Improving Diabetes Adherence Using an Android Application

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Abstract— Diabetes is an autoimmune disease in which the pancreas no longer produces insulin needed in order to maintain proper blood glucose levels. Managing diabetes requires consistent monitoring of blood glucose levels as well as administering insulin. At times, these tasks may become tiring and patients often to do not fully comply with the recording and treatment instructions given to them from their doctor.

The aim of this project is to improve diabetic patient adherence through use of an Android smartphone application. Measurements taken from a patient's blood glucose meter will be wirelessly transmitted to the app, as seen in figure 1, which will then have the ability to store the received data, perform simple data analysis, and create graphs. Creation of application features will be done with respect to currently available applications as well as suggestions gathered from a survey of diabetics and discussions with an endocrinologist. Through the use of this application, patients will be able to reduce the amount of time and effort required to track blood glucose levels.

In order to capture the patient's blood glucose reading there is an additional device housing the blood glucose meter, microcontroller, and the camera. The patient has the option of using three different meters that will all be compatible with the final product. These meters are the OneTouch Verio, Accu-Chek Nano, and the FreeStyle Lite. These meters were chosen based upon considerations from the endocrinologist and looking at common insurance coverages. In order to capture the blood glucose reading the camera will be mounted inside the case. The camera will be controlled via Java code loaded onto the microcontroller. The chosen microcontroller is a Raspberry Pi 3, which will also complete the image processing of the obtained image before wirelessly sending the blood glucose reading into the mobile application. Figure 1 shows the image transfer between the camera and the microcontroller.

Once the image is captured and transmitted into the mobile application, also seen in figure 1, the blood glucose reading will be automatically logged and plotted on a scatter plot within the app. The user has the ability to also manually enter glucose values and input nutritional information to further record relevant information for their doctor.

The purpose of the mobile application is to automatically store the patient data as to increase patient compliance so when the patient attends a doctor's appointment their glucose values are recorded along with the time and date. By use of the Bluetooth communications and image capture the number of steps required by the patient to record blood glucose reading is limited. Doctors are also able to formulate a more accurate treatment plan based upon consistent data recording. By reducing the number of steps the patient needs to complete for data recording the patient compliance should increase as long as the patient checks their blood sugar.
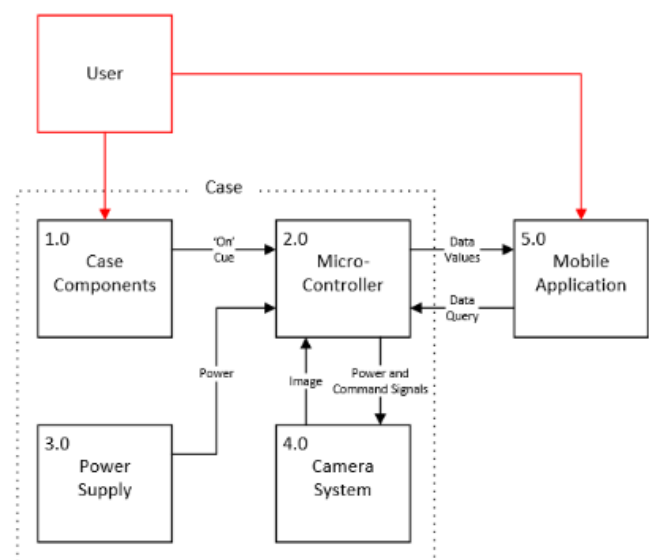

Figure 1. Zero Level Block Diagram