



Smart Diabetic Companion

Project Proposal

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1. Abstract

Diabetes, one of the leading causes of deaths worldwide, can cause serious harm to a human being's body if left unchecked. However, continuous monitoring of diabetic patients can help reduce the number of deaths caused directly by diabetes to a bare minimum. This project aims to develop a smart phone based application that monitors the blood glucose of diabetic patients through a glucose measurement device and provides suggestions in time to help remind the patients of their insulin dosage as well as their sugar intake. Moreover, the app will also give predictions of high and low glucose levels in the patient based on their food intake as well as their insulin dosages.

2. Introduction

Diabetes is a chronic disease that occurs when the pancreas are no longer able to make insulin i.e. Type 1 diabetes, or when the body cannot make good use of the insulin it produces i.e. Type 2 diabetes [1]. As for type 1 diabetes, insulin is really important so that glucose level does not shoot to a really high amount. On the other hand type 2 diabetes can be managed with a healthy diet and increased physical activity. Today, most of the diabetic patients need to keep a journal or a diary to take notes of their insulin dosages and food intake. It has always been a challenge to do that manually. A digital smartphone based solution could really help these patients live as close to a normal life as possible.

Based on the patient's diabetes type, they will be given suggestions on healthy diet, glucose intake and proper physical activity. This app will help patients eat better, track their exercises and keep their glucose levels in check. Moreover, we will be using Machine Learning to train our model on the patient's data so that it can predict abnormal glucose levels to warn the patients beforehand.

3. Goals and Objectives

The primary goal of the project is to provide a healthy life to diabetic patients by minimizing the death risks and improving their quality of life. Real time glucose monitoring will not only allow the patients to check the glucose level but will also help the patients with their insulin dosage and meal planning which in turn will keep their glucose in check and their diet healthy. Moreover, the prediction of abnormal glucose levels will alarm the patients beforehand which can reduce the death risks immensely and let them take their insulin or their meal on time.

4. Scope of the Project

This project will consist of creating an android app based upon a solution provided by us for diabetic patients to make their life easier and less prone to critical and severe situations. The modules that this project will be divided into include automated transfer of readings from the glucometer to smartphone app, creating schedule to the user for insulin dosage, providing the user with workout routine as well as generic meal plan. Besides these, one major module will include using ML to come up with predictions for low and high glucose levels in the patient.

5. Initial Study and Work Done so Far

We are currently searching for a suitable glucometer which is non-invasive in nature to provide us with accurate glucose readings. There is a plethora of research on non-invasive or minimally invasive glucose monitoring and a number of products in the market as well. So far we have reviewed five methods [2]:

- Interstitial fluid, via 'minimally invasive' systems
- Light-based methods
- An earlobe clip
- Smart contact lenses
- Sweat patches

After thorough review we are more inclined towards Light based methods. Light based methods include NIR spectroscopy, an LED is used to cast a beam of infrared in the skin which penetrates to a certain depth. A certain amount is absorbed by the glucose molecules, which ultimately varies the voltage generated. We will gather data of voltage generated on a range of glucose concentrations, subsequently, we will send the data via Bluetooth to our target smartphone.

6. References

- [1] R. Nall, "An overview of diabetes types and treatments," *MedicalNewsToday*, 8 November
- [2] E. Young, "Non-invasive glucose monitoring for diabetes: five strategies under development," *The Pharmaceutical Journal*, vol. 299, 12 October 2017.