\WeightVestScreensho
Algorithm	Hash	Path
SHA256	5F5E00CAA8D900380BD4F954A09C5EDF09F4F17094881ADEA66D200B7F533A1A	F:\Thesis Materi