



Faculty of Computer Science and Information Technology

*Developing an App to Generate Artistic Deep Dream Images based on a Deep Learning
Framework*

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Bachelor of Computer Science with Honors

(Software Engineering)

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Framework*

TAN WENG KUN

This project is submitted in partial fulfilment of the requirements for the degree of
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Framework

TAN WENG KUN

Projek ini merupakan salah satu keperluan untuk
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Abstract

This study is concerned about the DeepDream Generator. DeepDream Generator is an app that are able to transforms ordinary photo into artistic images. Nowadays, people tend to do the things all the same ways without thinking out of box. This is because there is no platform for them to express themselves and creating art. It is important to exposed to art since small because being exposed to art can helps in release stress and increase creativity thinking. With problem statement, the objective is design and develop an app that implements the framework for the generation of creative and artistic images based on a user-selected photographic medium. Hence, the aim of this paper is to describe and demonstrate the development DeepDream Generator for provides targeted users a free platform to express themselves, release stress and even able to help them improve their creativity. The methodology chosen to use in this study is the rapid prototyping methodology (RAD). Lastly, the conclusion and future work will be discussed at the end of this project.

Abstrak

Kajian ini berkenaan tentang DeepDream Generator. DeepDream Generator adalah satu applikasi yang dapat menukar gambar biasa kepada gambar artistik. Pemuda sekarang cuma membuat sesuatu perkara dalam cara yang sama tanpa berfikir keluar dari kotak. Ini kerana tiada platform bagi mereka untuk ekspres diri dan mencipta seni. Mendedah seni sejak kecil amat penting kerana seni dapat bantu seseorang untuk mengurangkan tekanan dan meningkat pemikiran kreativiti. Dengan pernyataan masalah, matlamatnya adalah reka bentuk dan membangunkan aplikasi yang melaksanakan rangka kerja untuk menghasilkan imej kreatif dan artistik berdasarkan medium fotografi yang dipilih oleh pengguna. Oleh itu, matlamat projek ini adalah untuk menggambarkan dan mendemonstrasikan pembangunan DeepDream Generator untuk menyediakan pengguna yang disasarkan satu platform percuma untuk ekspres diri mereka, mengurangkan tekanan dan juga dapat membantu mereka meningkatkan kreativiti mereka. Metodologi yang dipilih untuk digunakan dalam kajian ini adalah metodologi prototaip pesat (RAD). Akhir sekali, kesimpulan dan kerja masa depan akan dibincangkan pada akhir projek ini.

Chapter 1: Introduction

1.1 Introduction

Creating artwork would be a difficult task as it would not come naturally to those who are not gifted. Not everyone can create artwork on their own. It can be taking up an hour or even more than days to just complete an artwork. Creating artwork helps to expand the creativity of a person. With creativity comes with innovative thinking. At present, there is more artist lean towards digital art compare to traditional art as it is easier to access and cheaper. Digital art is a general term for a range of artistic works and practices that use digital technology as an essential part of the creative or presentation process. (Reach, 2019) For example, in multimedia industries or social media always use advertisement to advertise their product. Here comes usage of the digital art, most of them use digital art to design the advertisement. This is because digital art is more appealing and easier to access as the art can be duplicate and store in the cloud. It also saves a lots money by using computer, software or tablets instead of colours, pencils and paper which need to restock whenever it is depleted. Digital art can be distinct into many types. For example, digital photography, photo painting, digital collage, integrated digital art, digital painting, vector painting and algorithm/fractals. Deep dream generator is one of the digital art examples. It allows user to convert the photo into artistic artwork by using a convolutional neural network to find and enhance patterns in images. Then produce a deep dream effects into the image by combining the characteristic of the artwork selected with the original photo.

1.2 Problem statement

“Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution.” (Manwani, 2018). There is one thing that never change is art benefits for everyone. Producing art can be very expensive and time wasting. There are two types of art which are traditional art and digital art. Traditional art needs lots of tools such as pencil, colour and paper which needs to always restock whenever it is depleted. When drawing images with pencil, the drawing can be too light and doesn't have the dark shadows that need to be achieved. But with digital art, only computer, software or tablet is needed. People tend to upload their daily lifestyle photo with Instagram, Facebook and Snapchat with just some normal filter. With the photo in the phone, they can always change their image to artistic images based on their preferences. Instagram, Facebook and Snapchat all of them does not have this kind of function. It is lack of apps for that avenue. To tackle this problem, a deep dream generator which able to turn the photo into artistic images based on their style preferences is introduced to them. The deep dream generator will survey the user with some question before the user start to use the apps and after collecting the result of the survey, the style is recommended according to the result of the survey. Nowadays, children are exposed to technology at very young age. According to Bernstein (as cited in Kohl, 2005), Creating art may boost young children's ability to analyse and problem-solve in myriad ways. Therefore, it is crucial to create a platform for children to expand artistic skill and creative thinking. According to National Endowment for the Arts (2011), art can also improve language development in young children and helps young children express their emotions and provides a good outlet for stress.

1.3 Objective

The aim of this project is to design and develop an app to Generate Artistic Deep Dream Images based on a Deep Learning Framework

- To study the existing system on the other platforms and determine flaws between traditional art and digital art and the CNN model in the deep learning framework.

In order to be more knowledgeable and have better understanding of the various domains of the art world, a study will be undertaken. Additionally, an in-depth study of CNN and deep learning model is necessary in order to apply the right methods in the implementation of this project.

- To apply the various features from the deep learning model into a simple framework that generates artistic deep dream effects onto photographic medium.

To create a prototype that implement the right methods from the study of CNN and deep learning model in order to study the features of the images and introduce the deep dream effects into the targeted image by combining the style of the artwork selected with the targeted photo.

- To design and develop an app that implements the framework for the generation of creative and artistic images based on a user-selected photographic medium.

To create a platform for the targeted users and allows them to use this platform as a place to express themselves and develop their creative thinking by allow them to create their own style of art by combining the style of art and the targeted images.

1.4 Brief Methodology

Rapid Application Development (RAD) is one of the methods of agile software development methodology. It is divided into four phases, analysis and design, prototype cycles, testing and deployment. This method is chosen to use for this project because it provides a simple adaptability and greater flexibility as when the change requirement is occurred, redesign is done according to the developer for easily adapt to the existing designed application. Besides, RAD is not only a risk control method but it also can deliver a better-quality application within a shorter time as the duration of Final Year Project 2 which is focuses on the development is only within three months. RAD can even get the rapid or constant user feedback during development through frequent iterations and prototypes release. (Powell-Morse, 2016) The implementation of the project in each phase (Refer Figure 1.1) will be explained in detail in the following subsections.

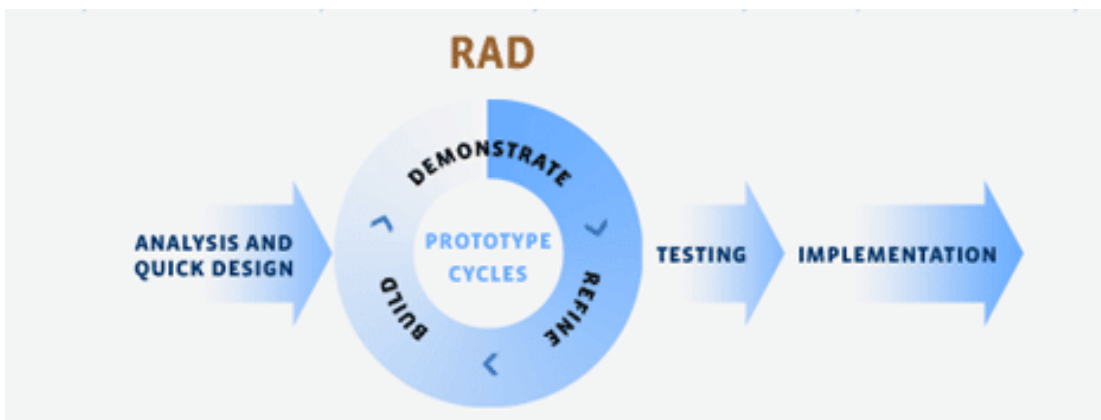


Figure 1.1: Rapid Application Development (RAD) Model (Ghahrai, 2018)

1.4.1 Analysis and Quick Design

Initial phase of this project is to collect target users' requirements. Next, surveys will be distributed to a group of students to understand their perspective. The data is then collected to evaluate user's interest, requirements and problems towards current art platform. Besides, existing product will be reviewed to understand their value proposition, how it worked, and what are their pros and cons in order to form a crystal-clear picture can be developed from both users and existing products.

1.4.2 Prototyping Circle

In this iterative phase consists of build, demonstrate, and refine. These phases will further discuss in detail at below.

1.4.2.1 Build

In this phase, app is developed and improved according collected requirements and feedbacks. Functions that considered as higher priority will be built first to get important feedback from the users earlier as those are higher priority features that used by them.

1.4.2.2 Demonstrate

A prototype is then demonstrated to users after all the main features are developed to provide users on how the app looks like in order to collect critical feedback from them. This enables users to run through the app to check whether the requirement is fulfilled and to reduce the unnecessarily time spent to build useless features. It also helps to detected bugs earlier and debugged before it is compiled.

1.4.2.3 Refine

After receiving feedback on how users use the app and their suggestion, developer will enhance the app accordingly.

1.4.3 Testing

Testing processes is then carried out to demonstrate that the app can function properly and discover app bugs or errors before it is published. If there are any app defects, the app must refine to fix all the bugs before release to the end users.

1.4.4 Implementation

After done checking and testing, the final product is ready to be published to the end users.

1.5 Scope

The scope of this project is targeted to be used for users to expand their creativity, destress or developed artistic skills. It allows users to convert the photo into artistic artwork by using a convolutional neural network to find and enhance patterns in images to produce deep dream effects into the images.

1.6 Significance of Project

The purpose of develop this app is to enable a platform for users to explore new path and change their thinking about traditional arts. It also helps user to destress and expand their artistic skills. Besides, users can expand their creativity or express their emotion through this platform.

1.7 Expected Outcome

The outcome of this project is an app that allows user to convert the photo into artistic artwork by applying a convolutional neural network that identifies and processes selected features in both the artwork and targeted images. Then the app proceeds to introduce the deep dream effects into the targeted image by combining the style characteristic of the artwork selected with the targeted photo.

1.8 Project Schedule

The proposed project schedule spans two semesters, first semester doing Final Year Project 1 (FYP 1) and second semester Final Year Project 2 (FYP 2). FYP 1 started at 9th of September 2019 and ends at 11th January 2020. For the first semester, the project prototype with limited functionality will be release for users' feedback for the first iteration, and the improvement will be carried forward for the next semester. Figure 1.2 and 1.3 show Gantt chart for FYP1 and FYP2 respectively.

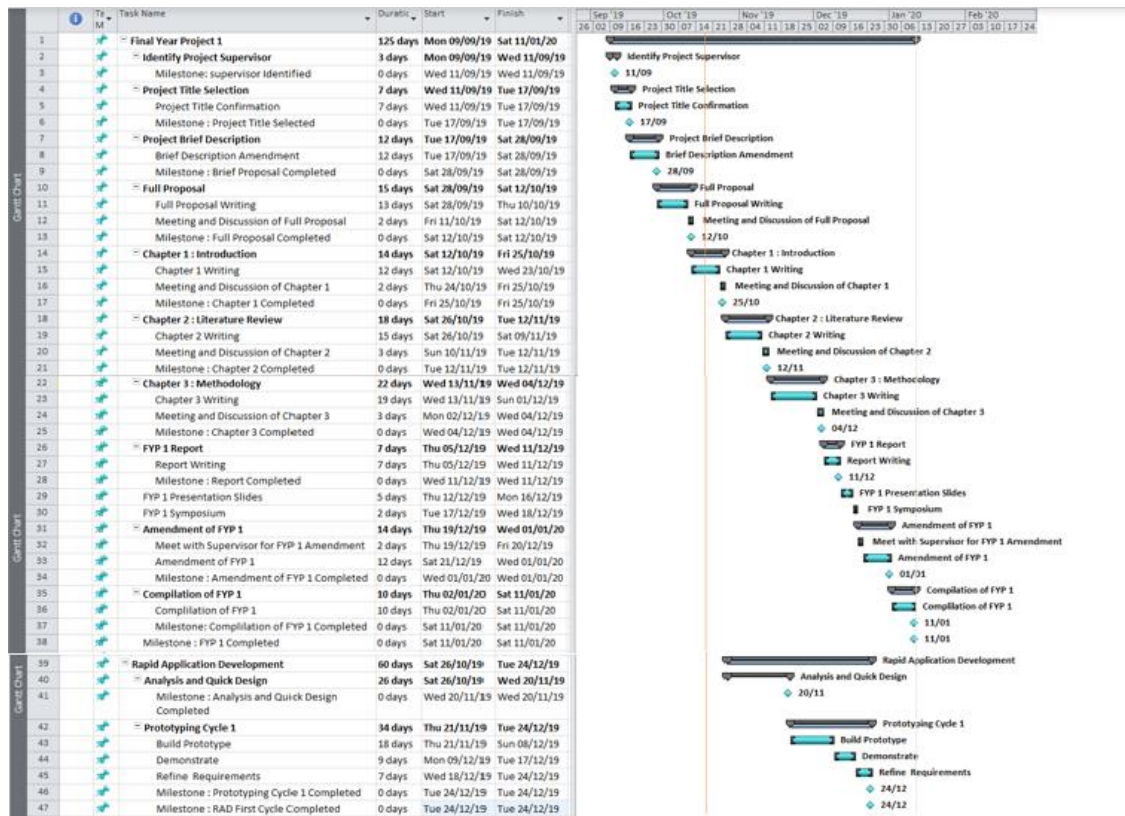


Figure 1.2: The Gantt chart of the development of the project (FYP 1)

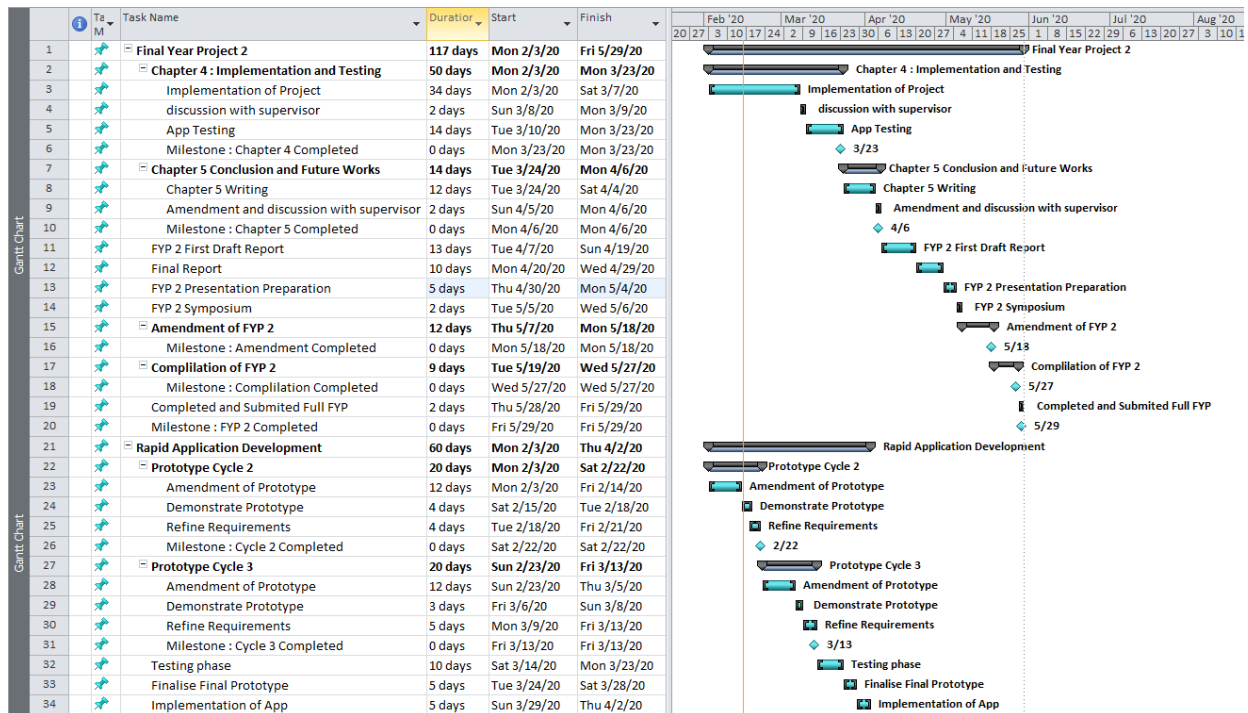


Figure 1.3: The Gantt chart of the development of the project (FYP 2)

1.9 Project Outline

This project report consists of 5 chapters, with each chapter summarized as below:

1.9.1 Chapter 1: Introduction

Chapter 1 describes the background of the project, which focuses on what are the problems that the project trying to solve (problem statement). It also discusses the objectives of the project, methodology used to develop this project, scope of the project that lists down the boundary for this project, significance of this project and the expected outcome for this project. Last but not least, the project timeline is scheduled to ensure we have a way to keep track of the progress.

1.9.2 Chapter 2: Literature Review

Chapter 2 reviews on existing system to gain a comprehensive understanding on how it works, which then further analyzed to see what came before, what work well and what did not work well. This chapter will also review technology stack that is going to be used in this project.

1.9.2 Chapter 3: Requirement Analysis and Design

This chapter discusses the methodology chosen for this project, which is Rapid Application Development (RAD). First part of the chapter will be discussing requirement elicitation process, from the result obtained, the latter part of the chapter will illustrate logical design of the system which are use case, sequence diagram, activity diagram, class diagram.

1.9.4 Chapter 4: Implementation and Testing

Chapter 4 will be emphasizing on the actual implementation of the project, which involve building a prototype of the project and the prototype is tested in great details to ensure verification and validation take place before its released to public.

1.9.5 Chapter 5: Conclusion and Future Work

This chapter concludes the project and documenting lesson learnt throughout this project. List of the future works is outlined to pave a way for future projects to benefits from this project.