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Dr. Eye: An Android Application to Calculate the Vision Acuity

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Abstract

Dr. Eye is an android application that focuses on the calculation of the vision acuity of a patient in a similar way an ophthalmologist checks the eyesight using Snellen chart. The calculation of vision acuity uses the text to speech conversion of android in a restricted way and also it uses the front camera to calculate the distance of the screen from the eyes. This is followed by the questionnaire for the patient, which uses OWL (Web Ontology Language) to suggest the best possible result based on the answers given by the user. The use of Google Maps API allows the user to locate the nearest hospitals based on his location.

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Keywords: Google maps; Ontology; Screen to face detection; Snellen's chart; Text to speech.

1. Introduction

Now-a-days android smart devices have become an essential part of our life cycle. Android applications have made our life a very soothing and easy one. Each and every work is now being replaced by an android application whether it is any sort of calculation, any sort of knowledge based or e-commerce based application. In the past few years, the health of any person has become a major issue for every human being and almost every human being has to rely on doctors in this moderate world. This has led to advancement of the technology to work in the health related issues and now we see many applications which work for the health related issue of the person.

One of the most important parts of our health is our eyes. Recent study suggests that maximum number of peoples have to visit an Ophthalmologist regularly to get their eyesight checked. Mostly the working people are suffering from the problem of eyesight and they find it harder to take out time and visit an Ophthalmologist. The intent of this application is to check the vision acuity based on the Snellen's Chart which an ophthalmologist uses to check eyesight of any patient. The use of front camera and the speech to text conversion of the Android API makes it possible to achieve this process.

The advancement towards health related applications motivated us to focus on this issue. The major problem from which the people are suffering is the problem of eyesight and this also motivated us to work on this application so that any person can check their vision acuity just by using this application and it will just cost him a fraction of their time and they don't have to spend a long time for visiting an ophthalmologist. A questionnaire has been developed based on

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the major problems related to distortion in the eyesight. The problems have been analyzed and major questions have been developed based on the symptoms of the problems of eyes such as myopia and metropia. Based on the answers of the questionnaire given by the user, reasoner is applied on the Ontology that has been developed which predicts the defect from which the user is suffering. After predicting the problem of the patient if the user has a large amount of distortion in his eyes i.e. vision acuity then the nearby hospital within a radius of 5 km is shown to the user. The user can then refer to the nearest ophthalmologist which he can reach according to their comfort.

In this paper Section 2, provides a brief review of all the existing work that has been done related to proposed work in different areas. Section 3 and 4, discuss on approach and the implementation part of proposed android application. Finally Section 5, summarizes with conclusions and the future work that can be done to enhance the performance of this application.

2. Related Work

There have been a lot of ideas about using semantic web in android applications. Roberto Yus[1] analyzed the most popular DL reasoners which can be applied on android applications. He suggested that the use of semantic web and the reasoners can significantly enhance the applications and developers can create more intelligent applications capable of inferring logical consequences from the knowledge considered. Pramod Anantharam discussed about Parkinson's disease and its importance of early detection[2] and management. He also compelled the use of mobile phone for its detection through sensor observations.

Amit Seth discussed about the Physical Cyber social computing[6] and the way in which different data has to be collected as samples for any particular issue before delivering any results. He also discussed about gathering and application of collective intelligence characterized by massive and contextually relevant background knowledge and advanced reasoning to bridge machine and human perceptions.

Amit Seth in his another discussion proposed Computing for Human Experience(CHE)[7] which provided the ability to deal with the abstractions, concepts, and actions that characterize human experiences. The CHE will anticipate when to gather and apply relevant knowledge and intelligence so that intervening of human can be reduced. Another research has been done in understanding the richness and nuances of health care data. kHealth[3] analysed observations from different sensors (like active and passive sensors) to provide intelligent explanation to individuals for informative decision making techniques. Konig, I. discussed an algorithm to measure the distance of screen to face[4] using the front camera and the importance of this algorithm in various tests for eye related diseases.

The work of[2] and[3] motivated us to develop an android application which detects an early stage of a disease.[4] guided us to work on one of the most important senses of our body viz the eye. It also gave us a direction to work on using the screen to face distance[1]. Inspired us to integrate semantic web in our android application for better and intelligent application.

2.1 Comparison with other eye testing applications

There have been other android applications based on Snellen's Chart but none of them actually measures the Vision Acuity or the power of a person. They just display the whole or part of the Chart without checking whether the person can read that letter or not. The proposed application first predicts the defect, suggests corrective measure and treatment, then calculate the vision acuity by checking the number of letters which a person can read with the help of Snellen's chart and speech to text conversion, and then finally displays nearby hospitals in a radius of 5 km on a google map.

3. Approach

The main idea behind calculating vision acuity was using Snellen's chart in our application. The basic Snellen's chart has diminishing size of texts in each row which should be read at a distance of 12 ft. Each row has a certain size of letters which has to be read at that distance and the size gradually decreases row by row. But to make this work on android phones and tablets, we had to scale this text size with the screen to face distance as suggested in[4]. The screen to face distance is calculated using the front camera and the flickering distance between both the eye balls. This distance is then saved and the fonts are adjusted and scaled according to this distance.