

Monitoring of glucose level with wearable devices

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Keywords. glucose, diabetes, monitoring, health, bluetooth low energy, android, smart-phone, smartwatch

Abstract

Diabetes mellitus is a group of metabolic diseases characterized by higher concentration of glucose in patients body. This symptom is called hyperglycemia and may lead to permanent damage to organs like eyes, kidneys, nerves and more. The patient is therefore required to measure his blood glucose levels on a regular basis (up to i.e. 10 times a day) by pricking one's finger and extracting a small drop of blood to a measurement device. If needed, the patient may apply a dose of insulin, which reduces blood glucose concentration. Since this type of measurement causes considerable discomfort, the patient may want to measure his glucose levels by alternative way – using a continuous glucose monitoring device, which is inserted to subcutaneous tissue and is connected via wireless technology to another device, like insulin pump or mobile phone. However, levels measured in subcutaneous tissue are different from the real ones in blood. This implies the need for a model, which is capable of transforming available signals to continuous blood glucose levels. Such model is a subject of research on Faculty of Applied Sciences, University of West Bohemia.

The main goal of this work is to analyze ways of measuring glucose levels in blood and subcutaneous tissue and methods of transferring measured levels from sensor to another device, such as mobile phone and smart watch. The work further analyzes a design of universal architecture, which would function with real device, and may also be used for simulations within one implementation.

The simulation platform also has to contain hardware simulation of continuous glucose monitoring device, which is capable of replaying set of measured data from past. This is done by using Texas Instruments LaunchXL CC2650 and implementing subset of IEEE 11073 Bluetooth Low-Energy standard related to continuous glucose monitoring.

Acknowledgment

This work was supported by (1) the project LO1506 of the Czech Ministry of Education, Youth and Sports and (2) Institutional support for long-term strategic development of research organizations. I would also like to thank my thesis supervisor, doc. Ing. Tomáš Koutný, Ph.D.