Journal of Optometry and Ophthalmology

Jayrajini S, et al., 2022-J Opto Ophth

Research Article

Autocount Flippers on Bases of IOT and AURDINO UNO for Accommodative Facility Testing

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Received Date: 07-23-2022

Accepted Date: 08-12-2022

Published Date: 11-10-2022

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Abstract

Background: The goal of structuring this instrument is to provide convenience to the observer and the patient without having to remember the counts (Cycles per minute-CPM) with equal optical performance as that of the manual flippers in order to test accommodative facility.

Objective: The product is designed in order to increase the grade of accuracy with the same optical performance as that of conventional flippers and making it convenient for both the examiner and the patient.

Material and Methodology: The instrument is designed with the help of optical and control module that enables automatic flipping of the lenses which will be tested both monocularly and binocularly on emmetropic subjects.

As a prerequisite screening test will be done in order to confirm BSV.

Conclusion: The instrument is to diagnose the anomalies of Accommodation and it can also be used in vision therapy training such as increasing the accommodative facility by adding different diopters to the flippable lens.

Keywords: Accommodative infacility; Visual symptoms.

Introduction

Accommodative infacility occurs when the crystalline lenses of the eyes have difficulty changing dioptric power while focusing from far to near or vice versa. This test is used to estimate the strength and dynamics of the accommodative response. This test is very much effective in diagnosing accommodative dysfunction.

Accommodative flippers are commonly used to interpret accommodative infacility. Flippers comprised of pair of concave and convex lens which can be flipped manually. Concave lenses stimulate accommodation and convex lenses will relax the accommodation. The test will be performed at the distance of 40cm for near. While this test is performed, the researchers have to flip the conventional flippers manually also

Citation: Jayrajini S, Karthikeyan S, Akshaya S. Autocount Flippers on Bases of IOT and AURDINO UNO For Accommodative Facility Testing. J Opto Ophth. 2022; 3(1):1-5.

DOI: https://doi.org/10.37191/Mapsci-JOO-3(1)-022

the number of cycles per minute have to be remembered to interpret the accommodative anomalies.

Materials and description

Control Module

Microcontroller

Aurdino UNO is a microcontroller. It not only Controls the instrument but also acts as the brain of the autocount flippers. Arduino controls the flipping axis and decides the total cycles per minute.

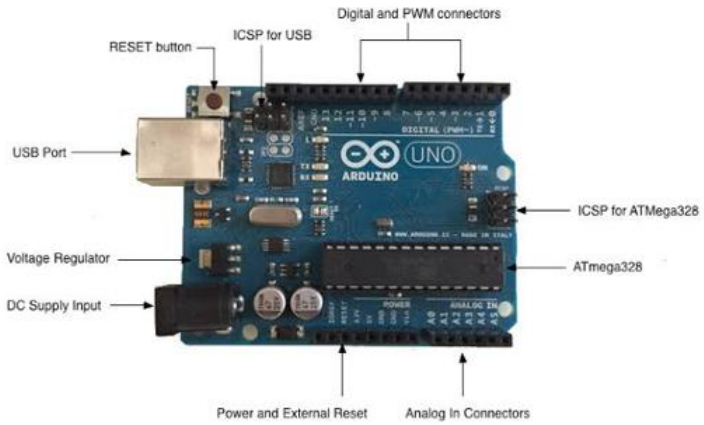

Figure 1: Microcontroller.

Liquid crystal display

LCD panel is connected with Aurdino UNO. The value outcomes of Autocount flippers are displayed in this monitor.

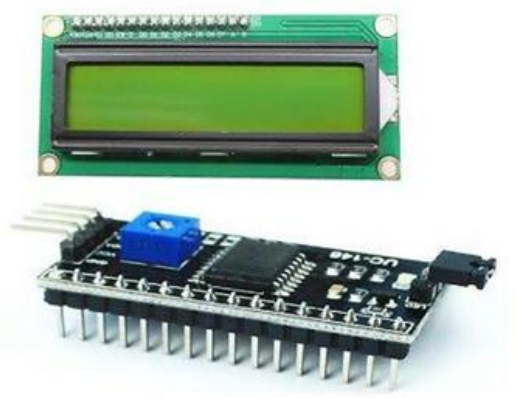

Figure 2: Liquid crystal display.

Power supply

The innovative instrument is driven with the DC power supply of electronic batteries. This will be given the power source to all the electronic components of the system. The Microcontroller power supply can be accessed with the use of USB cable and also an external energy supply. The power supply will be linked to the microcontroller by means of plugging into the electricity jack of the Aurdino board which will be directing power supply to all the electronic components of the system.

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Optical module

It is comprised of a spectacle frame with the power of -2.00DS, clip on attachment with the power of +4.00DS and a servo motor.

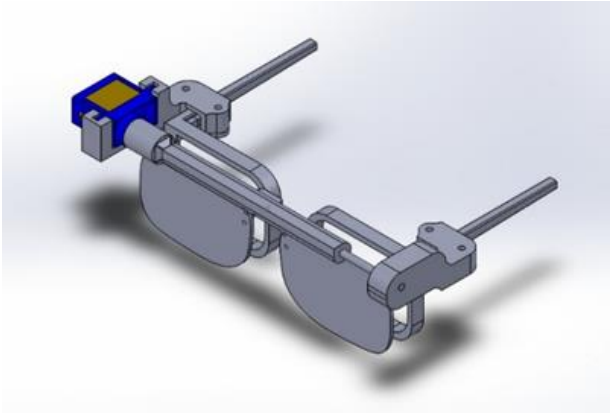

Figure 3: Optical module.

Spectacle frame

It is the supporting system for the autocount flippers. The Spectacle frame holds the pair of minus two spherical lenses. It holds the clip-on attachment and servo motor. The entire stability of the flippers relies on the frame.

Clip on attachment

It is incorporated with two +4.00DS lenses integrated along with a nose bridge. Then the nose bridge gets attached to the midpoint of a 3D printed rotating shaft. Further this shaft is linked perpendicular to the Servo motor. It only assists to flip the +4.00DS lenses. One end of the clip-on attachment gets connected to one side of temple front and the fellow end gets connected to the Servo motor with the help of additive manufacturing.

Servo motor

A servomotor is a free-standing electrical device that rotates the flippable lenses of the instrument with high efficiency and with great precision. A servomotor can normally rotate up to 90° in two ways, for a sum of 180°. The motor is controlled and concealed with Arduino microcontroller to rotate the flippable lenses in clockwise and anticlockwise direction.

Figure 4: Servo motor.

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Workflow

The product involves assembling of 12 V battery to an Arduino UNO that is connected to an LCD (control module) and Micro servo motor which in turn is attached to the spectacle frame and Flippable lenses (which enables flipping).

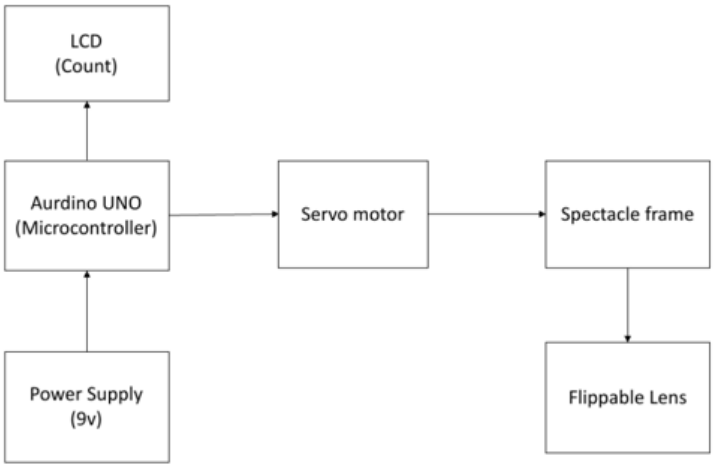

Figure 5: Block diagram of Autocount flippers.

Future scope of this study

Diagnostic purpose

It is used to diagnose different anomalies of accommodation.

Vision therapy

The designed autocount flippers can be used in vision therapy training such as increasing the accommodative facility by adding different diopters to the Flippable lens. Binocular flippers are also used to improve the fusional vergence. It is a used in anti-suppression training such as bar readers.

Future enhancement

In future research, the innovative instrument will be developed into a fully automatic one. The microcontroller could be connected to the Android mobile phones via wifi, and it is planned to incorporate different sensors to make it user friendly.

Conclusion

This study is to evaluate the accommodative responses to the +/- 2.00 flipper test using the concept of autocount and to overcome the shortcomings of the conventional flippers and to match the cycles per minute (cpm) between the conventional flippers and automated flipper.

The study is further anticipated to be standardized.

Acknowledgement

We sincerely thank the management of Dr. Agarwal's Institute of Optometry and Mr. Ganesh.A B.E CSE student, Prince Shri Venkateshwara Padmavathy Engineering College.

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