CHAPTER 1

INTRODUCTION

1.1 Problem Background

In 2019, the World Health Organization (WHO) released a report titled "World Report on Vision". The information recorded that around 2.2 billion people, nearly 1/3 of the global population, experience visual impairments due to ocular diseases or uncorrected ocular errors (World Health Organization, 2019). About 1 billion of them could have been prevented with more proper and accessible healthcare, including eye health care. Despite the progress made over the past 30 years, the global need for eye care is projected to increase drastically in the coming years. It is estimated that by 2050, half of the world population will be living with some form of visual impairments (World Health Organization, 2019).

The current condition poses a significant challenge for the health system all around the world. According to the WHO report, one way can address the problem is by early detection for prevention. This goal is further supported by the United Nations' Sustainable Development Goals (SDG) number three, which reads, *"Ensure healthy lives and promote well-being for all at all ages."* Thus, actions taken now will contribute to the SDG. Moreover, the report found a close link between eye health and almost all major development issues such as education, economic growth, and sustainability.

Sadly, those who are more likely to be affected by such impairments are among the poorest and socially disadvantaged members of society who experience cultural and socioeconomic barriers to eye care services. The currently available tools used for diagnosis are intrusive (Miranda, 2019), which may cause some discomfort in getting the care needed, and often requires an expert to be present. Fortunately, emerging technologies like virtual reality (VR) have opened up new doors of opportunities for scientists to solve real-world problems like this in a new way.

Nowadays, hardware distribution and software development for VR based games and applications have become more accessible. Thanks to smartphones' advancement, VR applications can be run on mobile devices. As more and more industries start to use VR, it is expected that VR will be widely used on the daily in the future. VR technologies have an advantage over others by providing total immersion for the user with the virtual environment, especially in interfering with the sense of sight.

Moreover, ever since the COVID-19 pandemic has begun, society's way of interacting has been limited. Even post-pandemic, in the foreseeable future, it is likely that interactions will stay limited. Being heavily influenced by the pandemic, the health sector dynamics have also shifted, including health controls or check-ups. Many of what used to be face-to-face interactions have now changed into virtual sessions to reduce unnecessary interactions to prevent further spread of the virus.

1.2 Problem Statement

Based on the conditions described in the problem background, thus the problem statement on this research is as follows:

1. How to design and implement a virtual reality-based app for colour blind detection?
2. How to evaluate the joy, control, and perceived ease of use of the application using Hedonic-Motivation System Adoption Model (HMSAM)?

1.3 Scope and Limitation of Problem

The scope and limitations of this research are as follows:

1. The app will focus on one type of visual impairments, which is colour blindness, specifically dichromatism.
2. The app will focus on the colour blind test.
3. There are several types of colour blind tests, but the reference tests for this app will be based on the standard Ishihara and D15 Farnsworth-Munsell Test.
4. The target user for this app does not limit anyone who wishes to test their vision, but testing scope will be done on people based in Tangerang Selatan.

1.4 Research Purposes

The purpose aimed of this research is as follows:

1. To design and implement a virtual reality-based app for colour blind detection.
2. To evaluate the joy, control, and perceived ease of use of the application using Hedonic-Motivation System Adoption Model (HMSAM).

1.5 Research Benefits

The benefits of this research are as follows:

1. To make colour blind test accessible for everyone.
2. To provide a non-intrusive way of early detection in visual impairments, in particular, the colour blind test.

1.6 Writing Structure

CHAPTER 1 INTRODUCTION

The first chapter of this paper presents the reason behind choosing this particular topic of "Design and Development of Virtual Reality-Based Application for Colour Blind Detection" It contains the problem statement, scope and limitations, research purposes and benefits, and the writing system.

CHAPTER 2: LITERATURE REVIEW

This chapter contains a literature review about the topic starting from the human eye, colour, colour blind test, virtual reality, HMSAM, and the Likert scale.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter contains the research methodology steps and proposed solution concept based on the theories previously mentioned on how to solve the problem. The research methodology steps are literature review, system design, implementation, testing and evaluation, and report creation. The proposed solution concept is further elaborated through flowcharts and user interface design.

CHAPTER 4: RESULT AND ANALYSIS

This chapter talks about the implementation of the design and code of the application, in addition with an analysis of the test results.

CHAPTER 5: CONCLUSION AND RECOMMENDATION

This is the final chapter of this paper and contains the summarised findings after the implementation and testing. This chapter also contains a recommendation for further research in the future.