Design and Development of Multimedia and Multi-Marker Detection Techniques in Interactive Augmented Reality Colouring Book

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Abstract. The aim of this paper is to the design and develop multimedia and multi-markers detection techniques in interactive Augmented Reality (AR) colouring book application for aquarium museum. This study is conducted to create entertaining AR colouring mobile application on Android Operating System which allows users to express, create and interact with their creativity through colouring activities. It allows users to engage and relish the stimulating colouring book content by switching between a reality and augmented world. Conversely, users may tend to lose interest in the colouring activities, but with AR technology it keeps colouring relaxing and inspiring. The design and development of this project was carried out using Unity3D integrates with Vuforia Engine. The multimedia and multi-markers scripting was written in C# programming language.

Keywords: Augmented Reality, Multimedia, Multi-Markers, Colouring book.

1 Introduction

A colouring book is a type of book containing line art targeting user especially children to add colour using either crayons, colour pencils, marker pens, water colour paint or any form of artistic media. Colouring book is a platform for user to express their imagination, creativity, emotional-feeling as well as opinions in daily life. Creating entertaining and educational books not only requires visually stimulating content but also means for students to interact, create, and express themselves [1]. Nowadays, children are captivated in using electronic devices for many purposes either for fun playing or learning. Hence, children tend to divert to 3D objects AR colouring application compared to conventional way of colouring book which expose only 2D images. Contrary, implementing AR into colouring book is deem as a way for user to learn new method, discover a new perception of reality, curiosity, and develop a sense of patience and calmness in daily life.

In today's technology hype, colouring has evolved from physical book to mobile colouring application. For example, SMASHINGMAG, Monochromatic Scheme, Mandala drawing app, Colorfly (Coloring Books for adults), and Family Coloring Pages.

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Users can start colouring and drawing using variety colours options provided in the application anytime and anywhere without the need to carry a book and colour pencils. Nevertheless, some of the colours may not be suitable to all the user's interest as users may be limited to certain colour choices offered in the system. Hence, when users are done with the colouring in the application, there is no further interaction, and this made the colouring application become less fun and attractive. Therefore, by designing and developing finger motion features in AR colouring book would certainly benefit user to gain a whole new experience, knowledge and cognitive-emotional curiosity.

2 Problem Statement

Conventional colouring book however do not have further interaction that can be seen through 3D from the screen. Attentively, colouring book is a book which contains art where user can add colour such as coloured pencil, water colour and marker pens onto the book. User may tend to get uninterested seeing the same colouring design and there is no uniqueness to the colouring design. Hence, the colouring book will eventually lose its attention to the user. Consequently, to make image 'pop-up' through mobile screen is by implementing AR in the colouring book app. With AR, it supports users to understand art experientially, appreciate art in a new perspective and getting user excited about checking out the art museum and gallery [2]. However, the interaction only happened to the physical touch screen of the mobile device, limited interaction where user can interact with the object that overlay on the screen. The interaction within AR application are still limited [3] and not advanced like allowing the user to touch and interact with the object so that it will change its colour or turn it into others object.

AR helps create interactive and experiential art, users get to interact and be creative with the art that will creates a memorable experience [4]. Furthermore, AR is the perfect approach to creativity. With AR technology there are infinite number of ways to alter user's environment. This technology is suitable to enhance user creativity and imagination [5]. Therefore, by designing and develop multimedia and multi-markers features in AR colouring book will add other features from the previous and existing AR colouring book.

3 Objective and Scope of Study

The objective of study is to design and develop multimedia and multi-markers detection techniques in AR colouring book. User is required to scan the colouring book using their mobile cameras. Subsequently, the colour chart options and interaction buttons will pop-out once the markers are detected. The application will display the virtual content in real environment. Human Computer Interaction (HCI) principles are applied as guidelines for designing the interface process and system flow of the colouring application.