



An Exigent Device that aids to Educate the Attention Deficit Hyperactivity Disorder (ADHD) Children

Rathinapriya Vasu, Bhumikka UD, Divya.K

Abstract— ADHD called the Attention Deficit Hyperactivity Disorder is predominant among the children and the teens. Children having ADHD has differences in the way they persevere things and also has slight variation in their brain development that affects attention, the ability to focus and self control. Thus children with ADHD face obstacles in their path towards success than the normal student. These children get bored with the tasks and get distracted easily. Completing their routine would be a difficult task for them. They are unable to sit still in the class and they roam around. In order to overcome this difficulty in learning among ADHD children Virtual Reality can be implemented. These ADHD children could use VR glasses for simulating their vision and creating a immersive 3D environment. VR headset will put forth a screen in front of the eyes which eliminates the contact with the real world. By doing so, they can learn things without any boredom and they will have a feeling of being in motion. This helps to increase their ability to concentrate.

Keywords s— Virtual Reality, ADHD, VR glass

A male child is prone to ADHD than a female child of the same age group. It is found that 13 percent of the male population is diagnosed with this disorder and 5 percent of the female population are diagnosed with this disorder. The first symptom of ADHD starts at the age of 3 to 6 years and it is properly diagnosed at the age of 7. As we know that this persists 4 percent of the American adults have also been affected by this. The main sign of ADHD is hyperactivity and impulsiveness. Children suffering with this disorder will not be able to concentrate on tasks and cannot sit still for a long time and focus on academics.

They have excessive physical movements and can act without thinking. They have little or no sense of danger and they keep constantly fidgeting.

I. INTRODUCTION

IT is understood that Life is a battle and everyday struggle has now become predominant among children. Technology has always been an evolving force, giving hope and motivation to live a happy life but hunting for proper use of technology for the cure of much illness has always been a journey and an ongoing process. Attention Deficit Hyperactivity Disorder commonly called ADHD is a medical condition which affects people of various age groups especially children and can persist into adulthood. It is a mental disorder which is caused due to genetic and environmental factors. There has been a lot of medical diagnosis and therapies conducted but in vain. There is no cure and success despite so many efforts.

As of now the government has provisioned for two laws: 1. The Individuals with Disabilities Education Act (IDEA) and 2. Section 504 of the Rehabilitation Act of 1973. Two plans have been funded by IDEA and section 504- Individualized Education Program (IEP) and 504 Plan. IEP provides educational services like giving extra time for tests and 504 plan provides changes in the learning environment to limit distraction.

ADHD CHILDREN

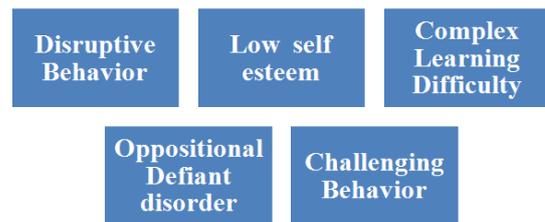


Figure 1 .1 Behavioral disorder of ADHD children

When they are on the process of completion of a particular task assigned to them , they become restless and also get bored easily. Children suffering with this disorder will not be able to learn from books because they can't sit still for a long time and they get distracted. They will have difficulty in prioritizing homework and other school assignments which will lead to the inability of acquiring proper knowledge. The children Diagnosed with ADHD has varied behavioral disorders which includes a much disruptive behavior comparatively low self esteem rather than a normal child which is represented in Figure 1.1 . The main objective of this paper is to provide support for people suffering from ADHD disorder. In order to provide assistance to these patients we make use of a Virtual Reality glass (VR glass). Since patients with ADHD disorder cannot study from textbooks by sitting still at a place for a long time, this virtual reality glass is used in providing a live experience with simulating environment to these patients in such a way that they will not get bored and will also be able to grasp the concepts easily. The VR glass is connected to a wireless or a wired device. Virtual Reality is an artificial environment where a child immersed into it will have a feeling of escaping from reality and going into a different world or environment.

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In reality they may be sitting in one place but they will have an illusion or a feeling that they are moving around within boundaries due to the simulated environment.

II. RELATED WORKS

2.1 Study of ADHD among Adults

Doing proper research about the children suffering from ADHD plays a vital role so that it does not persist in adulthood. C.Watters and et al[1] proposed a paper on the impact of attention deficit hyperactivity disorder in adulthood. Adults generally experience three to four psychiatric disorders in addition to ADHD and these disorders can dominate more which can cause symptom of ADHD that can be overlooked and also undiagnosed. Since adults don't receive sufficient treatment it can lead to life long challenges and other difficulties. The paper mainly focuses on three main themes:

1. The burden of symptoms of ADHD
2. Perceived positive and negative effects of ADHD.
- 3.Challenges of accessing services.

Methodological approach was to conduct interviews for the participants in order to obtain detail description of the experiences. Patients attending any adult mental health services were invited to complete a self report scale and Utah rating scale and ADHD diagnosed patients were asked to take part in this research further.

2.2 Predominant in Ethiopia:

This study was to prove that prevalence of ADHD disorder was found in the rural parts of Ethiopia. Hirbaya Mokona Lola and et al [2] proposed a paper that by focuses on children of the rural areas aged 6 to 17 years old. This study was done in Girja district, Rural Ethiopia. A cross sectional study was conducted from May to June 2015 among the children of the rural areas. Logistic regression analysis was used to see statistically significant variables. A data collection method was used which consisted of 45 items representing symptoms of disruptive behavior. This rating scale consists of different questionnaires that is based on Diagnostic and Statistical manual of mental disorders. Thus this paper concludes that ADHD is associated with the socioeconomic status of the family and it also points out that prevention, early detection and management of risk factors may prevent ADHD. It also points out that prevalence of ADHD in Ethiopia is also similar to the prevalence of ADHD in other African countries.

2.3 Medical treatment:

Maria Keilow and et al [3] proposed a paper that deals with the children's academic performance. A Danish administrative registered data is used to study the impact of treatment on ADHD children and their GPA is assessed. This GPA is compared with the teacher evaluated GPA.

2.4 Effects:

Attention Deficit Hyperactivity Disorder will affect all aspects of a child's life. It also has a great impact on their family, siblings and causes various disturbances in family and martial functioning. Dr V A Harpin and et al[4] proposed a paper which focuses on the effect of ADHD on the life of an individual, their family and their school. The aim of the paper

is to track the history of their disorder in pre school years, school life and adulthood. Co-morbidities and healthcare costs are also examined. Poor concentration, high levels of activity and impulsiveness are some the symptoms of ADHD disorder. It is also found that assessment by an educational psychologist may help the ADHD Children to identify their learning strength and difficulties. Therefore it is concluded that ADHD affects all aspects of a child's life and the current treatment focuses on temporary relief of symptoms during significant times of the day such as early mornings before school and during bedtime which is done with the help of healthcare professionals by providing supportive information about ADHD.

III. SYSTEM ARCHITECTURE

This paper provides a solution for people suffering with ADHD disorder who are unable to concentrate on academics. This can be used by these patients all over the world which helps them to improve their learning ability.

Figure 3.1 represents the system architecture diagram.

Firstly a mobile device is connected to the required wearable virtual device. An android application is created with the various educational videos and games. This is further hosted with the mobile device. The mobile is now connected to the wearable device. Housing is a moulded plastic consisting of straps with padding is worn by the user. The wearable device is made up of three sensors. Here the sensors are made up of Accelerometer, Magnetometer and Gyroscope.

Infrared emitters are used in the audio headset. It is used to track the positioning movement in the headset. Frensel lens are used which is connected to the display. Frensel lens are generally made up of glass or plastic and they consists of all refractive elements. They are flat on one of the sides and are rigid on another. They provide large aperture and short focal length that provides the lens an equivalent power to that of the conventional lens used.

This device makes the kid suffering from ADHD study easily. Since they are hyperactive, they cannot sit in a particular position and cannot concentrate on studies. If they wear this virtual reality device they enter into a simulated environment through

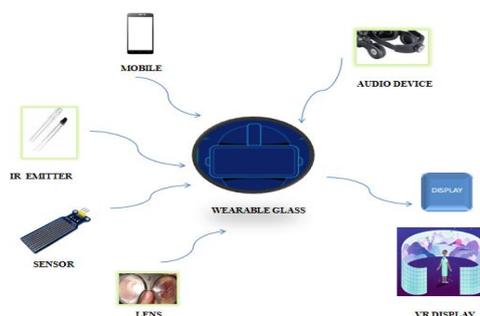


Figure 3.1 System Architecture

the App from the mobile device from where they can gain and grasp the concepts using a simulated environment. Thus, this brings them concentration as well as entertainment and it would be easy for them to grasp or acquire knowledge. The mobile device is connected to the wearable glass via a wireless connection.



The App is generated using Android development tools. A stereotypic head mounted display is used for creating illusion among the children use the wearable glasses. Since it is stereopsis it provides binocular vision and also provides perception of depth in 3D structure. Controls or buttons on the headset are used for the adjustment of volume, brightness, power, selection etc.

IV. WORK PLAN

The Figure 4.1 explains the work plan that would be adopted for the implementation of this technology:

The first phase in the application is to ensure whether this application is safe and provides benefits to various users.

The second phase involves designing an application for the Mobile device which is done using Android tools. This is hosted to the mobile device. This provides various educational videos and other educational games to the patients.

The third phase involves combining the application developed with the wearable device using a wired or a wireless connection. This wearable device is nothing but a virtual reality glass which provides simulating environment to the users.

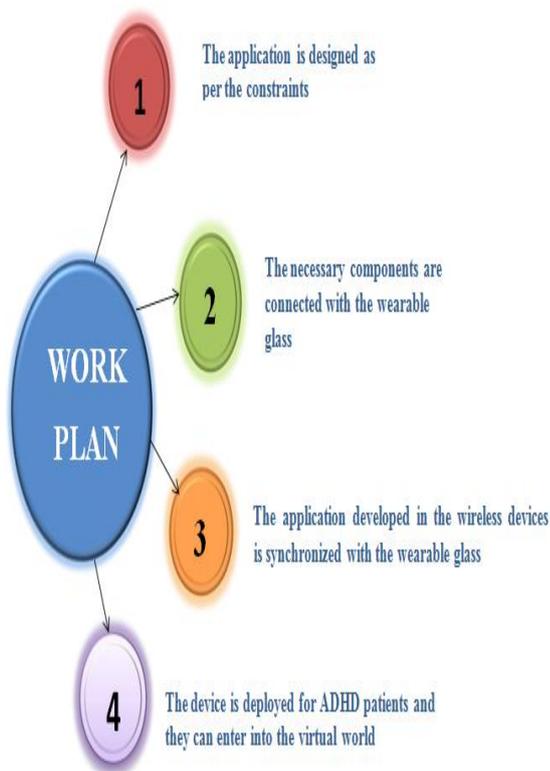


Figure 4.1 Work plan to be executed

The fourth phase involves deploying it to the end users, where these ADHD patients can easily study.

V. IMPLEMENTATION

Different combinations of educational goals and classrooms will lead teachers to use the VR to its full potential. This intelligent simulation component creates an interactive and responsive world where the consequences of actions are portrayed inside a realistic and time critical scenario. Virtual Reality helps to examine, explore and travel without leaving the classroom

The virtual reality glass is connected with a mobile device which has an application for exploring the different educational platforms.

5.1 Apps

Some of the VR game and travel apps are Google Expeditions, Allumette, Colosse, Google Earth VR, Kingspray Graffiti VR and Ocean Rift.

By using this we can build an app for the mobile device that can be used for educational purposes which helps the ADHD children to study easily without getting distracted.

5.2 Virtual Reality

Any VR device when attached to a computer will be returned with Navigator.getVRDisplays() method. Web XR API is used for exposing virtual reality devices such as ocular rift. In order to translate position and the movement information into movement around 3D environment. VRDisplay is a central interface for WEB VR API. It is used for starting and stopping the display. Some of the interfaces of WEB VR are:

- VR Display
- VR Display Capabilities
- VR Display Event
- VR Frame Data
- VR Pose

Now, the mobile app will be connected with the virtual reality glass through which the ADHD affected children can learn new things within a simulated environment.

VI. STATISTICAL ANALYSIS

Most of the children affected by the attention deficit hyper activity disorder is mainly due to Parental emotions, Family emotions and Mental health. Figure 4 represents the statistical analysis between normal child vs ADHD Child. These problems affect these children to a greater extent rather than a normal child.

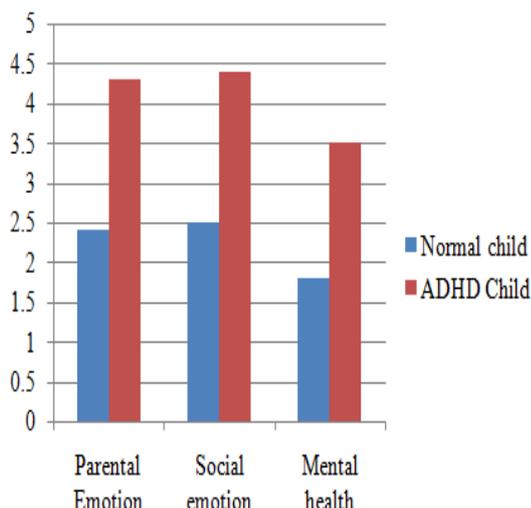


Figure 6.1 Statistical analysis of Normal child Vs ADHD Child

VII. CONCLUSION AND FUTURE WORKS

Using the Virtual reality the ADHD patients are provided with opportunities for their betterment of their career. This keeps them engaged and they will not get bored easily. Thus enabling them to focus on their work. Since ADHD patients are hyperactive and cannot sit in one position, the Virtual Reality provides them a real time experience in a 3D environment and thus helps them to control impulsive outbursts. By using this VR it helps them to study like any other normal child and it is also cost effective with no major medical help required for them.

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