Ishihara Test Application through Virtual Reality Technology

Patricia Figueroa Garrido[a], Wilver Auccahuasi[b], Lucas Herrera[c], Sonia Mori[d], José Chombo[e], Sandra Meza[f], Christian Ovalle[g], Pedro Flores Peña[h], Yuly Montes Osorio[i], Marco Felippe[j], Moises Tongo[k], Francisco Hilario[l], Milner Liendo[m] and Esteban Medina Rafaile[n]

[a, e, l] *Universidad César Vallejo, Lima, Perú*
[b, j] *Universidad Privada del Norte, Lima, Perú*
[c] *Universidad Continental, Huancayo, Perú*
[d] *Universidad Tecnológica del Perú, Lima, Perú*
[f] *Universidad Científica del Sur, Lima, Perú*
[g] *Universidad Autónoma de Ica, Ica, Perú*
[h] *Universidad Nacional Mayor de San Marcos, Lima, Perú*
[i] *Universidad ESAN, Lima, Perú*
[k] *Universidad Nacional Daniel Alcides Carrión, Pasco, Perú*
[m] *Universidad Privada san Juan Bautista, Lima, Perú*
[n] *Universidad Nacional Santiago Antúnez de Mayolo, Àncash, Perú*

Abstract

At present, many of the diseases that were difficult to diagnose due to the lack of medical equipment are being resolved with the use of emerging technologies, such as virtual reality systems, in our particular case we present a method for the diagnosis of color blindness, through In the ISHIHARA test, this disease is characterized mainly by the deficiency in recognizing colors, the standard protocol is related to the use of cards where the number present in a colored image has to be recognized, our proposal is made up of the same test , with the difference that it is projected by means of virtual reality lenses, where the patient has a greater concentration and can better distinguish colors, thanks to the resolution of the virtual reality glasses and the control of the images thanks to the control from the computer, the results that are presented show us that it is of practical use, achieving r a better control of the test because it is visualized in the lenses as well as in the computer that is used as control.

Keywords 1

Test, Ishihara, RV. control, images, medical equipment

1. Introduction

Performing a search for new alternatives in the design of medical equipment with the use of new technologies we find: in this research we analyze about the potential related to events (ERP) used as an alternative non-invasive method which deliver data in less time, it is also used to detect perception and attention, in which visual signals are transmitted from the retina to the cortex, where people with poor vision about the red-green color who cannot see the hidden numbers performed by the Ishihara plaque test, the objective of the research is to analyze the responses of the EEG signals taken between the normal and color blind people using the ERP method given with visual stimuli which have images from the Ishihara book test, where it was shown about how the brain processes information over time from the beginning in the early sensory process up to the cognitive stage [1].

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EMAIL: wilver.auccahuasi@upn.edu.pe (Wilver Auccahuasi)
ORCID: 0000-0001-8820-4013 (Wilver Auccahuasi)

In this research we analyze about human vision where we are going to describe about the existing types of deficiency such as Monochromaticity, total color blindness Dichromacy present in the vast majority of people, partial color blindness, red-green color blindness, blue-yellow color blindness, Trichromacy , we find the dichromacy present in the vast majority of people and to correct them an image processing filter is developed based on the Ishihara color test, which has been working effectively, where the filter is adjusted according to to the stretching and inversion of the contrasts in order to provide a good result, so when a new filter is applied both people work to distinguish shape, number or alphabet [2].

In the present investigation we analyze about color blindness considered as a genetic mutation which alters color vision which decreases about the sensitivity on the color wavelength and its effects, where we find various types of color blindness ranging from monochrome even the red-green variation and opaque tones are difficult to perceive, so a filter is designed based on Ishihara color tests to fix the problems about color blindness used to see the objects found in each of the Sheets used in the test, however, it was not applied very well in the real world for which modifications have been made eliminating muted, light, dark and vibrant tones where the original image has been shown to color blind and normal people where it has been found. that these vary according to the people, then the modified filter has been applied where it was appreciated that it was detected correctly in dal people tonic [3].

In the present investigation we analyze about the problems about color vision (CVD), that is, the colors considered with a birth problem cannot be differentiated, which is a weakness of the color receptors, there are several methodologies to make the diagnosis of CVD Considering the Ishihara plates, so the evaluation has been made about the computerized diagnosis compared to the traditional plates, the Ishihara plates test is applied to 267 people in a traditional way together with a computer system with LCD monitoring, from where has been able to demonstrate that the tests performed deliver the same results as traditional methods [4].

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In the present investigation we analyze about the methods used to analyze the capacity of the visual system based on isochromatic plates such as the Ishihara plates, for which it has been implemented in a method that was based on a computer with which we will determine about the deficiency of the red-green color by Ishihara plates using a CRT monitor, for which a comparison has been used about the spectral emission of daylight that shows an irradiation of the plates used in a CTR monitor, this process was applied to 10 subjects with normal vision and 10 with abnormal vision, where it was obtained as a result of the experiment where the computer-based method differentiates people with normal vision from abnormal ones, for which it is concluded that the use of a CRT monitor is recommended to detection with Ishihara plaque reduction with which to assess color vision, so the suggested method uses only 9 primers [6].

In the present investigation we analyze about the evaluation of the prevalence of errors about the numerical disorder in the Ishihara test, for which 1741 children have been included where color vision tests have been included, the cases with color vision defects were excluded when At the same time, the responses from the Ishihara plate have been recorded, where it was taken as a response that children with normal color vision had errors of numerical confusion, there was no difference between genders, which is why it is concluded that errors about confusion Numerical using the Ishihara test is normal in children with normal color vision that the mistakes made may be results of inherent deficiency [7] [8].

In the present investigation we analyze about the evaluation of the efficacy of red contact lenses in order to improve the benefit of color vision exams that was based on Ishihara, Farnsworth D15 and Martin Lantern Test (MLT), for which The test has been carried out on 30 people who had a color vision problem which was evaluated by the Ishihara test, the D15 test and the MLT where the error score has been recorded, repeating the test after the use of glasses of red contact where it has been obtained as a result that the mean error score was the Ishihara test [9] [10].

2. Materials and Methods

The materials and methods that we present are characterized by the presentation of the situation in which the application of the test is found, as the working method for easy implementation, in figure 1, we present the block diagram based on the implementation of the method which we describe below:

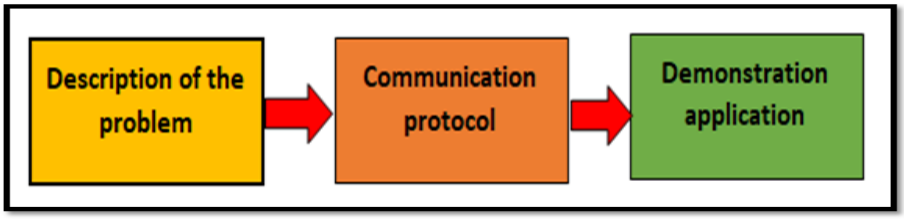

Figure 1: Block Diagram of the Proposal

2.1. Description of the Problem

The problem in the use of printed images for the evaluation of the Ishihara test is based on direct visualization, where different problems may arise such as the deterioration of the cards where the images are, the wear and tear of use , among other factors deteriorate the test material, which creates a risk in the diagnostic process, the method we propose is to present the images corresponding to the test, in digital form, with the highest possible resolution, so that the patient can be diagnosed in the best way, added to the presentation through virtual reality glasses where the patient is not influenced by external agents and only concentrates on the images present in the lenses, as well as the control of the test, achieving that the health can view the images that the patient is observing, changing the image manually or automatically.

2.2. Communication Protocol

The proposed method is characterized by the practicality of being able to share information through the wireless connection, between the different devices, for which virtual reality glasses are required, in our case to demonstrate the method, we resorted to the use of lenses of the Oculus Gest 2 model, a computer with wireless connection is necessary, this computer works as a workstation for health personnel, from this computer what can be presented in the lenses is controlled, in this computer we present the images of the Ishihara test in two formats, the first in video format where the images are projected sequentially with a programmable change time, and a second option in manual form where the operator can change the image with the help of the keyboard or the mouse, in order to have all these functionalities it is necessary and essential to have the Virtual Desktop program installed, which allows integrating In a single entity, both the computer and the glasses, both devices must be connected to the same WIFI network. As can be seen in figure 2.

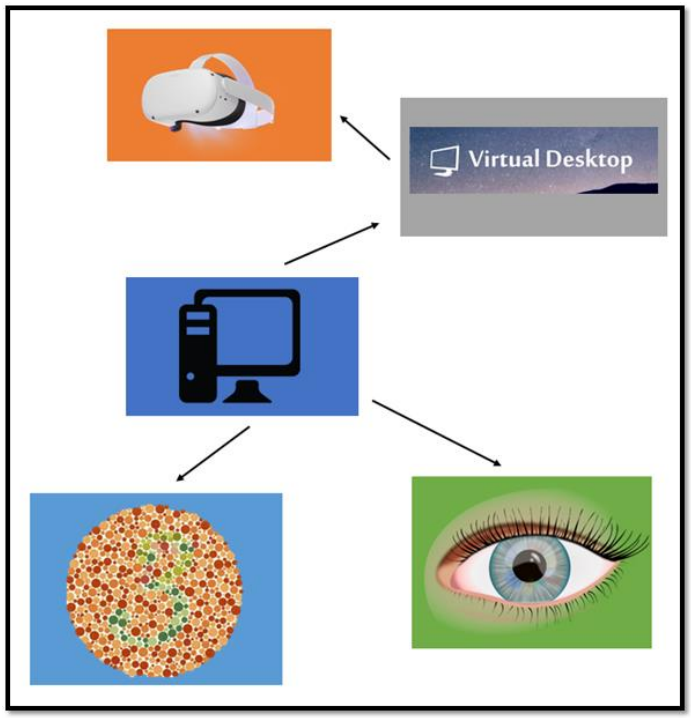

Figure 2: Proposed Architecture Model

2.3. Demonstration Application

In accordance with the requirements described above, what we can observe on the computer, we can send it to the virtual reality glasses, in this case it is necessary to be able to organize the images to be projected, for which a video was made with the sequence of the numbers, for which at the time of execution, the images change at a set frequency, we can also randomly send the images, in this way we avoid some type of bias at the time of evaluation, in image 3, it is observed As the images are organized, in the two forms of presentation, according to how the images are required to be presented, this criterion can be characterized if the patient is a child, an adolescent or an adult.

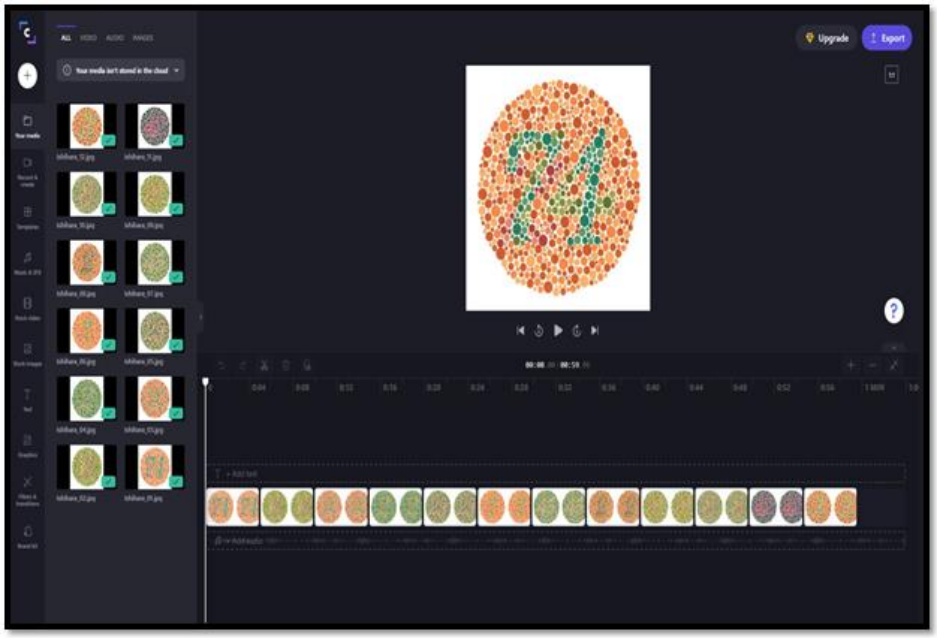

Figure 3: Ishihara test design

3. Results

The results that are presented, at the end, are determined by the use of the application implemented with the use of virtual reality glasses, from where the images that correspond to the Ishihara test are projected, it is the two versions described, in figure 4 , the method by which the video is visualized in the virtual reality glasses is presented, in the glasses only the video is observed, according to figure 4, evidencing that the patient is concentrated with which we avoid some type of bias in the evaluation, as well as health personnel, can improve the diagnosis.

From the implementation point of view, the Virtual Desktop application allows us a quick and easy integration to share information between various devices, in our case the virtual reality glasses and the computer, so we can send the glasses what is you are viewing on the computer, with this feature, we can increase the capacity of the method by integrating other types of tests and examinations, increasing the capacities of health centers and improving diagnoses. Our work is a contribution from the engineering community to the health sector.

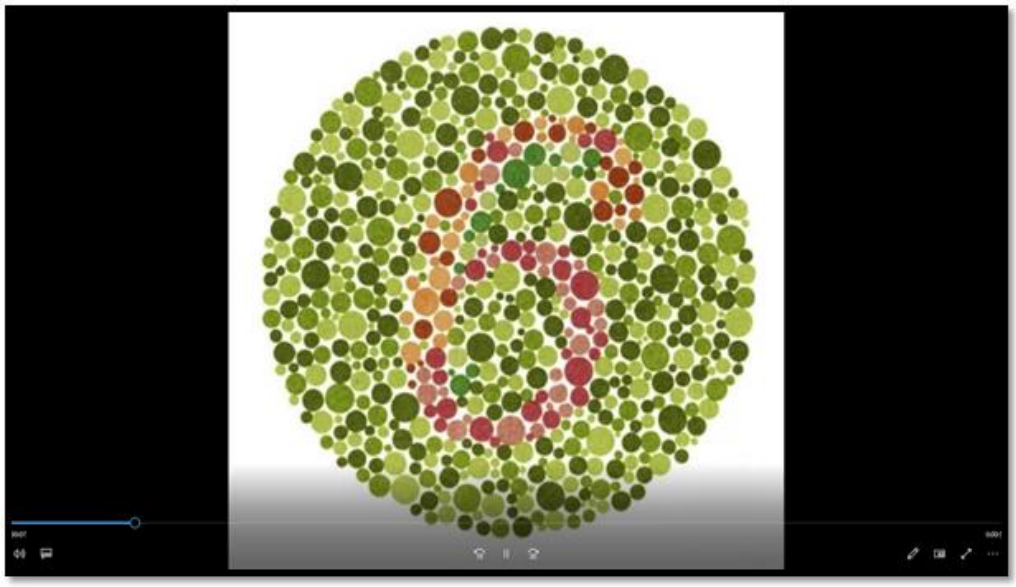

Figure 4: Ishihara test execution

4. Conclusion

The conclusions that we reached at the end of the demonstration of the method, are related in two conditions the technique and the medical application, the first corresponds to the practicality of being able to configure devices of different architecture by means of communication protocols based on WIFI, as is the case of the computer and virtual reality glasses, this communication is achieved thanks to the Virtual Desktop application, with which the virtual reality glasses become an extension of the computer, with which more capabilities are achieved and devices are configured for use in the medical area, managing to scale the uses and applications of virtual reality in the health area.

The second conclusion that is reached is related to the application of new health technologies, in our case significantly improving diagnoses, eliminating any distracting agent at the time of performing the Ishihara test, this result allows us to integrate other tests to be able to improve the diagnosis of problems related to the visual system, we have new opportunities with the use of technology to improve medical diagnosis.

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