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2 HESHAM H. ALSAADI
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GAMMA

DEVELOPING IMAGING SYSTEM USING CAMANJS

TECHNIQUES TO ANALYZE AND VISUALIZE STREAM IMAGES

ELSEVIER B.V.

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For My Family

In the kingdom of glass everything is transparent, and there is
no place to hide a dark heart.

VERA NAZARIAN

Introduction

Digital photography has conquered the market. Photographers understand that the ease created by technology are many, at the early age of photography editing, photographs were done manually by inspecting photos with magnifiers to find any lens flare failures during printing processes [1]. Many software applications are now available and devoted to manipulate and enhance images completely [2]. Photographers, however, need to learn and devote much more time in learning about current technology. Meanwhile, many types of software have eased the use of enhancing images using predefined preset filters and effects [3]. However, due to the wide range of such software which is optimized, mostly to ease in enhancing photographs using programmed sets of rules, thus affects photographers by keeping such presets out of their control. Hence many photographers shed away from such efforts and complexity when it is essential to understand and have an in-depth knowledge of technology and applied theory of digital image processing.

The age of digital photography

Digital photography has conquered the market, all over the world; the speed of the facts has never been outlined in images as much as now. In the early years of technology, professional photographers eased the development of photography in different aspects of life. Creative photography, on the other hand, revealed in the 20th century and the old Polaroid have been abandoned slowly, telling a positive story about how life is, and the flourishing of the darkest side in the most unexpected places still exist.

The French Nicephore Niepce first created an analog photograph in the 1820s, and the first consumer camera released in early 1900 by Kodak Brownie. Now cameras are much more cheaply produced a lot better and stronger than before [4]. The age of electronic camera has advanced, photos are now stored in a digital format then processed through chemicals on film. In 1975, Kodak invented the first camera where a single photo takes a couple of seconds to record a black and white photo [5]. In 1981, Sony made the big breakthrough when it developed a two-inch-by-two-inch floppy disc that replaced the tape, and digital cameras continued to improve through decades [6]. In the nineties, film's photo quality was still far superior and electronic.

I am thankful that I had time to save some money and buy several Kodak thirty-six exposures for thirty shots, rubbing the film into the camera and start photographing what was around me, there were not many places to go, so I photographed whatever that was around me. Life was simple, a couple of dollars for the exposures and standard film camera by Kodak and that is it - you are all sorted. I didn't cover as much as I wanted to include in my shots. My father used to take me to the film studio to export

what I have shot, 30 pictures made one album which cost three dollars, cover made from plastic not fancy but holds memories; the enjoyment out of what I export meant a lot to me. I still have every single photo I made, not that I am very proud of, but that's the way I got into photography, leaving every concept of photography and just shoot, it is historical now. Every photo is valuable as every aspect of the picture visualizes a story with a profound impact on the senses, exposing you to the surrounding and subtleties around your object/subject. Each image has its language to be spoken and told, shaped in a digital or analog medium.

Sincerely Expressed

Every image has a language. Black and white photography is a medium that can be artistically shaped in full format, photography or digital photography is still difficult art and must be mastered. In black and white you can add your feelings away from distractions, which I aimed to write about in this book, to show you a step-by-step guide to what I have developed for my photo productions.

Away from technical aspects which many textbooks cover about photography either digital cameras, digital technology, or about the latest image manipulations, this book is not intended to simulate either facilitate technicality, but rather to demonstrate a creative development solution for editing and to compose any images to meet your style.

Technical View in this book

Black and white or monochromatic photos are described in this book to ease the use of different techniques. Moreover, the book doesn't focus on image composition or image capture technologies, some of the pictures will be briefly explained to demonstrate the visionary of the photos from the photographer perspective that are taking in several places around the world. However, the technical aspects have been used to produce the images using a simple programming language that is designed by the photographer.

Who is this book for?

This book is for everyone, amateur photographers, professional photographers, creative digital specialists, and creative industries. Unlike other books that spend hundreds of pages talking about theories of photography and technicality behind the photos and doesn't provide the secret recipes. This book is intended to provide tools and materials to help you boost your creativity in photography and to encourage you to think with a vision of how photography composed in a simple context. This book is the first series of the upcoming series of black and white photography captured in different countries around the world. The increasing of digital photography is becoming much more advanced to be mastered and covered in a book, and technologies shouldn't be complex to provide a good photo, but rather provide contents that express the photographer's visions and feelings, which is the aim of this book.

What your going to learn

What you will learn in this book is entirely something not new. The open source tools are provided online at no purchase, but to use such tools an optimization is always needed to meet the demand. If

you haven't done any programming language before, you will learn some of the simplest methods of programming in this book, although I assume you have a small background in HTML and Javascript.

The modules demonstrated in this book will guide you in an easy form to install, configure and program a clean code for your first application. Also, guide you to run other applications on your own, and in case you have experimented that your code is wrong during programming, I have obtained a clean copy of all the source codes needed for download in this book, so you're always safe. If you have any questions or you have experimented some errors during installation or programming, please don't hesitate to email me heshamalsadi@protonmail.com and I will get back to you as possible as I could.

Chapter 1

1 | Be You Not Someone Else

1.1 A good camera is you

Every camera has specifications. Professionals often use some particular cameras. Printing a large size photo is different from publishing an 8x8 photo. In fact, digital cameras differ in their efficiency as well as their performance; the three megapixels were not insufficient for enlargements, image noise in night photos, unnatural colors, week photo edges and much more of the inefficiency in a photograph. Digital photography in the new world has solved all these problems. Medium-format cameras have now more resolutions of 60 million and more. It only makes sense if only you intended to print a 10 or 20 feet long image, which an amateur photographer doesn't need at that stage of learning photography.

The first thing to think about owning a camera is to develop your thoughts of why do you need to photograph? are you interested in nature, portrait or landscape? I love how those amazing photographers take amazing pictures and initialize their style of photos. It is amazing how a photographer takes a perfect time to deliver their emotions and feeling into pictures.

I have seen many great photographers, and before I observe their art work, I see their photos. I believe you will be able to understand the photo credits, the style, and vision comes first. Your first hundred thousand photos are your worse. That's true because, after hundred thousand photos, you will notice what your style/type. Use this method and try taking your first 100 thousand photos using a simple digital camera with no filters, no high pixels, unleash your brain and your eye to shoot and express your feelings. Developing a good eye takes years.

1.2 Envision your process

Connecting with your viewer is the most important part of delivering your sense, pointing at shooting is not enough now. Viewers want to imagine and analyze the creative process of the photographer, copy others if you want to but honestly, I would rather do my experiments to develop a new style rather than copying what someone else does. I would rather learn from my failures to define and refine my style.

A good example of amazing art work is the Mona Lisa painting. This amazing art used many colors, was not only the case of its success but as well as the visual concept of the Mona Lisa. It inspired other artists to create the same replica that you will not even identify until you bring a microscope to check the lines and colors. Analyzing the paint, hinting the fact that many artists developed the same concept of the Mona Lisa painting turned the price of the art extremely low, but why are we comparing a paint

and a photo? Being an artist is a complex process towards successful style. Every photographer wants that picture as a beautiful art piece, and paintings are one good source of admiration, it reflects your thoughts, your opinions to invade and speed up the process of your imagination. Of course, analyzing photos of great photographers and finding out the techniques of the great artist's work is an excellent source of speeding up the process to develop a creative style as well. Again we go back to our primary goal, which is connecting with the viewer and leaving a real emotional impact that is achievable to be creative and think about the process when you want to build a good photo.

1.3 Learning is not a shame thing

In the new age of digital photography, everything is possible from making the most complex objects to simple medium, one advantage that previous photographers didn't use to have was software's to compose and edit their photos. In fact, expect many errors and flaws and photos that appear to be not great is okay - that's how we learn and we still learn every day. Sharing your photos with others is one thing that helps you to understand and develop a good style of photos and the trick is to keep the significant photographs and not sharing every photo but rather than that to be more selective in what you post or share with others, show the best of your best and leave the rest for experiments. I usually store all my photographs either within the digital camera or store it in my digital storage device and archive the photos into folders by date and name of locations, when time of publishing a photograph I can easily identify the date and search by locations and not share the photo more than once, this helps me to know what to post and when I posted the photo as well. If you're more experienced and you like to self-edit those photographs you can save it into a different folder and name the files as edited into the same folder you previously created, this strategy gives you a good navigation later on when you photograph daily and more than hundred photos a day. This technique helped me a lot and I learned that from someone else and now am passing it to you, use every material available through the internet or personal blogs and start analyzing the images of photographers it's not harmful to copy the style of a photograph but add your touch to bring the difference you want to show.

1.4 It's not your camera.. It's you

One of the most regular questions that are being asked everywhere is, "Hey, What kind of camera do you shoot with?", "What software do use to edit your photographs?" The truth is the camera is not the only thing that made the person's photos interesting. The camera records and processes the image but it's the photographer's decision about what's going to be in the picture. Focusing on what you're making is much better than worrying about the DSLR quality, great images come from great thinking. If you don't have a good concept behind your photographs or telling us a story about what we're seeing and they affect us emotionally than it has no impact, rendering the photo ineffective. Focusing on the photo to have a strong focal point and draws attention to your main subject with good composition and lighting is much better than shooting very fast in order to catch a moment that's happening in front of you, but rather focus on the subject that drives emotions and technically perfect. Creating and developing your own fantastic photo out of your own imagination and focusing on your emotion of the scene and the story is one of the most important communication you can tell to others and don't worry, if your images are edited or not, because darkrooms were being used long time ago and Ansel is a way in between documenting the world around us and creating our own imagination "Dodging and burning are steps to

take care of mistakes God made in establishing tonal relationship", dodging means to brighten an area of a photo and burning means to darken it. So capture every spirit you like, any place with your own naked eye. Remember 'Impact' tweak and peek what you want to tell.

Chapter 2

2 | Installing, Configuring Your Work Ground

2.1 The needed requirements

The following chapters deal with techniques that many other software vendors offer for achieving the best possible digital print results, but many software vendors such as Adobe Photoshop require a good skill level in order to achieve and master the techniques. However, the true focus is to explain them in the clearest terms possible. The requirements for you in order to use the techniques are as follows: Photos must be taken in color mode, it doesn't really matter what device you take the picture with or how, whether it's a JPEG format or converted to RAW. Although what we will learn in the following chapters deals strictly with the JPEG format, the RAW format is equally achievable. However, the difference between the two formats is barely noticeable to the eye, but the aim is to open the possibilities for creative and professional photographers as well the armature in developing their own style of photos, away from software's restrictions. The chapters will also demonstrate tools and files free of charge, you will only need to have basic skills and understanding in coding to achieve the desired photo as well as the chapter provides an essential action script for further understanding.

2.2 What you need before getting started

- Text editor: To edit and create HTML, CSS, and JavaScript files.
- Web browser: A modern web browser (Firefox 40.0, Chrome 45.0).
- Local HTTP server (Optional): You need a local HTTP server to host data file for some of the most advanced steps in this book, however, this will launch simply as well in your located directory files.
- Git client (Optional): if you would like to check out the recipe source code directly from our Git repository, you need a Git client installed on your computer.
- Dropbox: You need a dropbox account to download all the files and examples and link to our account, you can view all the source code and use the application as well online.

2.3 Who this book for

If you are a developer or you're familiar with HTML, CSS, and JavaScript, and you wish to get the most of the materials than this chapter is for you.

Code words in text are shown as follows: We can select HTML elements through the use of the `Util.extend = function(obj)`

A block of code is set as follows:

```
Caman("#canvas-id", "path/to/image.jpg", function () {  
    // manipulate image here  
    this.brightness(5).render();  
});
```

When I wish to draw your attention to a code block, the relevant lines or items are set to bold:
`var maxWidth = 1080`

2.4 Important Notes

If I wish to draw your attention to more information related to the subject, the relevant gray box will be provided. This contains information and details about any topic in this book, the box of note should look like this:

Atom is open source project, if you would like to download the software visit <https://atom.io/>

2.5 Downloading the example code

You can download the sample code files, all Packet books you have purchased from your account at <https://www.dropbox.com/sh/u1ng65t5hlhfc5s/AABDcRt2Xnh405psdqrWGjHpa?dl=0> or please email me on heshamalsaadi@protonmail.com.

2.6 Errata

Although I have taken care to ensure the accuracy of the content, mistakes do happen. If you find a mistake in one of the books copy - maybe a mistake in the text or the code - I would be grateful if you could report this to me. By doing so, you can save other readers about any faults and improving in the subsequent versions of this book. Email me with the page number and the details of the error on heshamalsaadi@protonmail.com.

2.7 Questions

You can contact me at heshamalsaadi@protonmail.com if you're having a problem with any subject or aspect of the book, and I will do my best to address it.

2.8 Setting up your WampServer

In this chapter we will cover:

- Installing WampServer on your local machine.
- Configuring WampServer files
- Demonstrating your first project

2.8.1 Introduction

This chapter is designed to help you to get the basic installation and configuration of WampServer, covering the most basic installation aspects, and how to set up a typical environment in order to run your software application internally in your own machine. This chapter will devote a basic understanding on how to use the project files and access the software using your browser. Many professional photographers use this technique in order to exchange photos across the internet privately. However, the intention here is to start developing and running your first project internally without the use of the internet.

What is WampServer?

WampServer [7] is a Windows web development environment. It allows you to create web applications with Apache2, PHP and a MySQL database. Alongside, PhpMyAdmin allows you to manage easily your databases.

WampServer is windows web development environment that are specifically designed to create a small to large applications [8], the software is shipped with several applications such as Apache2, PHP, and MySQL databases, and the installation process is made simple with the second version release. WampServer is developed by Romain Bourdon and maintained by great professional software engineers and its completely free as well as open source project. The software now supports French, Russian as well as English languages. For more information about the software and what type of functionality it supports and to understand the necessary installing specification guides, visits the project through the link <http://www.wampserver.com/en/>. Here in this book, I will focus more on how to use the WampServer to power up your application locally and test your results through the web application that we will develop. I hope that what I will cover can help you to get started, to test and examine multiple Open Source projects that are available on the internet, what we will achieve from this demonstration will guide you to set-up the right environment for your WampServer to work effectively with less errors. WampServer will help you to open up your mind into many other projects and start your own development, it will boost up your productivity with the many possibilities that you can handle and perform.

2.8.2 Installing WampServer On Your Local Machine

To install the WampServer is simple as installing any other software in your local machine, this guide will demonstrate how to install the latest release of WampServer from the official website, and set-up your environment wouldn't take more than a few minutes.

Before Getting Ready

Before we get started make sure you have downloaded the software EditPlus [8] visit <https://www.editplus.com>, EditPlus is a Text Editor and distributed as Shareware. You can download the evaluation version and try

it for 30 days for free. If you have other software that can help to edit code blocks such as Dreamweaver or Notepad that will help as well, but in this book the EditPlus tool is used for editing and configuring the server.

Atom is open source project, if you would like to download the software visit <https://atom.io/>, if you want to check the video of the project which contains the most key elements of the project visit <https://www.youtube.com/watch?v=U5P0oGSrtGg>. Moreover, if you face problems and you don't know what version you should install for your computer visit the latest platforms releases <https://github.com/atom/atom/releases/latest>.

One of the recommended text editor that I personally love to use and it's almost similar to EditPlus functionalities is Atom 1.0, Atom is a desktop application built with HTML, JavaScript, CSS, and Node.js integration. It runs on Electron, a framework for building cross-platform apps using web technologies. Atom 1.0 comes with two different themes - dark or light colors, most importantly its available for Windows 7, 8 OS X and Linux. Atom's main interesting feature is called Smart auto completion, where Atom will help you to autocomplete a necessary code segments as well as among other important features that the software provides is flexibility in modifying and navigating to other project files and folders.

Installing WampServer

1-To download WampServer navigate to the link www.wampserver.com and click on the Download button (see figure 1 and 2).



Figure 1: Shows the WampServer Official Landing Page.

2- For the ease of use, we will assume you're using Windows 8 operating system which is 64 bits, note that this will work in many operating system and older version of Windows operating systems. By selecting the option 64 bits, it should pop-up an alert box about the incompatibility of previous WampServer Extensions/Add-ons as well as the runtime packages component of visual C++, to download the WampServer Correctly some necessary component packages needed, Navigate to Microsoft link www.microsoft.com/en-us/download/details.aspx?id=30679 and the Visual C++ Redistributable Pack-

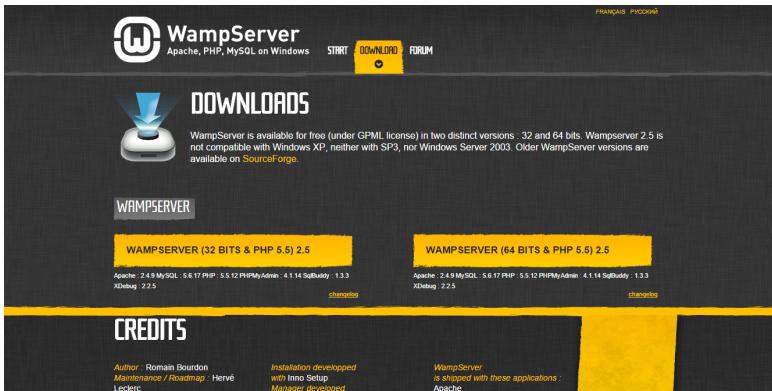


Figure 2: Navigating to Download WampServer Versions.

ages to install the runtime components that are required to run C++ applications built with Visual Studio 2012 (see figure 3).

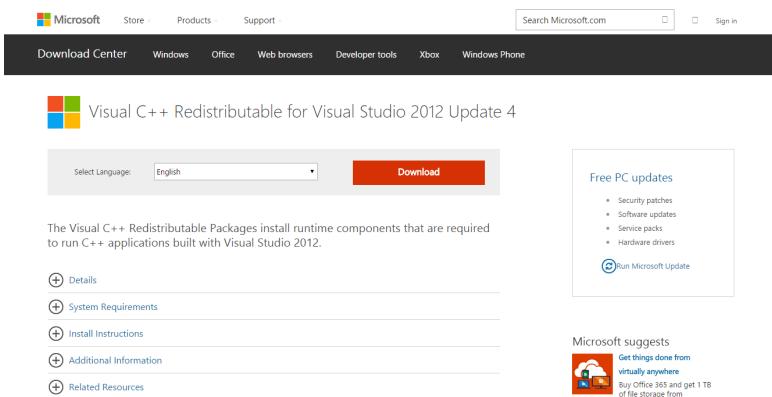


Figure 3: Shows the Microsoft Download Page of Visual C++ Redistributable Packages 2012.

3- After successfully downloading the necessary files, head back to the download page of WampServer, click on download directly highlighted in the pop-up box (see figure 4).

4- The Installation Process demonstrated as follows. Remember that this guidance may appear different, the reason is because WampServer versions always keeps updating and fixes a lot of vulnerabilities ,the version used in this book is WampServer 2 with Apache 2.4.9 , MySQL 5.6.17, PHP 5.5.12, PHP-MyAdmin 4.1.14, SqlBuddy 1.3.3 and XDebug 2.2.5 always download the latest version from the official website.

By accepting the license agreement you will be able to continue the installation process, in case of not accepting the agreement you will not be able to continue the installation, it is advisable to read the license agreement before installing the WampServer. By scrolling the bar in the screen you can read all the necessary information you need to know about the software. It is optional to select any location

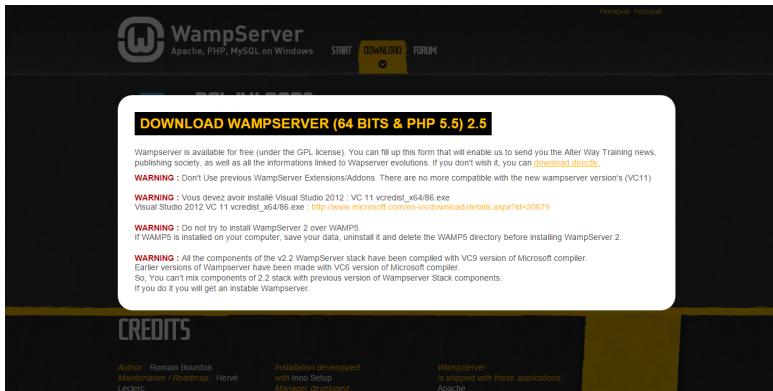


Figure 4: Shows Pop-up Box and instruction to download WampServer.

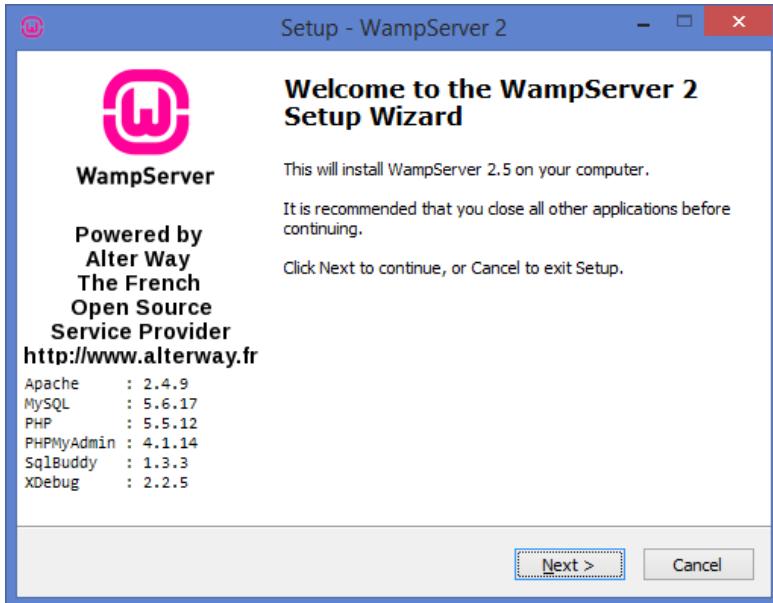


Figure 5: WampServer welcome installation Set-up.

destination of your software installation, however the suitable way to achieve a good installation is to locate the installation where your programs installation files defaults are, this is usually hosted in your C drive, moreover if you choose other drivers it will not harm the software since its all open source project , but you won't be able to follow up with the rest of the chapters since its all explained in the C drives, another thing is when starting the service the software uses a lot of your computer performance, it's always a good choice to keep the default location destination as it is. You can always navigate to the destination location, all files will be located in the C drive, you can simply navigate after the installation

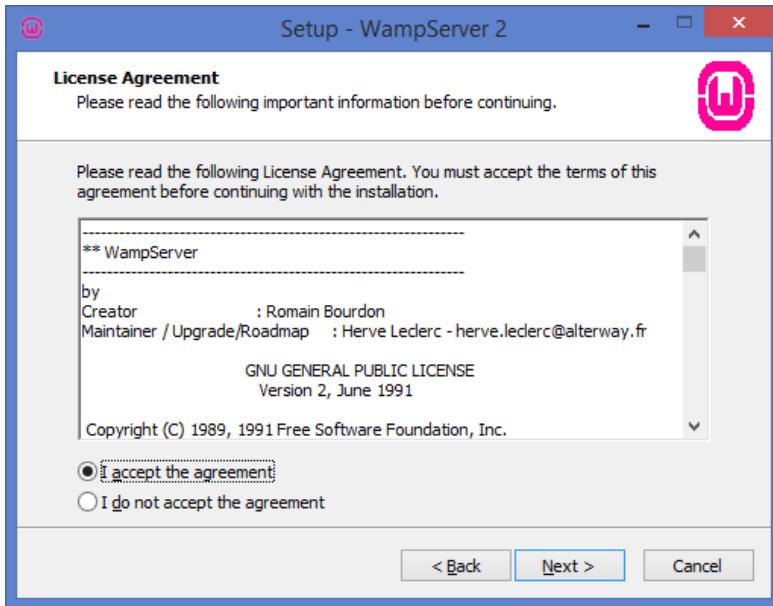


Figure 6: Select the option "I accept the agreement" to start the installation Setup.

finishes to C:\wamp, all your projects will be installed manually once the installation finishes, later you will be able to configure the configuration files of your server.

During the installation a pop-up dialogue will appear to select your favourite browser, in order to run the service WampServer requires the a browser, in case if you don't know what to choose, WampServer by default will select any available browsers in your computer, moreover if you want to select your favourite browser you should navigate manually and select the application runner of the selected browser. It should look something similar to this if you selected Chrome browser it should look like this chrome.exe or Internet Explorer iexplore.exe.

In figure 11 you can choose what browser you want for WampServer to communicate with, if you do have more than one browser, the default running browser will be chosen automatically by clicking open. However, like me I like to choose what browser I want to work with so I choose Mozilla Firefox, to navigate manually to browser running .exe follow the navigation directories as follows:

Choosing Google Chrome as default browser navigate to the following directory

C:\Program Files (x86)\Google\Chrome\Application\chrome.exe

Choosing Internet Explorer as default browser navigate to the following directory

C:\Program Files (x86)\Internet Explorer\iexplore.exe

Choosing Mozilla Firefox as default browser navigate to the following directory

C:\Program Files (x86)\Mozilla Firefox \firefox.exe

After selecting your browser and continuing the installation process Windows Firewall Security Alert pop-up box will appear see figure 12, this due to installing the Apache HTTP Server, sense the installation uses a restricted area in your local computer in this case the C directory, the Windows Firewall will block any installation and will alert the system administrator in order to Allow the access (see figure 12).

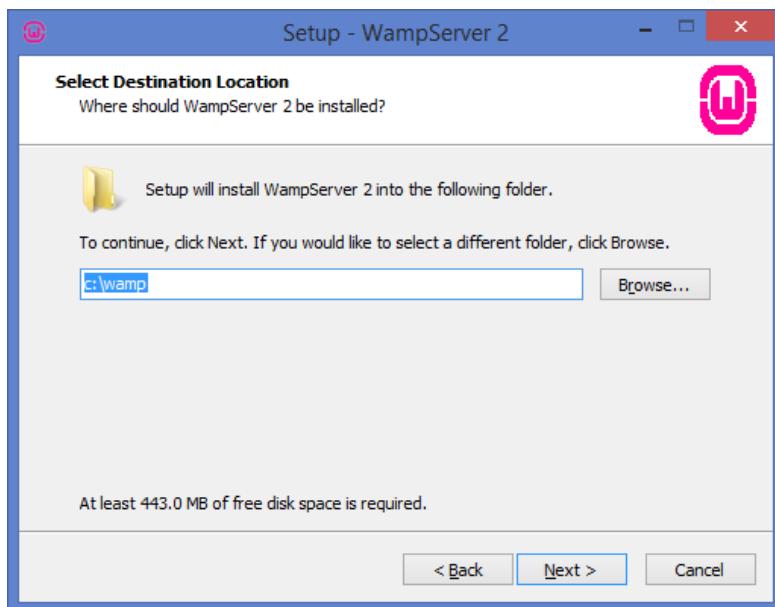


Figure 7: Choose the default directory which is c:\wamp, through this directory will install all the software necessary files as well as our development.

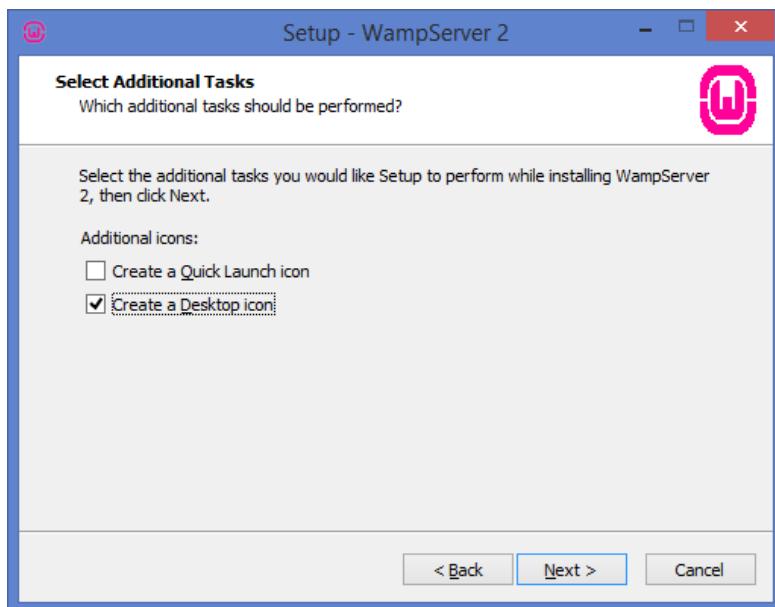


Figure 8: Choose the default directory which is c:\wamp, through this directory will install all the software necessary files as well as our development.

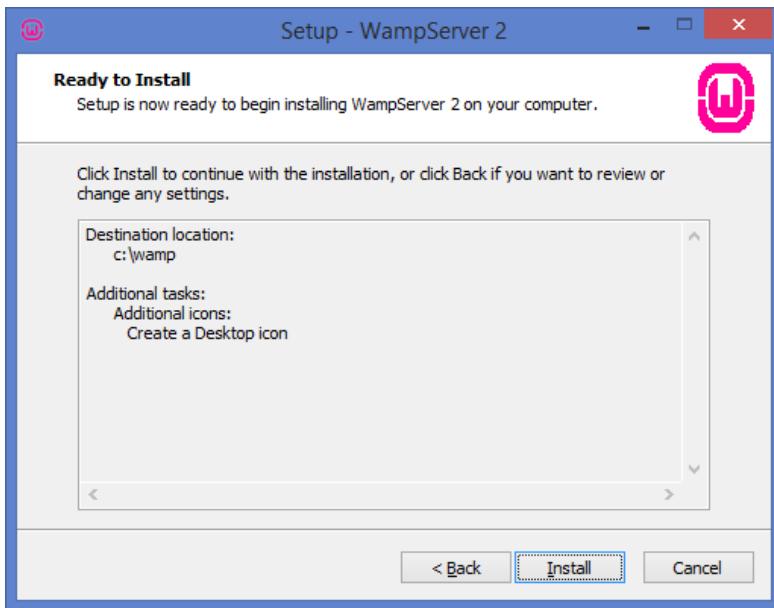


Figure 9: Click Install to continue with the installation to the destination directory location c:\wamp.

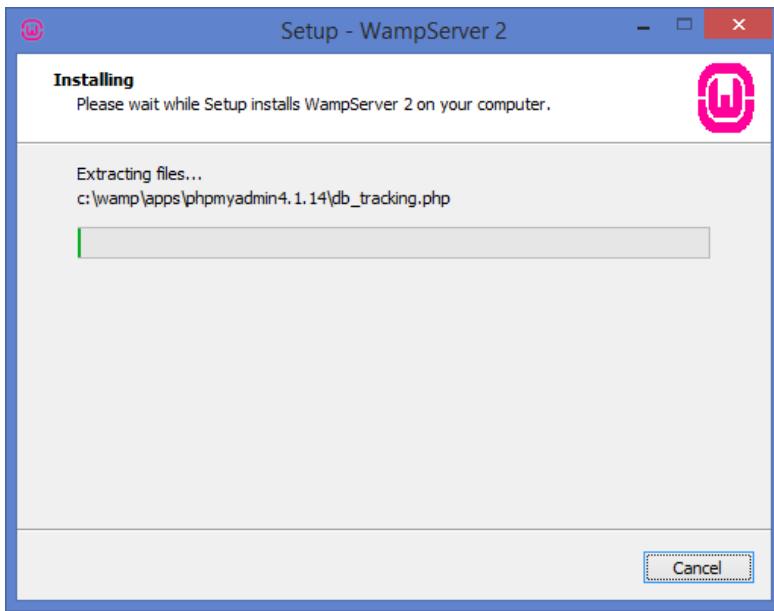


Figure 10: Wait tell the Setup installation completes.

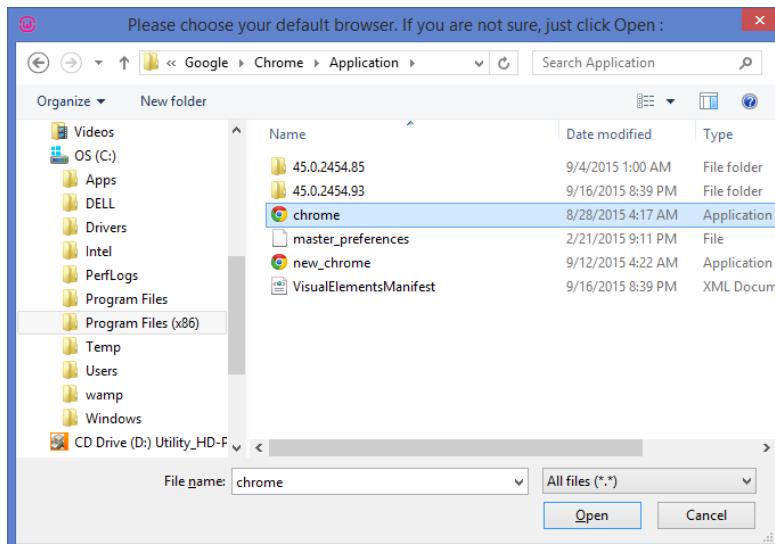


Figure 11: Pop-up window will appear to choose the default browser, if you're not sure click open and it will select the default browser in your computer.



Figure 12: shows an alert of Windows Security Message to authenticate the feature of Apache HTTP Server software which is a part of the WampServer installation.

By selecting the option Private networks, this means the server will be managed and maintained within your home or work network, by selecting the second option the server can be shared over any network that the computer connected to, so choose the first option Private Network.

To configure the SMTP server and address, the configuration of your own server, in this stage you can

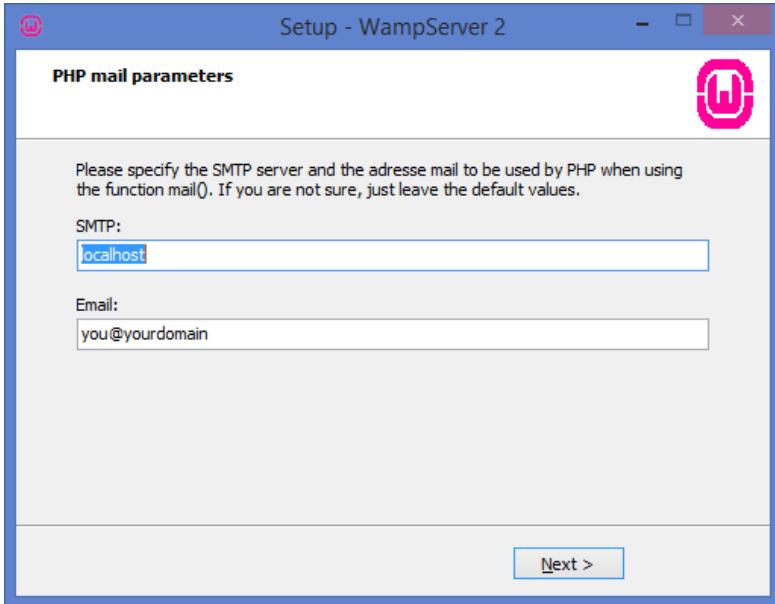


Figure 13: shows the SMTP and the Email Configuration setup.

choose your SMTP server name, this will be our navigation to your directory in your browser such as <http://localhost>, the SMTP uses the port 80 and also port 8080 this is why windows defender blocks such operations since it can be accessed from anywhere (see figure 12), for the sake of this stage leave everything as default, but also feel free to change your own domain email and the SMTP Server name. To start up the WampServer is very simple process, when the set-ups complete an icon will be created in your Desktop, double click the icon to fire up WampServer. Once that is allowed, an icon will be shown in your computer toolbar, wait a minute till the icon turns green, once that is complete, left click to see the options then click on the option Put On-line. Wait a second, the WampServer icon will turn green. Once the WampServer is on and running. A browser page will deploy and show all the files and the default index page of WampServer, if that page is not shown please check all the process again. Next section will show how to configure our server and run our first web application project in the next section.

2.8.3 Configuring WampServer On Your Local Machine

Configuring WampServer is quite simple, note that during the installation process of WampServer files that are created by the software are default files, and those files need to be configured in order to safely use the software. The software uses many complex programming languages and each of those files are configured and attached to each other, for the ease of use, I maintained for you several steps that will help you configure WampServer environments. The following steps will help you achieve this in the most simplified way. In this section you will learn how to configure and maintain your WampServer to host the project files as well as how to create your own portfolio page.

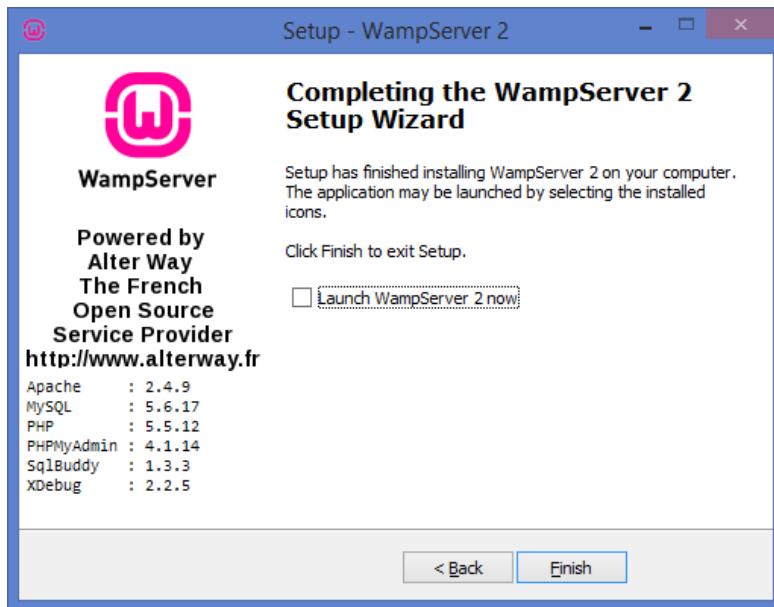


Figure 14: Compilation of the Installation Setup Process WampServer, check the option Launch WampServer 2 and click Finish.

Configuring WampServer

In order to configure WampServer it requires a very simple process, this process will help you to securely configure the major installation files, this configuration is only made once and once only, note that if uninstalling the WampServer all the configuration will be gone and you have to set-up and configure the files again. To start configuring WampServer files, we will need to use the EditPlus software which will help us to edit the WampServer installation files. This doesn't mean it will erase the files but we will modify it, that is the reason behind a good open source projects.

Getting Started

The configuration files that we will modify are the bare bones of WampServer, if these files are contaminated it may cause the WampServer to crash and eventually not work. A simple configuration file contains quotes as well as script tags that the server understands, how the configuration files work is not the case, a configuration file looks something like the following:

```
<Directory "c:/wamp/apps/webgrind1.0/">
    Options Indexes FollowSymLinks
    AllowOverride all
    <IfDefine APACHE24>
        Require local
    </IfDefine>
```

```
</Directory>
```

Configuration process is usually a hectic process to maintain, since there are many operating systems available. In this section of the book you will learn to optimize the most global configuration needed for obtaining a good environment. For the ease of use, I have created a zipped file where it can be downloaded, simply by copying and replacing the files into the right directory, I have also created read-me file which contains the directories destinations, to help you navigate easily.

Option 1 [The Easy Way]

- Start by Navigating to download the necessary project files which can be found in the following link: <https://www.dropbox.com/sh/u1ng65t5hlhfc5s/AABDcRt2Xnh405psdqrWGjHpa?dl=0>.
- Unzip the Chapter2.zip folder; you will notice a one folder under the name **alias** which contains configuration files, another configuration file under name **httpd.conf** and text file name under **Readme.txt**.
- Copy all the first folder name **alias**.
- Navigate to the following directory C:\wamp.
- Past the folder name **alias** to replace all the contents of the default configurations.
- Make sure that the folder contents contains the following configuration files as follows: **phpmyadmin.conf**, **phpsysinfo.conf**, **sqlbuddy.conf** and **webgrind.conf**.
- From the unzipped folder copy the file name **httpd.conf**.
- Navigate to the following directory C:\wamp\bin\apache\apache2.4.9\conf.
- Past the file name **httpd.conf** that you have copied earlier and replace it with the **httpd.conf** file that is found in **conf**.
- Restart WampServer, see if it works well.

Option 2 [The Core Way]

In the following option, if you wish to learn how to edit the files manually without following the steps in option 1, and in order to achieve that you need to have EditPlus installed, you may be able to use Notepad. However, I don't recommend the use of Notepad because the code block shows broken and de-formatted, so advised to use any software that has the capability to edit programming languages such as Dreamweaver, Microsoft FrontPage or Atom.

Step 1 /alias configuration files

Navigate to WampServer configuration files to the following directory destination C:\wamp\alias , what should appear to you the following configuration files **phpmyadmin.conf**, **phpsysinfo.conf**, **sqlbuddy.conf** and **webgrind.conf**.

phpmyadmin.conf

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If you haven't applied the steps in option 1, follow these steps to edit manually. Let's start to edit the first file which is `phpmyadmin.conf` right click with your mouse and chose EditPlus, the following code will appear like this:

```
<Directory "c:/wamp/apps/phpmyadmin4.1.14/">
    Options Indexes FollowSymLinks MultiViews
    AllowOverride all
    <IfDefine APACHE24>
        Require local
    </IfDefine>
    <IfDefine !APACHE24>
        Order Deny,Allow
        Deny from all
        Allow from localhost ::1 127.0.0.1
    </IfDefine>
    php_admin_value upload_max_filesize 128M
    php_admin_value post_max_size 128M
    php_admin_value max_execution_time 360
    php_admin_value max_input_time 360
</Directory>
```

Change the `Deny` to `Allow` and make sure to use capitalism (capital letters) in the first letter otherwise WampServer will crash, this is very case sensitive configuration, `Ctrl+S` to save, your code should look like this now.

```
<Directory "c:/wamp/apps/phpmyadmin4.1.14/">
    Options Indexes FollowSymLinks MultiViews
    AllowOverride all
    <IfDefine APACHE24>
        Require local
    </IfDefine>
    <IfDefine !APACHE24>
        Order Deny,Allow
        Allow from all
        Allow from localhost ::1 127.0.0.1
    </IfDefine>
    php_admin_value upload_max_filesize 128M
    php_admin_value post_max_size 128M
    php_admin_value max_execution_time 360
    php_admin_value max_input_time 360
</Directory>
phpsysinfo.conf
```

keep the files the same as in `phpsysinfo.conf` because we will only allow the connection to be sent to default local host which is in our case `127.0.0.1`, and will Deny any other connection, this will give us

more security to control the connection.

sqlbuddy.conf

SQL is your database on WampServer, since we allowed the connection to be transmitted in the configuration file on `phpmyadmin.conf` this should change too; the following code will appear like this.

```
<Directory "c:/wamp/apps/sqlbuddy1.3.3/">
    Options Indexes FollowSymLinks
    AllowOverride all
    <IfDefine APACHE24>
        Require local
    </IfDefine>
    <IfDefine !APACHE24>
        Order Deny,Allow
        Deny from all
        Allow from localhost ::1 127.0.0.1
    </IfDefine>
</Directory>
```

Change the Deny to Allow and make sure to use capitalism in the first letter otherwise WampServer will crash, use Ctrl+S from your keyboard to save, your code should look like this now.

```
<Directory "c:/wamp/apps/sqlbuddy1.3.3/">
    Options Indexes FollowSymLinks
    AllowOverride all
    <IfDefine APACHE24>
        Require local
    </IfDefine>
    <IfDefine !APACHE24>
        Order Deny,Allow
        Allow from all
        Allow from localhost ::1 127.0.0.1
    </IfDefine>
</Directory>
```

webgrind.conf

This configuration file is connected to other `alias` directory files mentioned above, this configuration needs to be changed in order to make everything work efficiently, and your code should look like this:

```
<Directory "c:/wamp/apps/webgrind1.0/">
    Options Indexes FollowSymLinks
    AllowOverride all
    <IfDefine APACHE24>
        Require local
    </IfDefine>
    <IfDefine !APACHE24>
        Order Deny,Allow
```

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```
Deny from all
Allow from localhost ::1 127.0.0.1
</IfDefine>
</Directory>
```

Change the Deny to Allow and make sure to use capitalism in the first letter otherwise WampServer will crash, use Ctrl+S from your keyboard to save, your code should look like this now

```
<Directory "c:/wamp/apps/webgrind1.0/">
    Options Indexes FollowSymLinks
    AllowOverride all
    <IfDefine APACHE24>
        Require local
    </IfDefine>
    <IfDefine !APACHE24>
        Order Deny,Allow
        Allow from all
        Allow from localhost ::1 127.0.0.1
    </IfDefine>
</Directory>
```

Step 2 Configuring Apache httpd.conf configuration file

Navigate to WampServer configuration files to the following directory destination C:\wamp\bin\apache\apache2.4.23\conf\extra the following files and folders should appear as the following directory tree, we only need to edit the following configuration file `httpd.conf`, right click and EditPlus.

- -extra
- -original
- -charset.conv
- -httpd.conf
- -httpd.conf.build
- -magic
- -mime.types
- -openssl.cnf
- -wampserver.conf

Since the code is too large to post here, this file is the core of WampServer, we will navigate through lines, on line 154 will uncomment the module as follow it should appear to you like this.

```
#LoadModule rewrite_module modules/mod_rewrite.so
```

Simply uncomment and delete the hash-tag to allow the module to work when WampServer lunches, as following line of code.

```
LoadModule rewrite_module modules/mod_rewrite.so
```

In line 242 will grant access to the localhost from anywhere, the reason for this will be explained later in a different book release, this will give you a huge potential in creating your own upload system and host your own files from anywhere around the world, you can say your own cloud service sounds good to me, let us leave it at that for now. The code should look like this:

```
<Directory />
    AllowOverride none
    Require all denied
</Directory>
```

Change from **denied** to **granted**, as follow

```
<Directory />
    AllowOverride none
    Require all granted
</Directory>
```

At this point you have completed the needed configuration of your WampServer to work ,save the file by using Ctrl+S from your keyboard to save, go back to your WampServer and restart all the services to see if all the settings are correctly applied and working.

2.8.4 Running your first project

Working with WampServer is easy, it doesn't require that much technicality, however there are many serious projects that work and integrate with databases, the intention of this section of the chapter is to help you start running your first application project within WampServer through localhost on your machine, than navigating through the browser and running your first project, this section will not explain how to program your own software but rather understand how to run the project when the software is ready.

Downloading Files

To get started with the project you need first to understand that all projects will be hosted locally, meaning that your application software will not be public, but rather internally within your local host machine, therefore it requires that WampServer works as intended to be working. Download the application files from the following link: <https://www.dropbox.com/sh/uining65t5hlhfc5s/AABDcRt2Xnh405psdqrWGjHpa?dl=0>.

Getting Started

Unzip the file you downloaded earlier, you should be able to see the following files and folders, index.html and one main folder under name assets. Copy all the zip file contents to the following directory, your navigating to the folder look like C:\wamp\www\PhotoFilterApp.

To run and test the application, start your WampServer and open up a new browser page, for this I use Firefox browser, type in the browser making sure no http hyperlink or www extension, simply type localhost, the WampServer test page will open up, under Your Projects, you will be able to see the PhotoFilterApp.

How to do it

To run the project type in the browser <http://localhost/PhotoFilterApp/> remember whenever you add any project to WampServer www file remember that the exact name is the same because it's case sensitive. The screen below should appear (See Figure 16).

The application consist of several elements, the project contains project title, image processing / canvas and the filter options. This can be seen in (Figure 16), images can be dropped by swiping from your computer, when image is dropped to the canvas area, filters will be showing below the image to choose the look and feel that will be demonstrated in the next chapter, also a download button will appear when final selection is chosen from the filters.

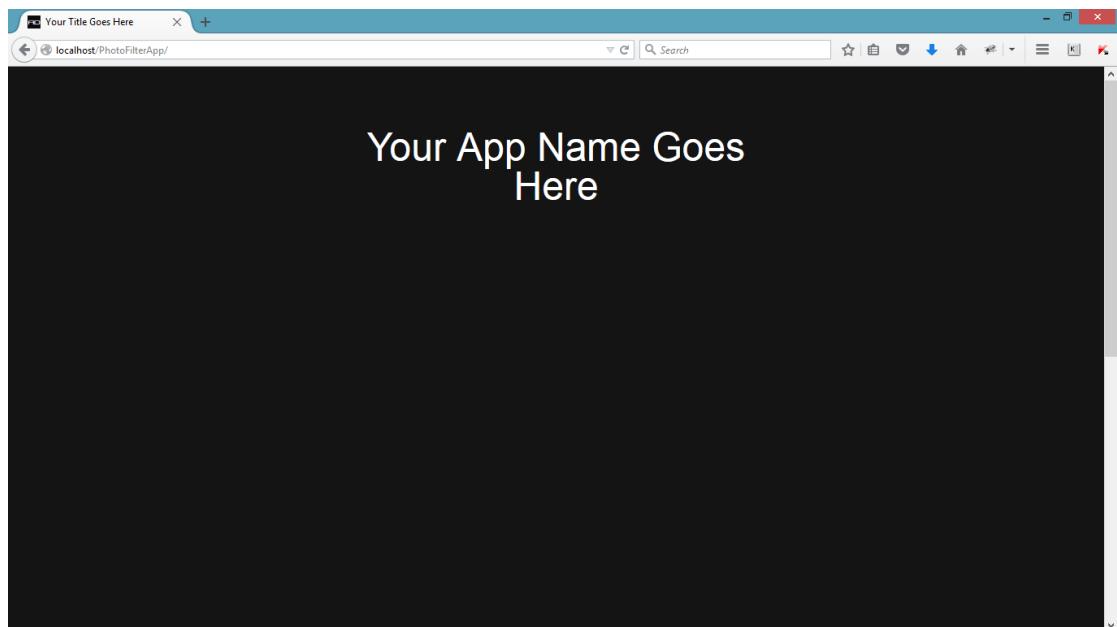


Figure 15: starting the first project using WampServer localhost

Chapter 3

3 | Developing Your Own Photo Filters Techniques

In this chapter we will cover:

- What is CamanJS project.
- How CamanJS works.
- Adjusting Your Own Photo Effects.
- Dodging, Burning and Retouching.
- Understanding Exportation of your System.
- Hosting your application and access from anywhere

3.1 Introduction

This chapter will guide you to develop your first photo editor software according to your needs using the free open source project called CamanJS. Moreover, we will explain how to design and program your first filter effect system by using CamanJS open source project. For the ease of use, I have created a sample project prototype with most of the elements needed to get you started, moreover, CamanJS have a huge library which we cannot include and explain everything. Instead of explaining every item in the libraries and how to use it, I will demonstrate the most essential elements to get your first software working.

What is CamanJS?

CamanJS is an open source manipulating image using the HTML5 canvas and Javascript libraries. It's a combination of a simple-to-use interface with advanced and efficient image/canvas editing techniques. CamanJS is very easy to extend with new filters and plugins, and it comes with a wide array of image editing functionalities. CamanJS is written in Coffeescript as of version 3.0. It works both in-browser and in NodeJS.

3.2 What is CamanJS Project

There are many softwares that can help you to achieve your desired final photo, indeed for professional photographers details are important, edges and color contrasts are all major pain, the CamanJS project is not aimed to teach you the fundamentals of photography neither about the rules of composition, CamanJS is more into helping you to develop and enhance your photo manipulation techniques as well

as helping you to add your own developed imaging controls to your images and achieve a unique style of your own.

The main focus of CamanJS project is manipulating images using the programming languages HTML5 and JavaScript. It combines many independent libraries and can be safely added over the web as a photo editor tool. It also combines a filters and plugins, and comes with a wide range of image editing functionalities.

There are many documents available online that explain CamanJS, to increase your knowledge about the project visit <http://camanjs.com/>, also if you want to see some examples powered by CamanJS visit <http://camanjs.com/examples/>. Moreover, the project documentation can be found <http://camanjs.com/docs/>, also if you wish to download the complete open source project, the official Github page can be found here <https://github.com/meltingice/CamanJS>.

Usage

Code words in text are shown as follows: "Include one of the versions in the dist/ folder and controlling brightness and contrast of the canvas"

```
Caman("#image-id", function () {  
    this.brightness(10);  
    this.contrast(20);  
    this.render(function () {  
        alert("Done!");  
    });  
});
```

New Updates

HiDPI Support

The latest version of CamanJS is version 4 which introduces a better support for HiDPI (Retina) displays, this helps to specify a higher resolution replacement using HTML data attributes.

Testing

To test CamanJS capability it can run both in NodeJS and web browser.

NodeJS Compatibility

CamanJS is fully compatible with NodeJS. The easiest way to install is:

```
npm install caman
```

To save your modified image in NodeJS, simply call the `save()` function after rendering is finished by passing a callback function to `render()` note, trying to save before rendering is finished will cause issues.

```
Caman = require('caman').Caman;  
Caman("./path/to/file.jpg", function () {  
    this.brightness(40);  
    this.render(function () {  
        this.save("./output.png");  
    });
```

```
});
```

More Information Node.js is a JavaScript runtime built on Chrome's V8 JavaScript engine. Node.js uses an event-driven, non-blocking I/O model that makes it lightweight and efficient. Node.js' package ecosystem, npm, is the largest ecosystem of open source libraries in the world. To read more about NodeJS visit <https://nodejs.org/en/>.

3.3 How CamanJS Works

Many serious photographers know that analog photography almost most of the photographs are achieved in the darkroom or in a good laboratory work. The rapid technologies advances and more possibilities of image manipulation are now available, but a good question is - can digital photography compete against analog photography in the term of black and white, the answer is yes, technologies are now more advanced from the side of cameras to outstanding pictorial quality, moreover the tremendous availability of image manipulation techniques that comes armed with Photoshop is widely used by many photographers. Note that there are many other disadvantages in printing as well as the type of the paper and also the enlargement level of images that are used in darkrooms. I'm not going to explain everything here, but it's a good thing to note the differentiation between the two processes.

This section of the chapter simulate a good understanding of the filter system used by CamanJS project, the only requirement for you to understand in this section is to know how this works, section three of this chapter will explain in detail about how to create your own photo filter and understand how to control the size of the exportation of your photographs.

How it works

CamanJS uses several JavaScript libraries as well as HTML5 programming language, with the possibilities of styling everything using CSS and Coffee Script, but what does that got to do with the photo filters? the project intended to create a quality web photo editing system, so if you are looking for alternative ways to develop your own photo editing techniques then CamanJS can help with that, it requires only a basic level of programming, which I assume many of you have designed a web portfolio since university projects, in case you are not familiar with that, section three will guide you to create a simple filter system of your own.

caman.full.js

There are three main parts that CamanJS uses for its render system the main parts are `caman.full.js` which is completely coded from CoffeScript and has the most elements and parts in terms of analyzing, blending, calculating and rendering the images, CamanJS uses a Dom functions to listens and start to initialize the canvas process with the usage of your Dom system. Moreover, CamanJS uses functions to convert your images into type Base 64 bits with PNG exportation extension type. Basically, linking external image files when using `` element in HTML by embedding the image data directly into the document with data URIs. The code below demonstrates how CamanJS uses the image data directly into the document with data URIs. First it understands the image dimensions width and height as well as the device pixel ratio by:

```
Caman.prototype.toImage = function(type) {
    var img;
```

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```
img = document.createElement('img');
img.src = this.toBase64(type);
img.width = this.dimensions.width;
img.height = this.dimensions.height;
if (window.devicePixelRatio) {
    img.width /= window.devicePixelRatio;
    img.height /= window.devicePixelRatio;
}
return img;
};
```

Then conversion type to PNG, using the image data directly into the document with data URIs:

```
Caman.prototype.toBase64 = function(type) {
    if (type == null) {
        type = "png";
    }
    type = type.toLowerCase();
    return this.canvas.toDataURL("image/" + type);
};
```

filereader.min.js

FileReader is a JavaScript code that allows you to read local files as binary, the motivation behind the script is to load the images into the browser by drag or drop, the script is intended to make accessing any file type into the web via the file reader interface, much more like it works perfectly with images as well. The only implementation to this script that should be explained is reading the image Data URLs, here is how it's achieved by filereaderJS:

```
readAsMap: {
    "image/*": "DataURL",
    "text/*": "Text"
},
```

There is no jQuery or any other library dependencies used by FileReaderJS and the implementation is super easy in HTML.

```
<script type='text/javascript' src='filereader.js'></script>
```

Here is a simple script that reads all files dropped on the body as data URLs including images files.

```
FileReaderJS.setupDrop(document.body, {
    readAsDefault: "DataURL",
    on: {
        load: function(e, file) {
            var img = new Image();
            img.onload = function() {
                document.body.appendChild(img);
            };
            img.src = e.target.result;
        }
    }
});
```

```
});
```

script.js

The ScriptJS programmed to do the following accept any image type by dragging or dropping this of course by communicating with filereaderJS, then it creates a new canvas element with maximum size, renders the filter systems used on caman.full.js clone the filter in the image by appending #photo div elements into the canvas, once the session is active a download button will appear to save the image into base 64 bit image by reading image URLs export the image to PNG extension.

```
\
```

Here is how the original photo size is implemented with max size, if you have larger photo this should be changed manually, 1080 is the width size of the photo canvas and the height as well.

```
var maxWidth = 1080,
    maxHeight = 1080,
    photo = $('#photo'),
    originalCanvas = null,
    filters = $('#filters li a'),
    filterContainer = $('#filterContainer');
```

When image effect/filter is chosen it activates by appending the #photo elements in the canvas and shows a download button, here is how it works:

```
var effect = $.trim(f[0].id);
Caman(clone[0], function (){
    if( effect in this){
        this[effect]();
        this.render();
        showDownload(clone[0]);
    } else{
        hideDownload();
    }
});
```

When the download link appears, it gets the DataURL of the image and set it as a href:

```
var url = canvas.toDataURL("image/png;base64;");
downloadImage.attr('href', url);
```

3.4 Adjusting Your Own Filter Effect

In order to create your own effect system using CamanJS extensive library, there are three main parts of files that need to be edited, I have already created 5 effects of my own with high resolution DPIs of size 1080 width and height size. To create your own filters, you need to understand how to simulate your own filter effects, for that reason black and white filters allows you to determine precisely the tones of your image effects, therefore the filters applied in this chapter simulates the Black and White visionary of the monochromatic image. If you're experienced or professional photographers you definitely know the process of conversion of the images to monochrome, since we are not writing about how to simulate the filter effects, but rather creating effects we want to use all the time. For the ease of use, I have maintained for you a very short, simple way to start the project to download the project navigate to the following and

download the necessary files <https://www.dropbox.com/sh/u1ng65t5hlhfc5s/AABDcRt2Xnh405psdqrWGjHpa?dl=0>, all the project files are completely working and tested in different environments.

To start program your own effects the main three files mentioned below is all interconnected, if one of the files programmed or interpreted wrongly, this will affect all the render system and you will not be able to get it to work. Let's start by the core code of the effect system of CamanJS.

caman.full.js

I would assume you have already downloaded the necessary project files and already applied the steps mentioned in the previous chapters, to start working head to the assets folder and navigate to the js folder you should be able to see all the JavaScript files, left click on `caman.full.js` choose EditPlus, you should be able to see all the code and program of Camanjs, from your keyboard `Ctrl+F` type in the search `dark1click Find`, you should be able to see the following code snippet.

```
Caman.Filter.register("dark1", function() {  
    this.greyscale();  
    this.sepia(10);  
    this.exposure(10);  
    this.contrast(15);  
    this.noise(2);  
    return this.vignette("60%", 35);  
});
```

Since we will be seeing a lot of functions, objects and values like `this.greyscale()`; it's good to note that the word `this` keyword is similarly used to refer to an object that the function `dark1` is bound to. The `this` keyword not only refers to the object but it also contains the value of the object. The `this` reference to an objects and it usually used inside a function or a method as well as outside a function in more global scope. It's always a good idea to learn something new, let's explain some of the objects of this function.

Dark1

This is the first filter we want to create, I named my first filter "**dark1**" (figure 18) and it contains the set of objects and values of `this.greyscale()`; which will convert any images even colored images into greyscale mode when using `this.greyscale()`; works as a conversion from colored to greyscale, secondly I want my filter to contain a bit of reddish-brown color and this is achieved by using `this.sepia(10)`; of a value 10 since I don't want my image to look more vintage but I need the sense of the brownish color mode in this filter, I also added exposure to add a certain amount of light to the unit areas of my images. If you are happy with your exposure keep this value empty. This is achieved by using `this.exposure(10)`; with a value of 10, using the value 10 always gives your images a freedom to keep the natural aspects of your photos.

Moreover, since I want my filter to be monochromatic I added a contrast to expose the dark areas and the white areas in the photo by `this.contrast(10)`; with value of 15, you can increase the value to your desired type, additionally, I always love to add grains to my images, the reason is what many photographers do understand that photos shot using the RAW mode or JPEG format are slightly different while RAW format now are so natural and contains many pictorial levels, grains usually in photos are missed, digital photography relies on pixels saved in RGB mode and they are completely different from films, to use that grainy in photos is necessary and its achieved by adding `this.noise(2)`; amazingly noise works as grain that gives the picture more sense in monochrome, finally to give the photo filter a finish-



Figure 16: Sample picture of Afghani girl by Steve McCurry



Figure 17: Demonstration of the Dark1 effect applied to the photo.

ing touch, I increase the midtone contrast by adding vignette `this.vignette("60%",35)`; increasing the midtone by 60% of a range 35 to feed the image into the background.

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Transposition

Transposition is an image filter type that combines some of the elements of Dark1 filter; however several changes made to this filter do not accept the grainy or noisy effect as well as reducing the midtone of vignette to 20% less of a range 10 feeding the image background and keeping the natural elements of the photo (Figure 19), here is how it's programmed.

```
Caman.Filter.register("transposition", function() {  
    this.greyscale();  
    this.sepia(1);  
    this.exposure(5);  
    this.contrast(1);  
    return this.vignette("20%", 10);  
});
```

First give your filter a name in this case "**transposition**" than convert any image to greyscale by adding to the statement `this.greyscale()`; if you don't want to convert the image to greyscale and wish to keep the original colors, you can by deleting `this.greyscale()`; , secondly I want my filter to contain a bit of reddish-brown color and this is achieved by using `this.sepia(1)`; notice the sepia value is low because if the value is high the photo will look more vignette and tone of the image will look brown to red , which we don't want, third we apply a lighting control to the filter from exposure and contrasting the dark area to dark and the white are to be more whitening by using `this.exposure(5) | this.contrast(1)`; giving the value for both exposure to 5 and contrast to 1, finally we end the function statement to low midtone contrast by adding vignette `this.vignette("20%" , 10)`; increasing the midtone by 20% of a range 10 to feed the image into the background.

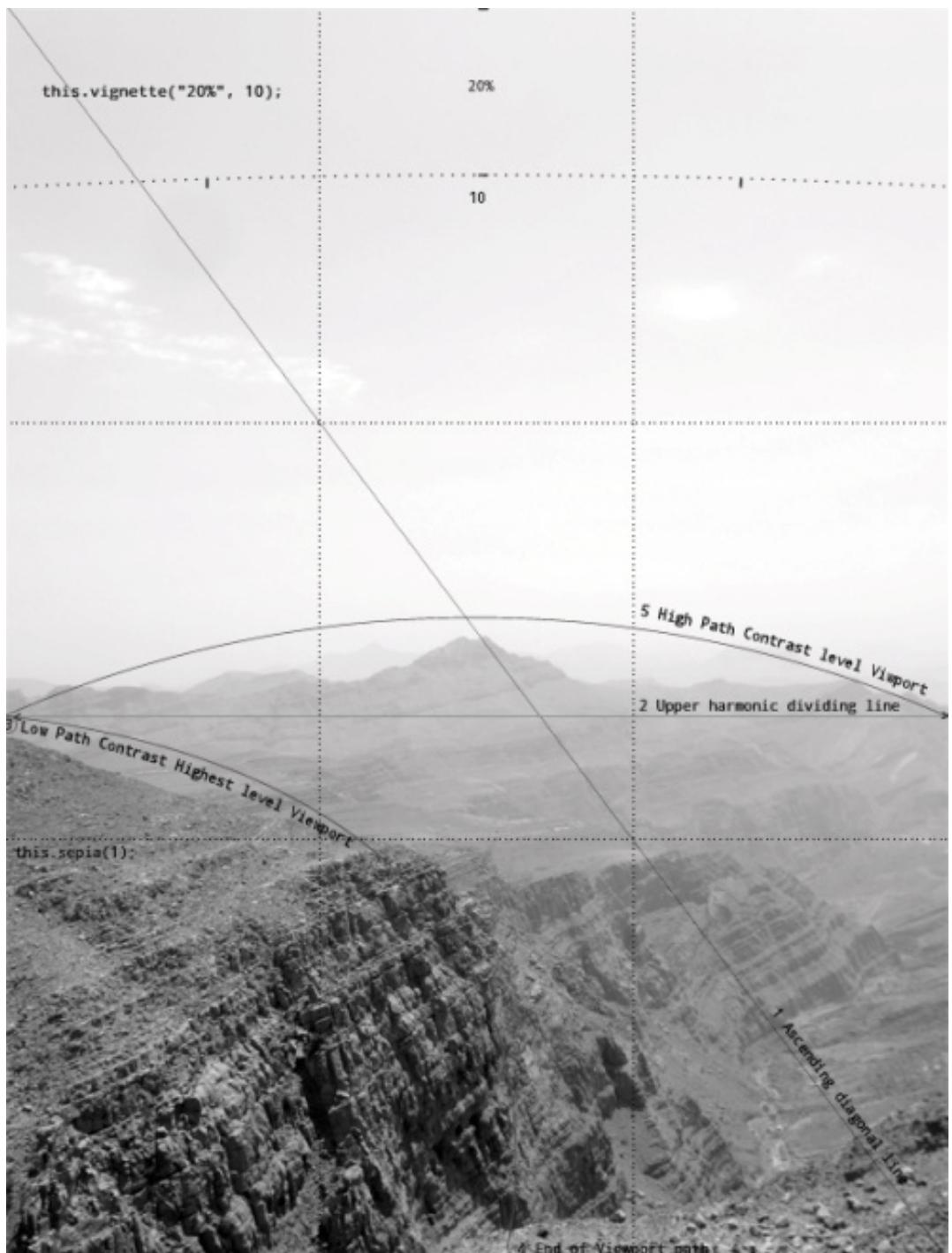


Figure 18: Image of Jabal Jess âš Ras Al Kaimah, demonstrates the exposure and effect of the filter vignette in the image by increasing using vignette object.

Bararri

The following filter and example (Figure 20) in this section demonstrates the difficulties that arise when working with a wide range of contrast and exposure of the sky, in digital format photos when image is converted to black and white it losses the type of gradations, this is even in Photoshop if you try to convert a wide area of landscape photo, the gradations of the sky will have some kind of curves that shows the skylines in a bad format, this mistake always appears when manipulating the contrast of the photos which in turn lose their structure and reveal the digital origin of the photo. However, to fix this issue in photos it needs a lot more dedicated time to inspect each of the photo elements during conversion, also before taking the shot, professional photographers understand the use of gradient filters to be placed in front of the lens to gradually darken the areas.

Moreover, to get the best out of using the source code, you will be able to control the exposure of image when manipulating, the image in Figure 21. I have used Hoya CIR-PL filter slim frame, and I also downgraded the exposure value as well as contrast when I manipulated the image, in this filter you should always customize it to meet your need, of course the code below will look different from what you will experiment, this is how I achieved the final setting for this filter and the photo.

```
Caman.Filter.register("bararri", function() {  
    this.greyscale();  
    this.sepia(5);  
    this.exposure(5);  
    this.contrast(5);  
    return this.vignette("50%", 10);  
});
```



Figure 19: Image of AL Marsa âš Business Bay Bridge located in Dubai.



Figure 20: Magnified final image demonstrates the use of low exposure and contrast used in Bararri filter.

Ramlee

The following filter and example of Figure 22 demonstrates the complexity of CamanJS and the abilities of scripting the code for black and white conversion, using the less value and simple statements of code. The autumnal scene in figure 22 was shot using a polarizer filter, converting the photo into black and white which loses the detail of the image. However, to get the most use of CamanJS, it provides the possibilities to add more complexity in code to achieve the desired look and feel, this filter is designed to convert any image to vignette by reducing the saturation and vibrance. I also added a new overlay layer of dark gray #6b5f63 with opacity of 50, lastly for the final touch I decided to add exposure to sharpen the edges with noise effect of 2. The code below demonstrates the complexity of CamanJS and how to apply different layers.

```
Caman.Filter.register("ramlee", function(vignette) {
    if (vignette == null) {
        vignette = true;
    }
    this.greyscale();
    this.saturation(-20);
    this.vibrance(-50);
    this.sepia(30);
    this.newLayer(function() {
        this.setBlendingMode("overlay");
        this.opacity(50);
        return this.fillColor("#6b5f63");
    });
    this.exposure(10);
    this.noise(2);
    this.gamma(1.1);
    if (vignette) {
        return this.vignette("50%", 20);
    }
});
```

To set a new layer in CamanJS is simple by starting a new statement with undefined function name, once your layer is set up; you need to define the mode of the layer by using `setBlendingMode`, you can choose your layer blending mode ex. darken, multiply, difference, exclusion, lighten, screen or overlay, as well as add more layer with different blending mode and set your pre-set values of your desired filter effect.

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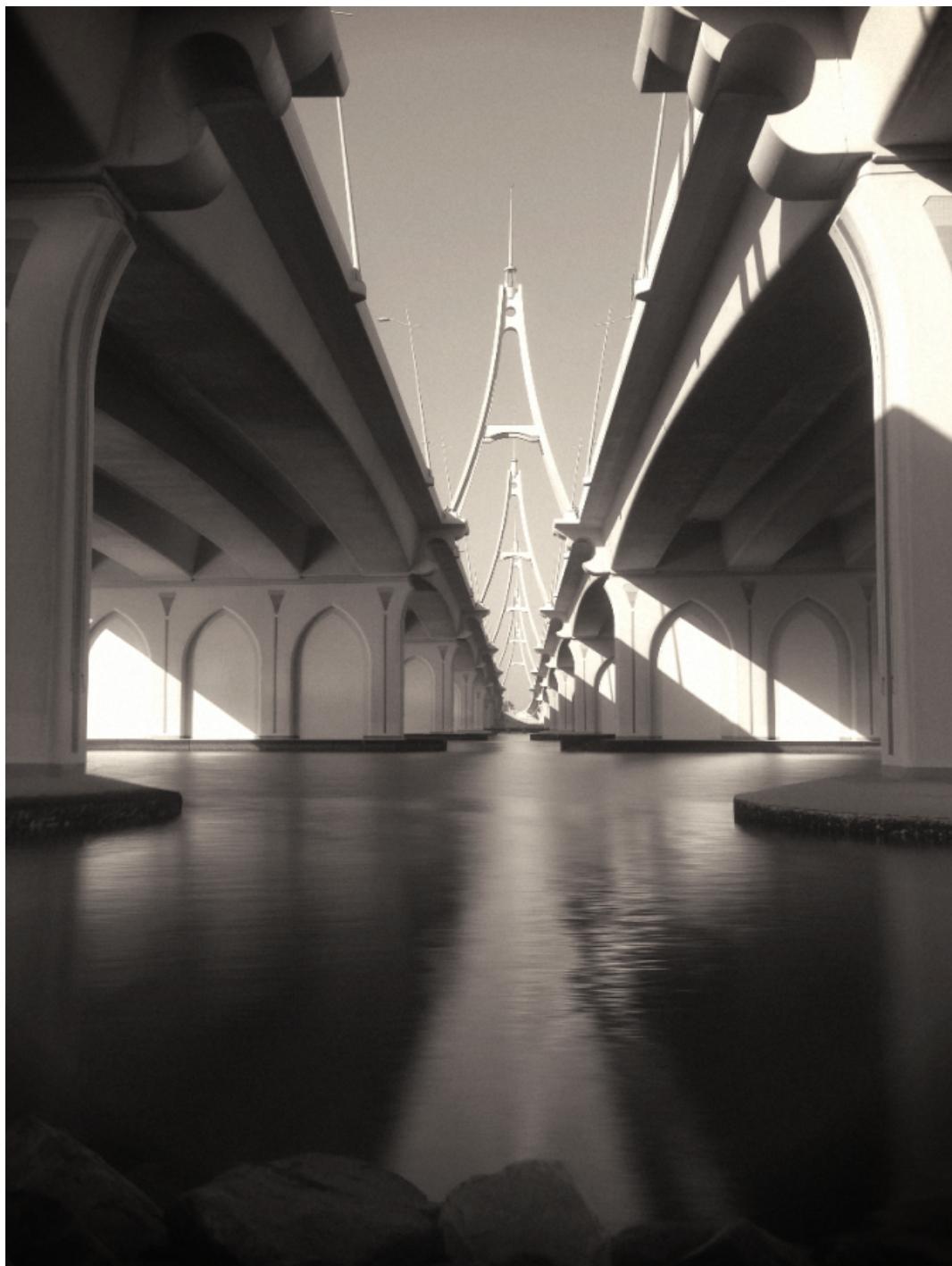


Figure 21: Image of Business Bay Bridge located in Dubai, filter ramlee used for final edit.

Ramlee Fine Art

Ramlee Fine Art filter effect came across multiple tries, it really doesn't depend on the filter only but it also simulates a huge role in your image composition. It has much more complexity than the previous filter explained earlier, when trying to shoot landscapes and keep some of the key aspects of the image neutrality, black and white has not got much options, the fact you need to make a choice either darken or brighten areas that need to be brighten in Photoshop Yellow Filters pre-set can help to darken and brighten areas away of your control! The second choice is simply to keep the image as it is with colors eh!, you don't have much choice while converting photos to black and white and you still want to keep some colors in your image that's the aim of this filter effect. It allows for much more possibilities in controlling your type of filters, which you really won't get in Photoshop, the reason why? It's simply the amount of range of colors you get in Photoshop - either Yellow or Red Filters pre-set even though Photoshop comes with many functionalities in saving your sessions but not very useful when photographing different locations and atmospheres, for that reason getting handy working with your image composition with no control with your color or your picture is a bad choice. Moreover, the filter demonstrated here uses predefined layers of your own as well as selecting your own color pre-set layer with your defined type of modes you want.

```
Caman.Filter.register("ramlee2", function() {
    this.greyscale();
    this.sepia(30);
    this.newLayer(function() {
        this.setBlendingMode("overlay");
        this.opacity(20);
        this.copyParent();
        this.filter.channels({
            red: 5
        });
        return this.filter.stackBlur(30);
    });
    this.newLayer(function() {
        this.setBlendingMode("overlay");
        this.opacity(30);
        return this.fillColor("#6b5f63");
        this.exposure(50);
    });
    return this.vignette("50%", 10);
});
```

The difference by maintaining a new opacity to our filter effect as well as added a Red filter channel pre-set; the value of 5 is the red channel value by low increase. Moreover, when completed effect should be affected by blurry stacks packages over the new layer of mode overlay and color fill of #6b5f63 ended with a 50% of exposure and vignette wide of 50% of range 10 (see figure 27).

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Figure 22: Ajman - Alzorah

3.5 Testing your filter

In this section you will be able to test your filter effect once you have made your own changes to any of the previous filters explained in section four of this chapter, you can always test how the final filter effect executed by following this guide, every time you decide to add a filter of your own pre-set defined effect, you can test it by dragging and dropping the photo into the work area (canvas). You can always change your image height and width manually since different sizes of images can be used, to get started there are two main files which you will modify for your own purpose.

render.js

To modify render JavaScript file, navigate to PhotoFilterApp\ assets\ js\ render.js, right click select EditPlus, you should see all the render code blocks and statements, in line 20 you will be able to view the following script.

```
var maxWidth = 1080,
maxHeight = 1080,
photo = $('#photo'),
originalCanvas = null,
filters = $('#filters li a'),
filterContainer = $('#filterContainer');
```

You can always change your canvas area and modify the Width and Height, change the value of your own maxWidth is the maximum width of value 1080 and maxHeight of value 1080, this will allow you to use more than 11MB size photo.

style.css

Represents the template structure of the canvas area. We will only modify the thumb image of the filter to appear when image is dropped to the canvas area, these thumb images should appear every time you add a new filter it's necessary to design a thumb image which indicates the effect type filter. Start by navigating to the following directory in the project folder PhotoFilterApp\assets\css\style.css, right click select EditPlus, in line 193 you will be able to view all the filter effect thumb image.

```
#filters li #bararri{background-image:url('../img/filters/bararri.jpg');}
#filters li #ramlee {background-image:url('../img/filters/ramlee.jpg');}
```



Figure 23: Thumbnail

Always add in the styles an indication of how your filters should appear when image is dropped. Each thumb image of size 150x13 (Figure 24).

index.html

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Index is the main web-page which contains the canvas and filter containers, to apply any filter index web-page contains all the necessary files including the JavaScript. Navigate to the project folder PhotoFilterApp\index.html, right click select EditPlus, and let's start changing the following.

Line 7

```
<meta name="Keywords" content="Bin Alsaadi , Bin Al Saadi Photography" />
```

Change the keywords name to yours with separated comma, this is helpful if you decide later to publish this web-page over the internet, it helps to get your page boosted over the search engine.

Line 8

```
<meta name="Description" content="Bin Alsaadi Art & Design" />
```

Every web-page contain description, in this Meta tag you can always refer to what your page content name is.

Line 26

```
<title>Your Title Goes Here</title>
```

This is your page title, which indicates your web-page name over the browsers, feel free to modify to what you like, make sure you only change what's in bold.

Line 44

```
<h1>Your App Name Goes Here</h1>
```

To give your web-page name from the body section you can always change this to whatever name you like, this will be shown in your web-page.

Line 49 to 58

```
<div id="filterContainer">
<ul id="filters">
<li> <a href="#" id="normal">Normal</a></li>
<li> <a href="#" id="dark1">Dark1</a></li>
<li> <a href="#" id="transposition">Transposition</a></li>
<li> <a href="#" id="bararri">Bararri</a></li>
<li> <a href="#" id="ramlee">Ramlee</a></li>
<li> <a href="#" id="ramlee2">Ramlee Fine Art</a></li>
</ul>
</div>
```

This will allow you to name the filters according to your id filter name you gave in the style.css file explained earlier, always make sure that the id name is identical and referred to an id filter name and it is case sensitive without it your script will not work.

There is more

Once the requirements are completed and updated/modified there are two options to start your application, you can always start your application in off-line mode. No need to host it in WampServer as well as no need for internet to start the process, to do so I usually host all my files in WampServer and start any project from there, it's preferable to host all the project and navigate easily from the browser.

Option no.1

From the project folder you modified earlier, if the project folder is on your Desktop which I assume can be navigated to the following directory C:\Users\YourName\Desktop\PhotoFilterApp to start the project simply click on the index.html webpage to start the application, you can always drag and drop

any image from any location in your computer to the canvas area which will automatically view the filter options (Figure 25). Note that, you can always maximize the height and the width of your canvas by modifying the render.js file explained earlier.

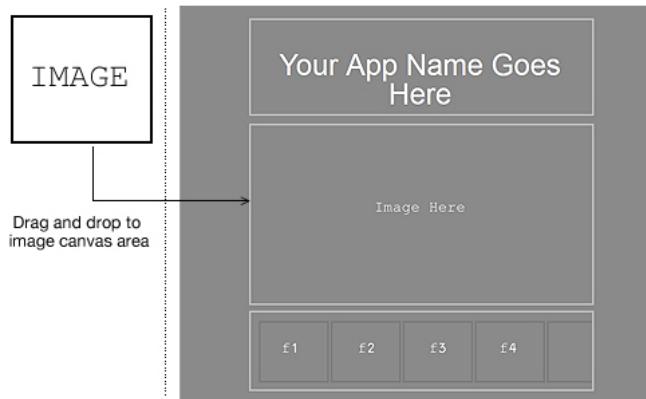


Figure 24: Option no.1

Option no.2

You can also start your project through the localhost, WampServer in this case, it needs to be up and running with no issues, I will assume you have followed the previous steps earlier, your project directory should be C:\wamp\www\PhotoFilterApp, you can always navigate to any of your web browsers installed in your computer, to start the application type <http://localhost/PhotoFilterApp/> when you will notice your application is working, minimize the screen and drag or drop any image to the canvas to view the filter options (Figure 26).

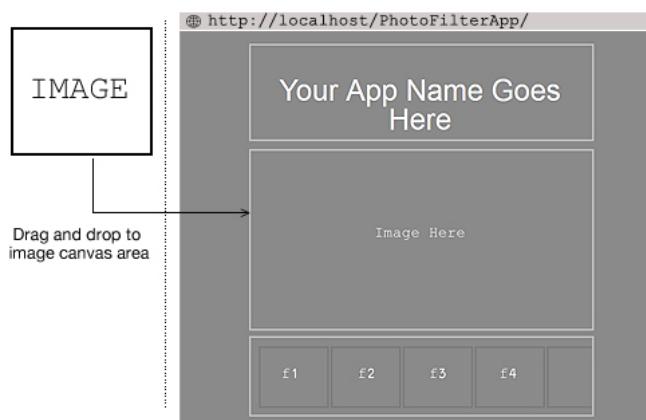


Figure 25: Option no.2

Once your filter is applied and you are happy with the outcome, you can always download your edited image, either by clicking the download image button which will appear after the selected filter or you can right click and save the image as whatever type you wish.

Chapter 4

4 | Working with HiDPI photographs

In this chapter we will cover:

- What is HiDPI.
- Why is it important.
- How to implement it using CamanJS.
- Analyzing and Comparing your photographs.

4.1 What is HiDPI

In this chapter we will demonstrate how to work with your photograph exportation using CamanJS and regenerate a high DPI size of any image. Moreover, working with high definition images with the filter system explained in previous chapters will not work with such theory. Therefore, CamanJS made this possible by simply adding a new work ground script that detects the image origin, and reconverted with the filter system without losing the quality of the image.

What is HiDPI?

HiDPI is a short extension term of high definition display image, this can be found in any photographs and can be detected with special softwares that read meta-data tags of the images. This term here, referred to in this chapter to facilitate the use of original photographs taken by any camera and reconverted with high quality definition display.

4.2 Why is it important

When photographing with different cameras the possibilities to have a different composition are numerous, therefore what needs to be focused on is the processing of the images that comes from the camera. In previous chapters I have demonstrated the use of the CamanJS project and setting up your environment with your own filter effect. However, it wasn't possible to work with high quality image being produced by digital camera, thus made possible with the new updated script of CamanJS project version 4, you can manually adjust your photographs to be processed with your filter specification and export a high definition image without losing the quality during resizing and converting processes.

It is also important to note that, while photographing, each camera has a specific function in processing the image in digital format, the following script has been tested in different digital formats. Some images tend to take a while to be rendered with the set of filters you develop.

You can always download the latest version of CamanJS by navigating to the following link <http://camanjs.com/docs/>. Moreover, to simplify the process I have imported the latest script in JavaScript folder file under the name of `caman.full.new.js`. I have also implemented the same filters explained in the previous chapters, always feel free to edit the code at anytime.

4.3 How to implement it using CamanJS

Implementation is pretty simple if you followed the project along from the beginning, you will notice that there is another web-page in the project folder under the name of `HiDPI.html`, this project file uses a different script work ground with the same set of filter script explained in previous chapter. I have left this page alone so you can work with only pictures that have a high quality, during the implementation you will notice that it becomes slower in the duration of a photo being processed, also you will notice after your export the image becomes a high DPI, which is also connected with the size of the photo.

How it works

CamanJS version 4 provides much functionality to assets the high quality images, each canvas (image) to be dropped in the page will take effect based on the filters. CamanJS provides the functionality to identify the high quality images. To get start and learn how to achieve this, use the following code demonstrated below:

HiDPI.html

HiDPI is the main web-page which contains the scripting code for identifying the high quality image. The page also contains a table to drop the image manually by targeting the image in a directory. This is achievable by adding the original CDN of CamanJS version 4. To get started we will demonstrate the specific code to get this to work.

Line 35

```
<script src="assets/js/caman.full.new.js"></script>
```

To assign the new version of CamanJS and to set the new functionality of using the HiDPI image, the script file contains a function that accepts any image dropped to the table. It will take effect based on the filter which we will have to target to the image.

Line 38-43

```
<script type="text/javascript">
var caman = Caman("#HiDPI", function () {
this.ramlee2();
this.render();
});
</script>
```

The above script contains the HiDPI function call, which will be maintained by a set of tags in the

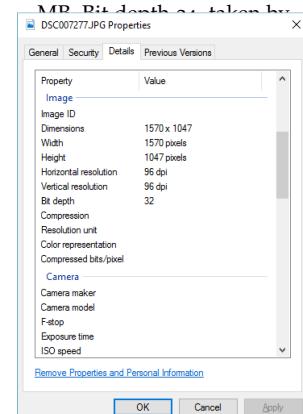
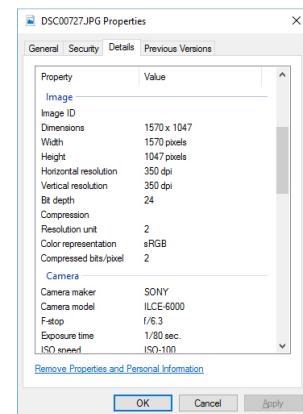
next step, also this function is assigned to do the operation provided by the original script file, then we simply call the filter effect we want by calling the filter function name `this.ramlee2(); this.render(); this.render();` meant to render the image file. You can always feel free to change the filter you like by changing the `this.ramlee2();` to whatever filter name you have assigned in the original file.

Line 56-52

```
<table align="center">
<td>
  
  <p>HiDPI</p>
</td>
</table>
```

In this table we specify the location of the image in the directory, since this operation (HiDPI) uses a different scripting and operated by the latest version of CamanJS, we will use this page only for a specific image we want to add the filter script developed in previous chapters. We added the id of the function name in this case HiDPI then we locate to the image directory by source linking ``. To always use the HiDPI in the code, target the identifier to the variable `data-caman-HiDPI` and then navigate to image directory, by doing so, the image will be showing in your page canvas element. To monitor the changes you can always change your image extension to .JPG or .PNG this also depends on your requirements.

The following example demonstrates the result of using the HIDPI feature. The picture of local woman selling souvenirs to tourists in Great Wall of China, the image demonstrates the original image details before the conversion process without any truncation (Figure 27), image taken using Sony ILCE-6000. The (figure 28) shows the use of HiDPI feature conversion using ramlee2 filter effect, noticing the image dimension is still the same; the good use of this feature that will extend the size and add more bit depth to the image without losing the quality. All this was done on the web!



4.4 Image Analysis

There are many ways in analyzing nearly any image. Humans generally tended to perceive a good understanding by what's surrounding them, human vision is the most sophisticated perception and an-

Figure 26: Picture before conversion to HIDPI, Dimensions 1570 x 1047 size 1.30 MB, Bit depth 24 taken by Sony ICEL-6000.

alytic system. On the other hand, Computer vision is added to ease the human vision in perceiving a good understanding to the image by analyzing image data and transforming the image into binary files. Currently, there are many software available and open-sourced aided, helping any photographer to identify meta data information.

What is Image Histogram

Histogram is a basic tool in image processing for versa prepossess such as image enhancement and image segmentation[9]. In this section you will be able to define what is image histogram and how its created from an image, as well understand the importance of image histograms in image processing and be familiar with basic image histogram operations such as equalization and matching.

The example demonstrated in this section will be strictly for gray level images. Any image with gray level from 0 to 255, we call the range of gray possible values the Dynamic Range of the image. The examples demonstrated in this section can also be extended to color images.

Moreover, the histogram provides a natural bridge between images and a probabilistic description. Histogram is often displayed as a bar graph (figure 29). The histogram is usually the only global information about the image which is available. It is used when finding optimal illumination conditions for capturing an image, gray-scale transformations, and image segmentation to objects and background.

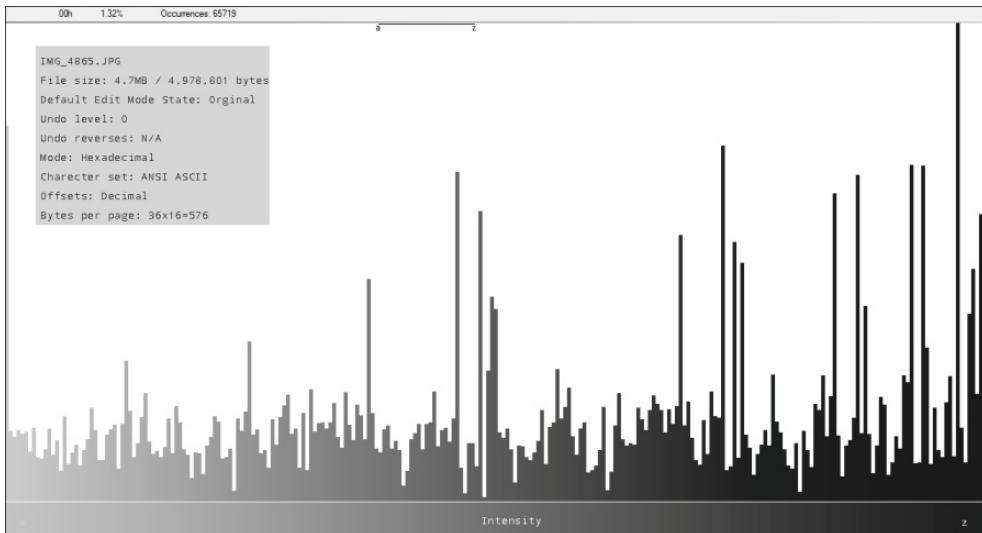


Figure 28: Sample of image histogram.

Comparing Image Quality

Comparing the images and identifying which image has a better quality, the image (a) on the left is not clear as image (b) on the right (figure 30), it is also doesn't highlight details. Moreover, areas seem to have variations in gray levels. On the other hand, the image on the right is much more conceived and has much more details due to relativity in gray levels.

This leads to the conclusion that the relativity abundance of different gray levels has direct impact in the quality of the image as perceived by the human visual system. This also raises questions on how

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can we quantify the difference of gray levels in any given image? How can we perceive that the image quality is low? How can we manipulate the gray levels to improve the overall image quality? The answer is in this section via histogram.

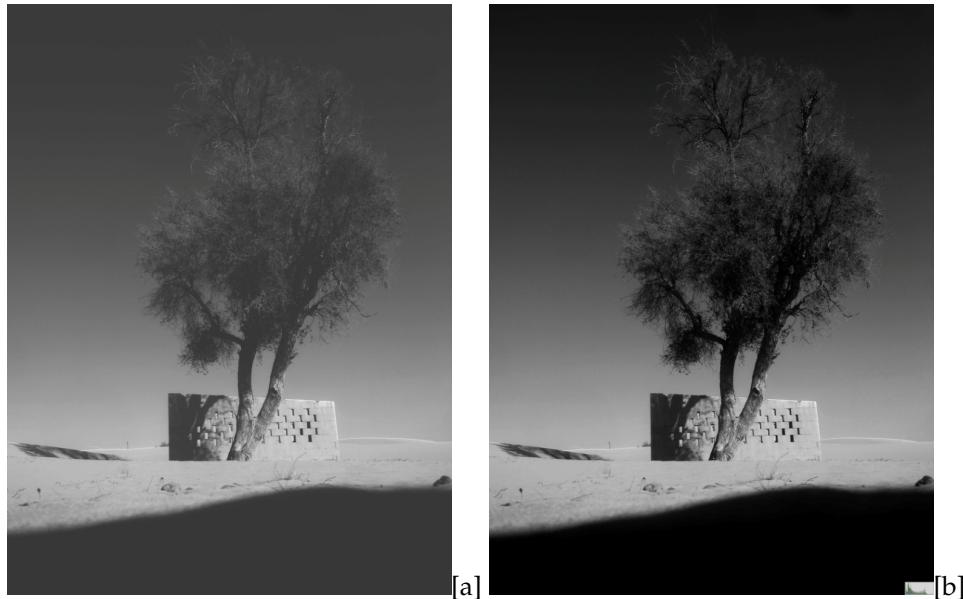


Figure 29: shows two images
(a) image from the right
with low quality, while
image (b) from the left
shows a high quality details.

This can be defined as a given digital image with gray levels from zero to L, the histogram of the image is a representation of the frequency of occurrence of each gray level in the image. In other words, the histogram is a tool that enable us to answer the following question, giving a gray level image how many pixels are there for every gray level? note that the term frequency occurrence related have the number of pixels at each gray level, the image histogram considers only the values of pixels without any special arrangements in the image. How an image histogram is generated? It involve a process of finding and counting all the pixels that have the first gray possible level in giving image and repeating this process for all remaining gray level values (figure 31).

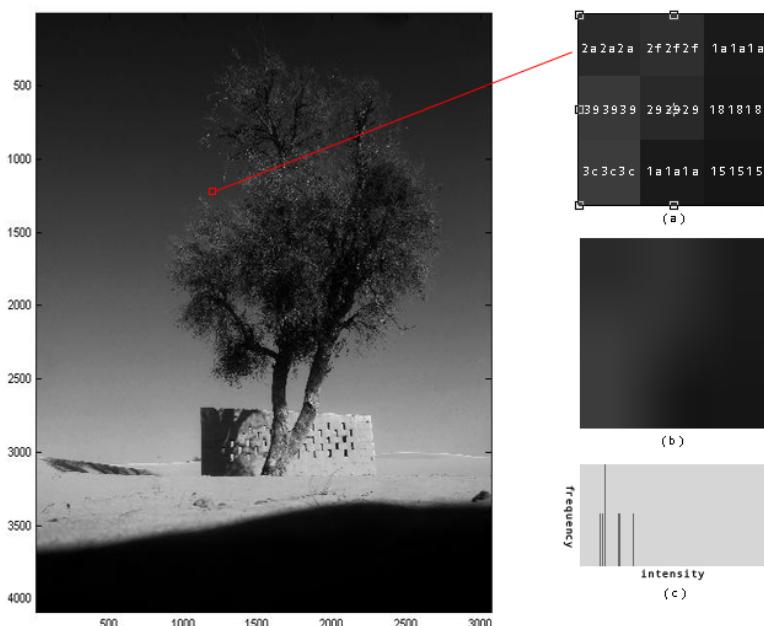


Figure 30: samples of 9 values of pixels from the scaled image (a), and the representation of the selected pixels (b), and the corresponding frequency x axis represent the gray level and the y axis represent the frequency (c).

From the previous examples we understand the importance of the image histogram and how it provides key information on the overall quality of the image and enhancing the image. To demonstrate the principles the following image of Ghaf tree was used (figure 32). Consider the following (figure a) the image histogram is concentrated at low gray level values and is not well spread out in the dynamic range of the image, as a result the image is very dark and has poor contrast. In (figure b) the image histogram is concentrated at high gray level and not well spread throughout the dynamic range, as a result the image is very bright and has poor contrast. In (figure c) the image histogram is concentrated on the middle of the dynamic range of the image, as a result the image is not too dark and not too bright, but it does exhibit poor contrast. Finally, in (figure d) the image histogram is wide and well spread on the dynamic range of the image, as a result the image is not too dark or bright and offers a good contrast.

The conclusion that by examining the image histogram we can determine if the image has poor or low quality contrast, also we can enhance our photo quality by controlling the histogram of the image to produce a balanced and good quality contrast of images.

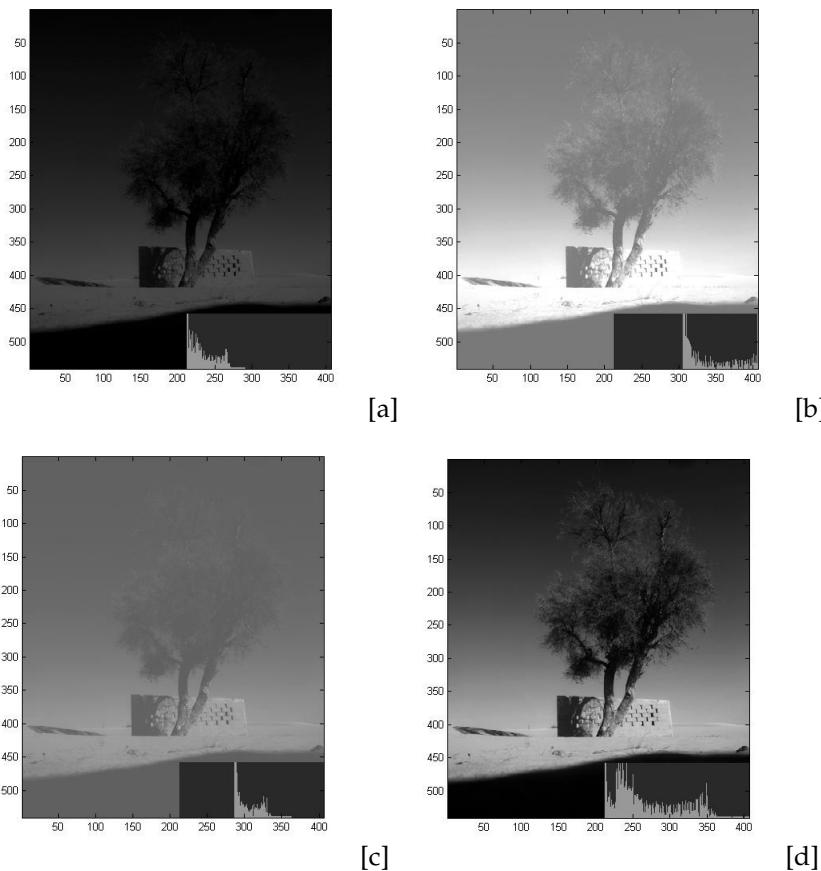


Figure 31: shows demonstration of frequency of occurrence of each gray level in single image

Image Histogram Tool

For the ease of use, I have included a page in the project folder which construct only the image histogram, note that it can also be used for colored images. To configure it, you can manually edit the code and add your own image to target the histogram frequency of the selected area. From your browser navigate to the following page <http://localhost/PhotoFilterApp/histogram.html> you should be able to see (figure 33).

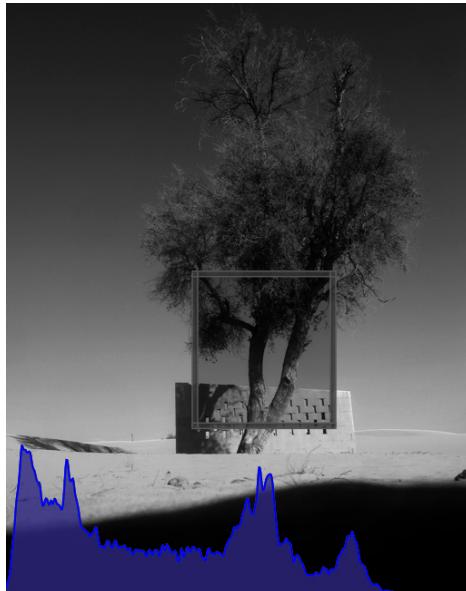


Figure 32: Image histogram frequency.

To get started, save the desired image in the project directory \localhost\PhotoFilterApp\assets\img. To edit the code, fire up the page using editplus editor, and navigate to line 191, the script should look like this:

```
document.addEventListener('DOMContentLoaded', function() {
  var image = new Image();
  image.src='./assets/img/IMG_4865.jpg';
  image.addEventListener("load", load);
});
```

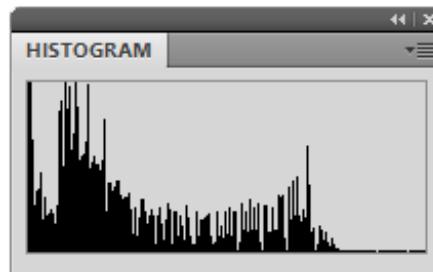
Change the `image.src` link to your desired image name or extension as follow:

```
./assets/img/IMG_4865.jpg
```

The above directory indicates to navigation directory of your selected image, you can always change the location of your image by editing the location of the directory. Note that a rectangular box will appear in the photo which reads the frequency of the selected area. Likewise, there are many tools that help you read the image histogram more accurately such as Matlab, Adobe Photoshop or Adobe Lightroom. The script works in two image extension type (JPG or PNG) files and support colored images as well, you need to have a JavaScript enabled in your browser otherwise the standalone script won't work.

The image histogram eventually would work differently from software to software, because each system generates its own reading depending on how the system render and reads the pixels rates in each level of the image. In (figure 33) you will notice that the limit of expanding the rectangular over the image will not give the user a full overview of the image histogram but overall it helps in detecting specific areas on the image. For this issue in histogram reading, I recommend using a specific tool used in Matlab Software called *image toolbox* which helps in generating an accurate reading of the image histogram and export meta-data information based on your code input.

On the other hand, famous software like Adobe Photoshop can also simulate a small reading of image histogram from the right panel of the software screen (figure 34), to show the histogram in Adobe Photoshop from the window option select histogram to show the desired image reading on your workspace.



Images and EXIF metadata information

Figure 33: Sample of Adobe Photoshop version 12.0 histogram window frequency.

Metadata is quite simply, data about data [10]. Each electronic file contains useful information. For example, a Microsoft Word documents contain information about the author's name and the date of the document was created/modified. Digital camera pictures may contain an Extended File Information (EXIF) header, which saves information about the camera model as well as other valuable information [11]. The EXIF version 1.0 was issued in October 1995 by the Japan Electronic Industry Development Association (JEIDA) and is referenced as the preferred image format for digital cameras in ISO 12234-1 [12]. The most recent version, Exif Standard version 2.1, was issued in July 1998 with additional tag information and recording format option [13].

Furthermore, global digital cameras manufacturers such as Canon, Nikon, Sony and Kodak implement the use of EXIF headers not only digital camera manufacturers but also extended to mobile cameras such as Samsung Electronics and Apple Incorporation, each image contains header which is stored in an application segment of a JPEG file, or as privately defined tags in a TIFF file [14].

A simple metadata information can be viewed via image properties in any operating system. Figure 35 demonstrates the metadata information of the image name DSC01061.jpg from windows 10 operating system. The picture was shot on 17/11/2015 at 10:58 PM using Sony ILCE-600 with ISO speed of 640 and F-stop f/5.6. Notice there are 3 dates available in the image properties, first the Date of image created on 1/1/2016 at 11:14 PM, and the date the image was modified on 17/11/2015 at 10:58 PM, but the original image was shot on 23/10/2015 at 1:42 PM, the image was modified using Adobe Photoshop CS5 Extended.

EXIF in Adobe Photoshop

Recently, the editing software Adobe Photoshop from 6.0 and higher attempt to preserve the image

```

Origin
-----
Date Taken          10/23/2015 1:42 PM
Program name        Adobe Photoshop CS5

Image
-----
Dimensions          4000x6000
Width               4000 pixels
Height              6000 pixels
Horizontal resolution 350 dpi
Vertical resolution 350 dpi
Bit depth            24
Resolution unit      2
Color representation sRGB
Compressed bits/pixel 2

Camera
-----
Camera maker         SONY
Camera model        ILCE-6000
F-stop               f75.6
Exposure time       1/160 sec.
ISO speed            150-640
Exposure bias        0 step
Focal length          50 mm
Max aperture         4.96875
Metering mode        Pattern
Flash mode           No flash, auto
35mm focal length     75

Advanced photo
-----
Contrast             Normal
Brightness           5.15390625
Exposure program     Normal
Saturation            Normal
Sharpness              Normal
White balance          Auto
Digital zoom           1.9
EXIF version          0230

File
-----
Name                DSC01061.jpg
Item type            JPEG File
Date created         1/1/2016 11:14 PM
Date modified        11/17/2015 10:58 PM
Size                 24.2 MB

```

Figure 34: Sample of image metadata header information.

extension .jpeg metadata information even after the image is modified [15]. For example, the above (figure 39) shows three dates. The first date shows the original date of the image was shot referred as Date Taken, the other is the file creation/modification. Notice that the image metadata information still has not been truncated even after modification. It is possible that the EXIF header of the image can be removed after editing the picture in other software rather than Adobe Photoshop, if a file doesn't contain EXIF information, it is possible that the picture is altered and has been modified [16].

Tags information in EXIF tool

In general there are limits to the precision of the capture information measured and detected by the camera, each of the information defined were to have strict values, and suitable information may not

always be obtained [17]. The definition provided by the following example and tool will have strict standard information of image EXIF data that was able to record during a specific capture conditions. Although the information can have different tags detected by the tool provided in this chapter, it is also possible to detect more newly added tag information such as subject, exposure mode as well as the digital zoom ratio.

EXIF image detection tool

The following tool will demonstrate three scenarios of images captured by 3 types of camera models Canon DIGITAL IXUS 85 IS, SONY ILCE-6000 and Apple iPhone 5 mobile camera. Each of the following camera will have different type of image information, the tool works as a detected system to detect a predefined Exif tags, Tiff tags as well as GPS tags. Each set of tags have a predefined values to read the image Exif information see sample values of GPSTags (figure 36). The tool also detects high file of images in TIFF format. However, the demonstration scenario does not include any TIFF image format type, the following scenarios as follows.

```
var GPSTags = EXIF.GPSTags = {
    0x0000 : "GPSVersionID",
    0x0001 : "GPSLatitudeRef",
    0x0002 : "GPSLatitude",
    0x0003 : "GPSLongitudeRef",
    0x0004 : "GPSLongitude",
    0x0005 : "GPSAltitudeRef",
    0x0006 : "GPSAltitude",
    0x0007 : "GPSTimeStamp",
    0x0008 : "GPSSatellites",
    0x0009 : "GPSStatus",
    0x000A : "GPSMeasureMode",
    0x000B : "GPSDOP",
    0x000C : "GPSSpeedRef",
    0x000D : "GPSSpeed",
    0x000E : "GPSTrackRef",
    0x000F : "GPSTrack",
    0x0010 : "GPSImgDirectionRef",
    0x0011 : "GPSImgDirection",
    0x0012 : "GPSMapDatum",
    0x0013 : "GPSDestLatitudeRef",
    0x0014 : "GPSDestLatitude",
    0x0015 : "GPSDestLongitudeRef",
    0x0016 : "GPSDestLongitude",
    0x0017 : "GPSDestBearingRef",
    0x0018 : "GPSDestBearing",
    0x0019 : "GPSDestDistanceRef",
    0x001A : "GPSDestDistance",
    0x001B : "GPSProcessingMethod",
    0x001C : "GPSAreaInformation",
    0x001D : "GPSDateStamp",
    0x001E : "GPSDifferential"
};
```

Figure 35: Sample of GPSTags

Scenario 1: Extracting image Exif information using Canon Digital IXUS 85 IS camera.

Consider the following image (figure 37). The image was edited using Adobe Photoshop CS5 on windows 10 operating system, the image dimension is 2736x3648 pixels taken with exposure time 0.005 seconds per 1/200 frames of ISO Speed rate 80. The previous information included from the Exif tool detection can be seen by the human visual system. Moreover, from the following information we can identify more details of the image. As a result, the image still contains the Exif header information and has not been altered. However, it is possible to identify that the image has been reproduced by Adobe Photoshop CS 5 using windows operating system for multiple purposes. From the reading the set of tags, it can give us more insight about the image, as a demonstration we will explain the set of tags that has been extracted using EXIF tool.

ImageWidth: The number of columns of image data, which equals to the number of pixels per row used for JPEG/JPG compressed data.

ImageHeight: The number of rows of image data used for JPEG/JPG compressed data.

BitsPerSample: The number of bits per image component, as a standard each component of the image is 8bits and represented as 3 type of values counted as 3 used for JPEG/JPG compressed data.

PhotometricInterpretation: The pixel composition value. If the value is 2, it means a representation of RGB standard format and 6 represent the YCbCr format used for JPEG/JPG compressed data.

Make: Represents the manufacturer of the recording equipment, the camera manufacturer equipment that generated the image.

Model: The model name of the camera or the model number of the equipment.

Orientation: The image viewed in terms of rows and columns, the default value is 1, which means the 0th row is at the visual top of the image, and the 0th column is the visual left-hand side.

SamplesPerPixel: The number of components per pixel, this is applied in both standards RGB and YCbCr images, the default value is 3.

XResolution: The number of pixels per ResolutionUnit in the imageWidth direction.

YResolution: The number of pixels per ResolutionUnit in the imageHeight direction.

ResolutionUnit: The unit for measuring XResolution and YResolution, default value is 2, represented in inches and value of 3 representing centimetres.

Software: This tag records the name and version of the software of firmware of the camera or image input device used to generate the image.

DateTime: Indicates the date and time of image creation, this refers to date and time the file was changed.

YCbCrPositioning: The position of chrominance components in relation to the luminance component, it is designed only for JPEG/JPG compressed data or uncompressed YCbCr data. The value 1 means of centred which is the recommended value of image quality and 2 referred to co-sited is a record of high quality view of image quality when viewed on TV systems.

ExifIFDPointer: Is a set of tags for recording Exif-specific attribute information pointed to the offset headers of the image.

ExposureTime: Indicates the exposure time given in seconds.

FNumber: Indicates the F number of image frequency.

ISOSpeedRatings: Indicates the ISO Speed and ISO latitude of the camera or input device.

ExifVersion: Indicates the version of the supported Exif version by default its set to 0220.

DateTimeOriginal: The date and time when the original image data was generated.



[a]

```

ImageWidth : 2736
ImageHeight : 3648
BitsPerSample : [3 values]
PhotometricInterpretation : 2
Make : Canon
Model : Canon DIGITAL IXUS 85 IS
Orientation : 1
SamplesPerPixel : 3
XResolution : 180 [1800000/10000]
YResolution : 180 [1800000/10000]
ResolutionUnit : 2
Software : Adobe Photoshop CS5 Windows
DateTime : 2015:11:28 12:53:47
YCbCrPositioning : 1
ExifIFDPointer : 296
ExposureTime : 0.005 [1/200]
FNumber : 2.8 [28/10]
ISO Speed Ratings : 80
ExifVersion : 0220
DateTimeOriginal : 2010:07:28 11:11:31
DateTimeDigitized : 2010:07:28 11:11:31
ComponentsConfiguration : YCbCr
CompressedBitsPerPixel : 5 [5/1]
ShutterSpeedValue : 7.65625
ApertureValue : 2.96875 [95/32]
ExposureBias : 0
MaxApertureValue : 2.96875 [95/32]
SubjectDistance : 4.21 [42100]
MeteringMode : Pattern
Flash : Flash did not fire, auto mode
FocalLength : 6.2 [6200/1000]
UserComment : [264 values]
FlashpixVersion : 0100
FocalPlane : 1
pixelXDimension : 1912
pixelYDimension : 3648
InteroperabilityIFDPointer : 1088
FocalPlaneXResolution : 15136.929460580914
[3648000/241]
FocalPlaneYResolution : 15116.022099447513
[2736000/181]
FocalPlaneResolutionUnit : 2
SensingMethod : One-chip color area sensor
FileSource : DSC
CustomRendered : Normal process
ExposureMode : 0
WhiteBalance : Auto white balance
DigitalZoomRatio : 1 [3648/3648]
SceneCaptureType : Standard

```

[b]

Figure 36: shows [a] the image and [b] the translation of EXIF metadata of the image.

DateTimeDigitized: The date and time when the image was stored as digital data, both the DateTimeOriginal and DateTimeDigitized will have the same value.

ComponentsConfiguration: The specific information of compressed data and the meeting channels of component uncompressed data uses YCbCr.

CompressedBitsPerPixel: Unit information for a compressed image in bits per pixel, the value 5 per 1 pixel [5/1].

ShutterSpeedValue: The shutter speed value.

ApertureValue: The lens aperture value per bit of pixels in our image it is 32bit.

ExposureBias: The exposure bias value, the default value is set to (0) if value showing it will be giving between range of -99.99 to 99.99.

MaxApertureValue: The minimum F number of the lens value per bit of pixels in our image it is 32bit.

SubjectDistance: The distance to the subject, given in meters. Note that if the number of the recorded value is FFFFFF.H, indicated as infinity, if the number is 0 distance unknown shall be indicated.

MeteringMode: The metering mode, 0 means unknown, 1 means average, 2 means CenterWeightedAverage, 3 means spot, 4 means multisport, 5 means pattern, 6 means partial other definition should be named as reserved.

Flash: Indicate the status of the flash when the image is shot.

FocalLength: The actual focal length of the lens in mm.

UserComment: Tag for Exif users to write keywords or comments on the image besides those in ImageDescription.

ColorSpace: The color space information tag is always recorded as the color space specified, normally sRGB (=1) is used to define the color space based on the PC monitor conditions and environment, other format will be defined as uncelebrated (=FFFF.H) or other as reserved.

PixelXDimension: This tag should not exist in an uncompressed file, all other file will show the pixel dimension of recorded width lines.

PixelYDimension: This tag should not exist in an uncompressed file, all other file will show the pixel dimension of recorded height lines.

InteroperabilityIFDPointer: This tag specifies the interoperability IDF structure of stored information structured as the same as TIFF IFD.

FocalPlaneXResolution: This tag indicates the number of pixels in the image width (x) direction per FocalPlaneResolutionUnit on the camera focal plane.

FocalPlaneYResolution: This tag indicates the number of pixels in the image width (y) direction per FocalPlaneResolutionUnit on the camera focal plane.

FocalPlaneResolutionUnit: Indicates the unit for measuring FocalPlaneXresolution and FocalPlaneYresolution, this value is the same as ResolutionUnit.

SensingMethod: Indicates the image sensor type on the camera or input device.

FileSource: This tag indicates the image source. If a DSC (=3) recorded the image, this tag value is set to 3 indicating that the image was recorded on a DSC.

CustomRendered: This tag indicates the use of special processing on image data, such as rendering geared to output, when special processing is performed, the reader is expected to disable or minimize any further processing, value of (0) indicate as normal process and (1) as custom process.

ExposureMode: This tag indicates the exposure mode set when the image was shot, in auto-bracketing mode, the camera shoots a series of frame of the same scene at different exposure settings, the value of

(o) indicates an auto exposure, value of (1) indicates manual exposure and value of (2) indicates auto-bracket.

WhiteBalance: This tag indicates the white balance mode set when the image was shot, the value of (o) indicates auto white balance and the value of (1) indicates manual white balance.

DigitalZoomRatio: This tag indicates the digital zoom ratio when the image was shot, if the numerator of the recorded value is (o) this indicates that the digital zoom was not used.

SceneCaptureType: This tag indicates the type of scene that was shot, it can also be used to record the mode in which the image was shot, if the value recorded as (o) means standard, (1) means landscape, (2) portrait and (3) as night scene.

Scenario 2: Extracting image Exif information using SONY ILCE-6000 camera.

Consider the following image (figure 38) the image was edited using Adobe Photoshop CS5 on windows operating system, the image dimension is 4000x6000 pixels taken with exposure time 0.00625 seconds per 1/160 frames of ISO Speed rate 640. Note that from the previous scenario explained about the tag, the same scenario will be applied to the same tag system. However, extra tags were detected by Exif tool, tags are explained as follow:

BrightnessValue: The value of brightness indicates the numerator recorded value of brightness in the image.

LightSource: The kind or type of light source even if light source was made manual, if value is undefined means unknown, the source of light can be Daylight, fluorescent, flash, fine weather, cloudy weather, shade, cool white, standard light A, standard light B, standard light C or ISO studio tungsten.

FlashpixVersion: This indicates the support version of the Exif version recording, the default value records o100 indicating the compatibility of the version.

Contrast: Tag indicates the direction of contrast processing applied by the camera when the image was shot. The value can be detected as Normal, Soft, and Hard.

Saturation: Tag indicates the direction of saturation processing applied by the camera when the image was shot. The value can be detected as Normal, Low saturation, High saturation.

Sharpness: Tag indicates the direction of sharpness processing applied by the camera when the image was shot. The value can be detected as Normal, Soft, and Hard.

Scenario 3: Extracting image Exif information using Apple iPhone 5 camera.

Consider the following image (figure 40) although the image was edited using Adobe Photoshop CS5 on windows operating system but it has been ignored by the Exif detector, the reason that the image data partially lost relates due to extra modification editing process of other application, in this scenario the application that set the new image data is Instagram mobile application. Moreover, in such situation when two operating system or more applications are used to edit/ modify the image, data information will be lost depending on the application or software functionality.

From the reading note that the GPS location was assigned to determine the location of the image, the image dimension is 1536x2048 with resolution of 299.99, also concluding from the image, the tag GPSDateStamp that is assigned to the image when geo tagged from Instagram application. It is not necessary to determine that the GPSDateStamp is the date of original image shot, but the image was distributed over the social network on that specific date with the assigned GPS location on Instagram.



[a]

```

ImageWidth : 4000
ImageHeight : 6000
BitsPerSample : [3 values]
PhotometricInterpretation : 2
Make : SONY
Model : ILCE-6000
Orientation : 1
SamplesPerPixel : 3
XResolution : 350 [3500000/10000]
YResolution : 350 [3500000/10000]
ResolutionUnit : 2
Software : Adobe Photoshop CS5 Windows
DateTime : 2015:11:17 22:57:54
YCbCrPositioning : 2
undefined : E PZ 16-50mm F3.5-5.6 OSS
ExifF0Pointer : 400
ExposureTime : 0.00625 [1/160]
fNumber : 5.6 [56/101]
ExposureProgram : Normal program
ISO Speed Ratings : 640
ExifVersion : 0230
DateTimeOriginal : 2015:10:23 13:42:09
DateTimeDigitized : 2015:10:23 13:42:09
ComponentsConfiguration : YCbCr
CompressedBitsPerPixel : 2 [2/1]
ShutterSpeedValue : 7.321928
ApertureValue : 4.970854 [4970854/1000000]
BrightnessValue : 5.15390625
ExposureBias : 0
MaxApertureValue : 4.96875 [1272/256]
MeteringMode : Pattern
LightSource : Unknown
Flash : Flash did not fire, auto mode
FocalLength : 50 [500/10]
UserComment : [64 values]
FlashpixVersion : 0100
colorSpace : 1
PixelXDimension : 4000
PixelYDimension : 6000
InteroperabilityF0Pointer : 1116
FileSource : DSC
SceneType : Directly photographed
CustomRendered : Normal process
ExposureMode : 0
WhiteBalance : Auto white balance
DigitalZoomRatio : 1.9 [19/10]
FocalLengthIn35mmFilm : 75
SceneCaptureType : Standard
Contrast : Normal
Saturation : Normal
Sharpness : Normal

```

[b]

Figure 37: shows [a] the image and [b] the translation of EXIF metadata of the image.

```

Make : Apple
Model : iPhone_5
Orientation : 1
XResolution : 299.99 [29999/100]
YResolution : 299.99 [29999/100]
ResolutionUnit : 2
Software : Instagram
YCbcRPositioning : 1
ExifIFDPointer : 136
GPSInfoIFDPointer : 226
exifVersion : 0221
componentsConfiguration : YCbCr
flashpixVersion : 0100
colorSpace : 1
pixelXDimension : 1536
pixelYDimension : 2048
SceneCaptureType : Standard
GPSLatitudeRef : N
GPSLatitude : [3 values]
GPSLongitudeRef : E
GPSLongitude : [3 values]
GPSAltitude : 2.380708661417323 [6047/2540]
GPSTimeStamp : [3 values]
GPSDOP : 123.81138790035587 [34791/281]
GPSDateStamp : 2015:11:15

```

Working with EXIF tool

Figure 38: shows translation of EXIF metadata of image shot using Apple iPhone 5 camera sensor.

To get started with your images EXIF data reading, make sure that your wampserver is up and working, from your browser navigate to the following page <http://localhost/PhotoFilterApp/EXIF.jsp>, you should be able to see the following page (figure 41).

To start working with your images enter the path of your image, by clicking on Browse button, once the image is selected a dialogue box will appear with the EXIF information tags, you should be able to see something like this (figure 42):

In case your image is altered or not original EXIF information will be lost and the application will not be able to detect or read the image information as explained, if the image has been used or modified by softwares that don't support EXIF information functionality, EXIF information of the image will be lost. See (figure 43).

JHeader Java EXIF/JFIF tool

It is also possible to retrieve EXIF headers by looking at each picture in a disk editor. However, the amount of time is also required in order to simulate the hex reading into human readable format. Another opensource project JHeader allows the retrieval of EXIF headers from jpg compressed image file. JHeader is a Java library that detect/ modify EXIF and JFIF headers in JPEG files. It also comes with a command line tool and a GUI tool <http://jheader.sourceforge.net/index.html>. Some advantage features included such as:

- Display and edit any recognized EXIF tag.
- Add and remove EXIF tags.
- Convert JFIF files to EXIF and vice versa.
- Create and extract thumbnails from EXIF and JFIF headers.
- View and edit JPEG file comments.
- A command line tool for performing some operations.

Although the tool is great to detect EXIF headers of jpg images, it has some issues such image modification will truncate and alter the originality of the image, meaning the original image will create other

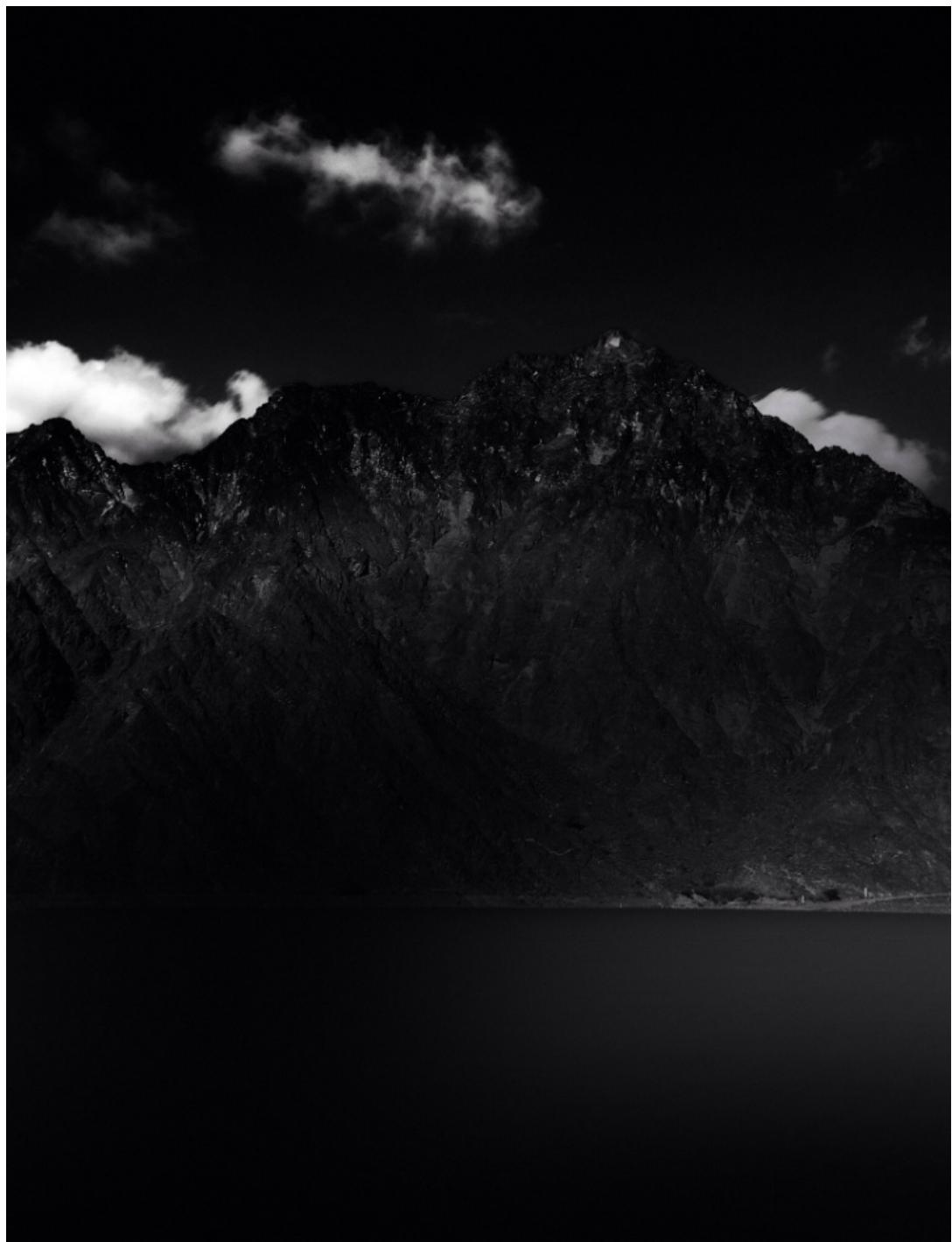


Figure 39: shows image shot using Apple iPhone 5 camera sensor.

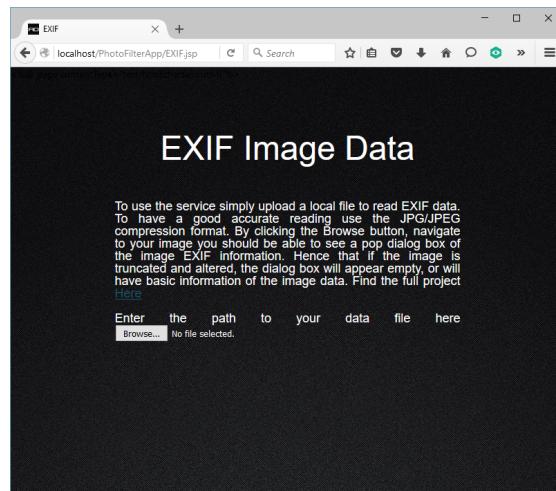


Figure 40: shows interface of the page tool

version of image EXIF header tags, this due to different tags supported by new digital cameras. For example, images that shot by Apple mobile cameras contain EXIF information as seen in previous scenario, with JHeader the same image was unable to be detected, and that is due to incompatibility of predefined tags detected by JHeader java classes. Overall the tool is easy simple and works with many platforms. I have included the .jar file of the tool in the project directory `jheader-0.1.jar`, make sure java is installed in your computer, double click the jar you should see something like this (figure 48). Or you can download the project form the main website project <http://jheader.sourceforge.net/index.html>. Hence that the tool can detect old type of EXIF metadata tags of the cameras models (Canon, Fujifilm, Minolta, Nikon, Panasonic, Pentax, Ricoh, Sony).

There are many tools available over the internet that helps to detect image EXIF metadata, a list of applications can be found <http://graphicssoft.about.com/od/exifsoftware/> or the ExifTool by Phil Harvey can be found throw the following link <http://www.sno.phy.queensu.ca/~phil/exiftool/>.

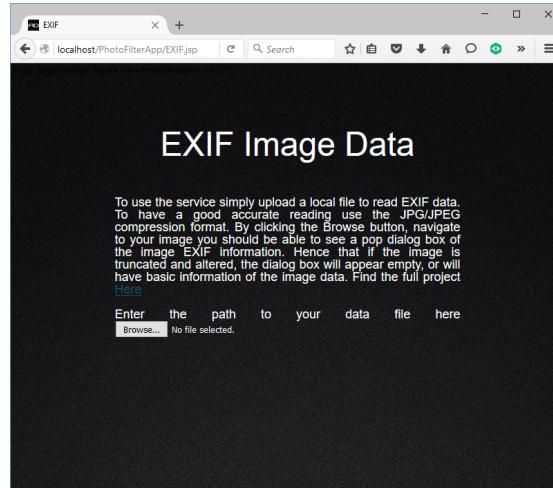


Figure 41: shows dialogue box with EXIF metadata

```

Orientation : 1
XResolution : 300 [3000000/10000]
YResolution : 300 [3000000/10000]
ResolutionUnit : 2
DateTime : 2015:11:19 20:54:04
ExifFDPointer : 164
ColorSpace : 1
PixelXDimension : 3072
PixelYDimension : 4088

```

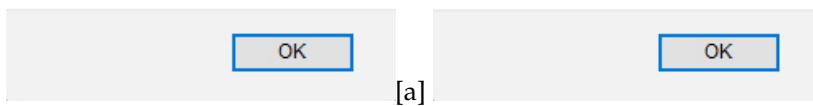


Figure 42: shows dialogue [a] altered image and dialogue [b] shows less EXIF metadata.

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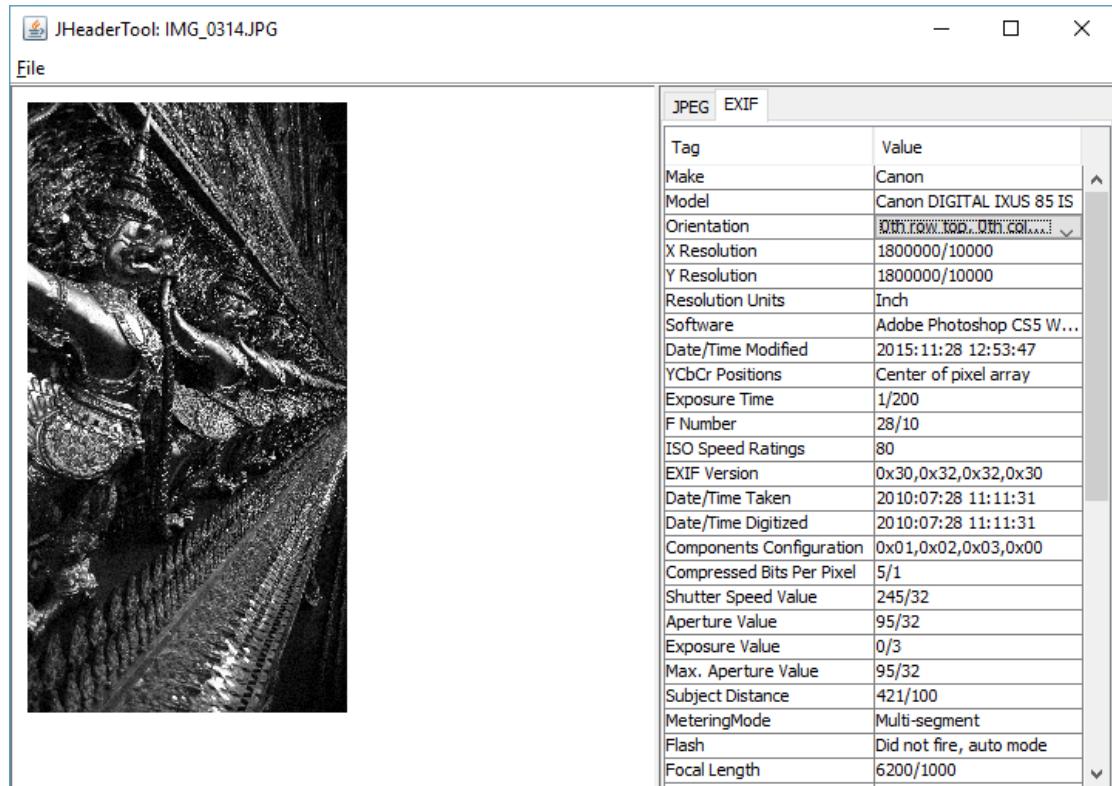


Figure 43: Image was shot using Canon Digital IXUS 85 IS camera model, no errors detected by the JHeader tool.

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