

## Virtual Reality-Based Communication Media For Acrophobia Therapy

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**Abstract:** The rapid development of information and communication technology has a significant impact on the use of media to help patients in reducing anxiety. This study aims at developing virtual reality-based therapeutic media to overcome acrophobia. Model ADDIE is applied in this research. The results show the therapy system that utilizes the technology of virtual reality proven effective to treat acrophobics by bringing together people with acrophobia along with a direct object using desensitization and virtual reality assisted with 3D glasses as display media. In this invention, a virtual reality system for acrophobia therapy is developed by using the android operating system which characterized by a minimum android KitKat 4.4 specification.

**Keywords:** *Virtual Reality, Communication Media, Acrophobia Therapy*

### Introduction<sup>1</sup>

Media of communication in the current global era has experienced a very rapid development and become a vital part of everyday life. One of the media that can support the development of this technology is a computer. Not only as a medium of entertainment, computer technology has also penetrated into various fields, such as industry, business, health and psychology.

Innovations in therapy using virtual reality have been widely used in dealing with psychological problems, especially for anxiety disorders [1]. Computer programs for psychotherapy have been recommended as a method for dealing with psychological problems that are effective and can be used for many people (2-3).

Anxiety disorder is a mental disorder in which the sufferers show feelings of fear and anxiety. Fear arises in response to current events in an instant, while feeling anxiety represents discomfort, restlessness of thought and uncertainty caused by future events. One form of anxiety, which is phobia, is an unnatural, high-intensity fear of a situation or object. [4]

The method of treatment used by the therapists is usually cognitive behavioral therapy. This therapy aims to make the patients perceiving their objects of fear patiently and differently, so that they can control their thoughts about the fear they experience. [5]

One of the innovations in psychotherapy method in helping the phobic is using virtual reality. Virtual Reality (VR), also known as immersive multimedia or computer simulated reality, is a computer-generated simulation of a three-dimensional environment, which looks very real to the person who feels it, using special electronic equipment. The goal is to achieve a strong sense of existence in the virtual environment. [6]

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## Literature Review

According to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (APA, 1994), acrophobia, is an extreme fear of heights, classified as a “specific phobia”, a “natural environment type” of phobia. Acrophobic behavior usually involves avoiding a variety of height-related situations, including stairs, terraces, apartments. [7] Anxiety or phobia is a type of mental disorder caused by the constant fear of a situation or something. [8]

A study by Fredrikson, Annas, Fischer, and Wik (1996) presented results with 6.3% of men and 8.6% of women presenting with acrophobia. The disorder tends to become chronic [9] mostly because of the avoidance of the high-related situations encountered in daily life. [10]

Virtual reality provides a new system of perception, visually utilizing quality. Virtual reality gives realistic-experience feeling, in a way that is different from a perception, and experience through observation. [11]

Virtual reality is a simulated environment by a computer, generated from a three-dimensional environment, which can stimulate physical sensations as in the real world or the world of the imagination. Virtual reality can mimic or recreate experiences that humans perceive as sensory. Most virtual reality provides a virtual environment utilizing the sense of sight. It is displayed either using a monitor screen or by using other visual aid. Besides the sense of sight, the sense of hearing can also be affected by virtual reality with the help of loudspeakers

A research by Carlos M. Coelho on the use of virtual reality has proven to be very effective in the treatment of acrophobia. [12] It is similar as the research conducted by Emmelkamp, P. It shows that the exposure of virtual reality can be effective with relatively inexpensive hardware and stand-alone computer software that currently on the market. [13]

## Research Methods

The researchers use a model namely Analysis (Analyzing), Design (Design), Development (Development), Implementation (Implementation), and Evaluation (Evaluate) or more often abbreviated as ADDIE model. [14] This model has several stages that match its name, namely (1) analysis, (2) design, (3) development, (4) implementation and ending with stage (5) evaluation.

Analysis stage. At this stage, system requirements planning is carried out in the form of an understanding of the problems faced by users. The first planning is to identify existing problems and the purpose of making applications. After that is the process of collecting information related to the media of therapy for people with Zoophobia, Virtual Reality, Android, C # Programming Language, Google VR, Java Development Kit (JDK).

Design Stage. The design stage is a process prior to system development. At this stage an analysis of what is needed in building an Android-based virtual reality application is carried out, including the device requirements such as the specifications that will be used in making the application.

Development Stage. The development stage is the stage for realizing correctly from the design stages that have been previously made in accordance with the rules of a software designation. At this stage, it includes the determination and selection of system development methods, as well as the selection of supporting tools and applications that will be used in making this system or application. The results of this stage are application designs that are in accordance with the rules for developing software information systems.

**Implementation Stage.** This stage is about implementing all the design or designing the information system that has been made in the previous stage into an application using the selected tools. The process of display designing creates a good Android-based virtual reality application, so it is easier for users to use the application. This stage provides a display overview of the application to the user about this application. The overall application development is then carried out based on the design. It starts from searching for images and video objects, creating 3D objects, creating buttons and combining animal objects with the backgrounds of places and sounds using Unity 3D software and C # language, so that it will become an Android-based Virtual Reality application. In addition, building applications, installing and testing it on an Android smartphone are done in the next stage.

**Evaluation Stage.** This is the final stage of ADDIE model. Evaluation is done to evaluate whether the built application meets the expectation or not. At this stage, application testing is carried out using several Android smartphones, such as Samsung Galaxy J7 +, Oppo F1s, Samsung Galaxy J7 Prime and Oppo A5s to prove the application can work properly. After that, the testing is carried to a zoophobic person using an Android smartphone and VR glasses to evaluate the effect of the application for them.

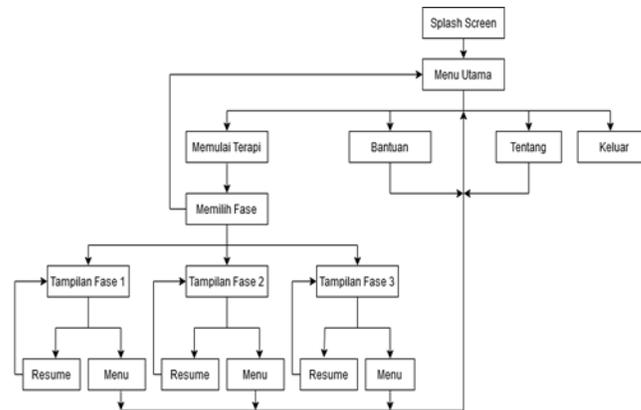
## Findings & Discussion

Several things can be obtained in the process of developing the application. First, A virtual reality application for acrophobia therapy, operated via the Android operating system; An aid of 3D glasses as a medium to display acrophobia's virtual reality.



Figure 1. Display of the Virtual Reality System

Second, the block diagram shows a virtual reality system for the therapy of acrophobia in an Android-based application. It is applied to the acrophobics in the form of a navigation structure, consists of a main menu with 4 (four) options that can be selected. Those are *memulai terapi*, *bantuan*, *tentang* dan *keluar*. If the option *memulai terapi* is selected, it will be directed to a page to choose a scenario of therapy phases from one to three. If the option *bantuan* is selected, it will be directed to a page with help information. If the option *tentang* is selected, it will be directed to a page with **about** information. And lastly, if the option *keluar* is selected, the application will be closed.



Picture 2. The block diagram

Third, the display of the main menu when the user starting the application, contains titles and menu options that can be selected by the user. Fourth, the display of the *bantuan* (help) menu. If the user selects this option in the main menu, it shows the guide on how to use the application. Fifth, the display of the (about) menu. It contains the information about the application and the device specifications. Sixth, it is the display after the user selects the (start the therapy) in the main menu. This display contains phases that can be selected by the user, starts from phase one, phase two and lastly is the third phase. There is also a (back) button to return to the previous page.

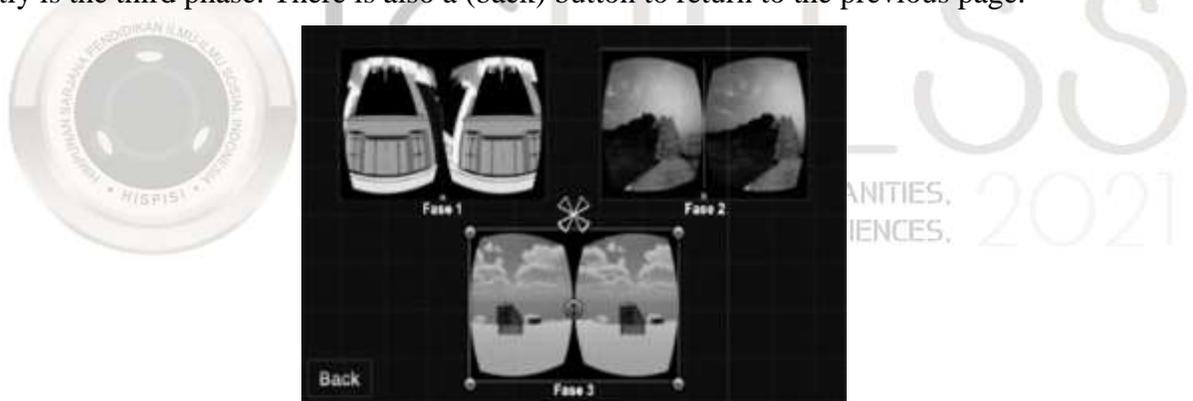
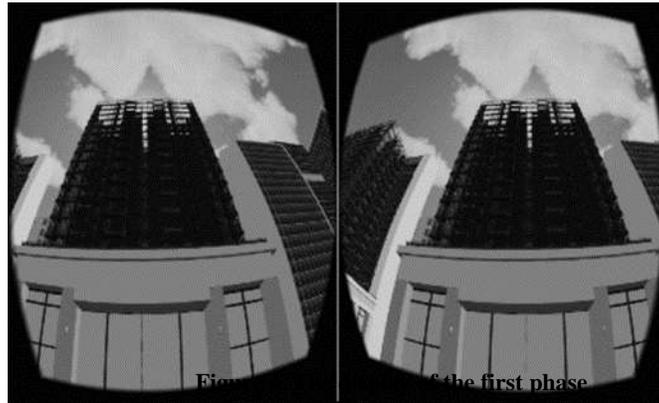


Figure 3. The display when user is selecting the phases

Seventh, the display of the first phase of 3 (three) scenarios that an acrophobic should go through, in which this scenario is, the user should walk between tall buildings in an urban complex.



Eighth, the display of the second phase, which is the phase when the user finish with the previous phase. In this phase, the user should climb a number of stairs to reach the top, while passing through the deep gaps on the sides of the stairs.

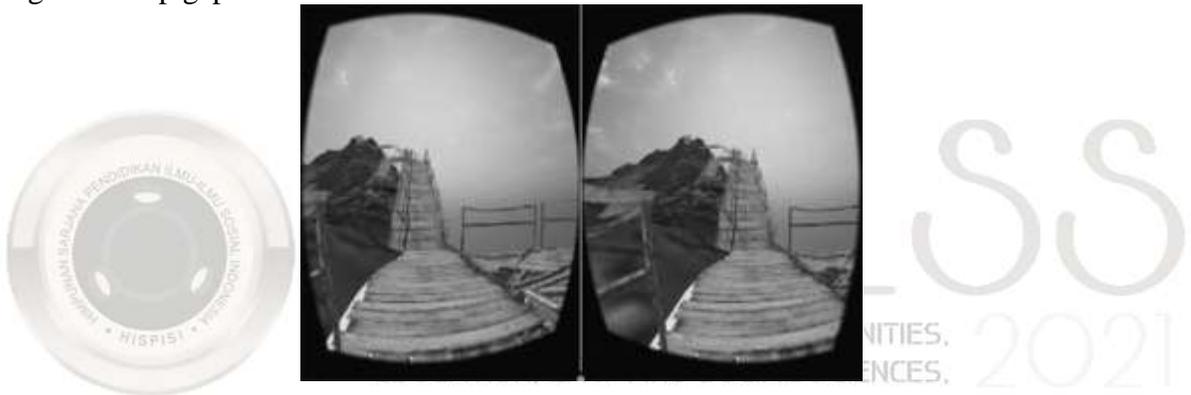


Figure 5. The display of the second phase of 3 (three) phases

Ninth, the display of the last phase, that is phase 3. In this phase the user should to go through the bridge from the side of building one to building two.

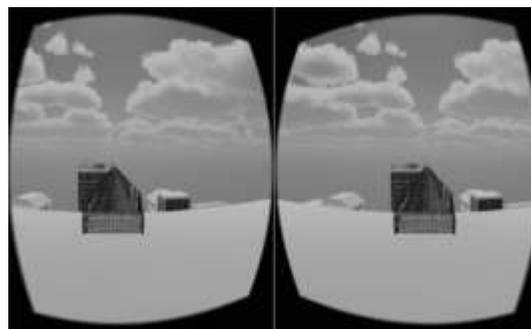


Figure 6. The display of the third phase

Tenth, it is the display for each phase, starting from phase 1, phase 2, and phase 3. There are the options of **resume** and **menu**. The user can select to return to the main menu or continue the therapy.

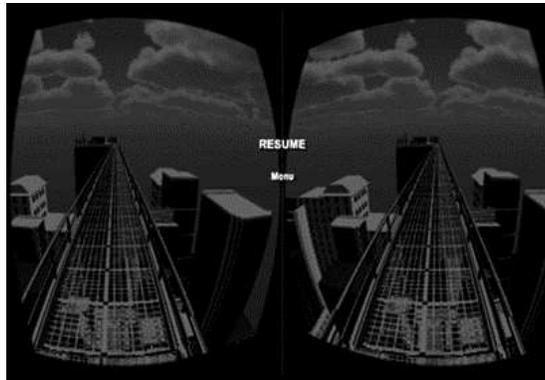


Figure 7. The display of each phase

The results of this invention can benefit the acrophobics and also the psychologists in handling cases of acrophobia. It practically and efficiently reduces the sufferers' phobia. This invention presents a highly practical improvement, especially on the tool of therapy for people with phobia of heights, namely acrophobia.

The completed application testing is made to find out the functions and features in the application according to the design and planning.

The testing is carried out on several android devices. The display in the application is in the form of a splash screen, display of the main menu, about, help, selecting phases, to start the phases from one to three based on virtual reality. Below is a table of specifications for Android devices that were tested with different brands, namely the Samsung Galaxy S3 Mini, Oppo F1 S, Samsung Galaxy Mega, and Asus Zenfone 4 Max. While Table 4.2 is the results of testing on Android devices. The testing is based on differences in the specifications for each device.

Table 1.1 Android Device Testing

No	Testing	Samsung Galaxy s3 mini	Oppo S1 s	Samsung Galaxy Mega	Asus zenfone 4 max
1	Installation	Failed	Success	Success	Success
2	Application Starting (detik)	-	4	6,09	4,2
3	Display Resolution	-	Optimum	Optimum	Optimum
4	Button Position	-	Suitable	Suitable	Suitable
5	Image Display Sharpness(VR)	-	Clear	Clear	Clear
6	Virtual Reality Camera	-	Optimum	Not Optimum	Optimum
7	Virtual Reality Motion	-	Success	Success	Unsuccessful

## Conclusion and Summary

According to the results of the testing in table 4.2., the application runs on an Android device with the operating system version 4.4 (KitKat) and above. The time needed by users to open the application at first is 4.7 seconds, with the fastest is Oppo F1s, followed by Asus Zenfone 4 Max, then Samsung Galaxy Mega. For Android devices, of which the application can be installed, the screen resolution and button position display the optimum results and is in accordance with the design. In virtual reality cameras, only smartphones with screen size below 6 inches can display optimally. The display of the virtual reality image results that all the tested devices show a clear image. Thus, only Android devices that supported the Gyroscope sensor can run the Virtual Reality feature based on table 1.1.

This study is an R&D research which is then tested on several different devices in accordance with the aim of this study, that is developing a media of therapy that will be used by therapists in treating acrophobia. The limitation of this study is no collaboration with psychologists in conducting clinical trials on the phobics, such as the research conducted by Levi F. Leboucher. In his research, the use of virtual reality is to control the condition of the acrophobics from the aspect of anxiety, presence in VR, and the phobics' heart rate when using the virtual reality.

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