Digitalization of eye charts for visual acuity testing

Authors: Svante Nilsson, Christian Johansson, Anders Ohlsson
Tutors: Björn Victor, Sofia Cassel

UPPSALA UNIVERSITET

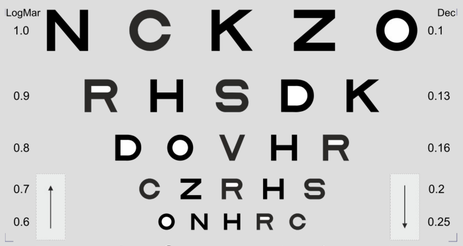
Summary

Digitalization of Visual Acuity Testing is a project involving development of a method for digitalization the displaying of optician's eye charts. Using a Raspberry Pi, an Android tablet device and network communication over WiFI we have created a system for displaying these charts on a screen. The system will be used as a prototype for possible future work.

Visual Acuity

Measurements of visual acuity uses charts with lines of continuously smaller symbols. The measurement is made reading symbols on the chart from a set distance. Reading down the chart until it is no longer possible to make out the characters makes it possible to determine a visual acuity.

Modern eye charts come in many variants, such as some for people who can't read or infants. Our system can easily switch between several specialized charts to suit the patient.

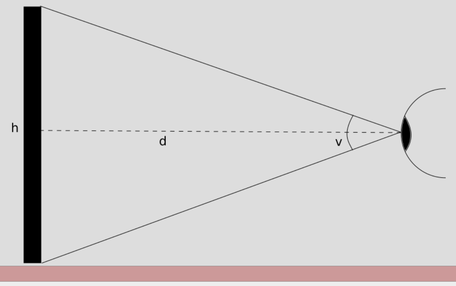


Example of an eye chart used as reference for the project

Optotype sizes

The size of each optotype is measured in LogMAR (Logarithmic of the Minimum Angle of Resolution), which is the base 10 logarithm of the angle of one fifth of a letter. The optotypes on the top row of the chart is of the size 1.0 LogMAR and then each row below is decremented by 0.1 LogMAR to the last row which is -0.3 LogMAR.

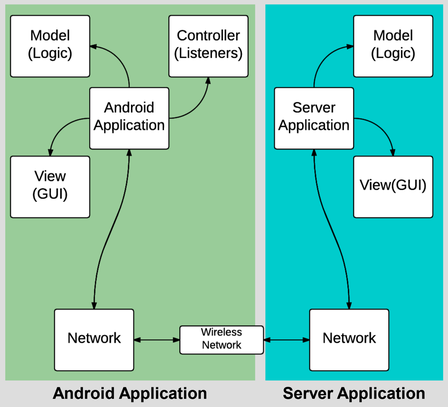
On normal, printed eye charts, these numbers are precalculated for a specific distance. Our system can recalculate letter sizes and LogMAR values on demand to improve testing.



System design

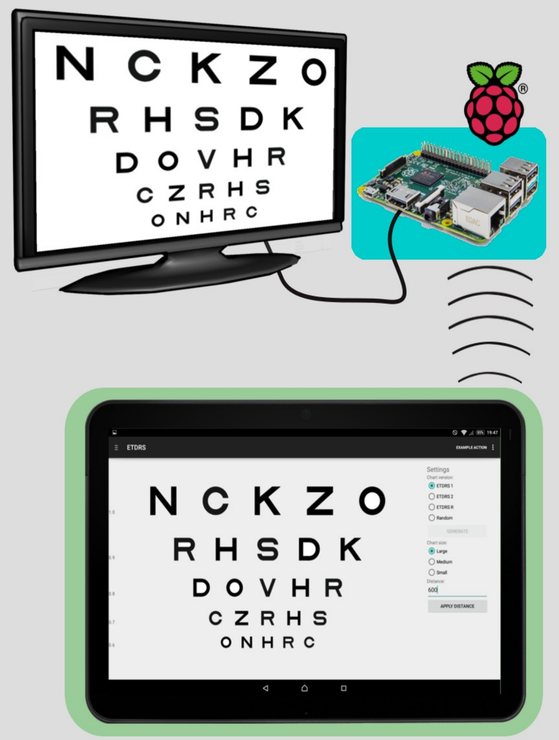
The most important part of the system is the Android device where the user controls the server program over a wireless network. The Android application follows a common Android layout standard to be easy to use.

It is written in the Android dialect of Java, and uses the AndroidSVG toolkit to render SVG-format eye charts on the Android device.



The server application is written in Java, and uses the Apache Batik toolkit to render the SVG-fortmat eye charts on its connected screen.

We designed the server so it would be appropriate for use with a Raspberry Pi as it's hardware, since it is a small and cheap alternative to a full computer that can still run our server. However, since the server is written in Java it can be used on a wide variety of platforms.



Above is an example of how the system would look like when used.

Acknowledgements

Thanks goes to P.G. Söderberg at Uppsala University Hospital for lending us the equipment needed for this project.

Contact / Info

If you wish to contact us, use any of the following email-addresses:
Svante.Nilsson.7746@student.uu.se
Christian.Johansson.1632@student.uu.se
Anders.Ohlsson.1140@student.uu.se

This project is a part of the course **1DT350**