Voice Assistants in Healthcare: The case of GlucoCheck.

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***Abstract*—Over the past few decades, there has been significant progress in the development and implementation of voice assistants (VA) in healthcare systems globally. These voice assistants have gained widespread acceptance, making usability a crucial factor to consider. Ensuring effective and accurate performance in the critical and sensitive healthcare environment is essential. In this paper, we present the implementation and interaction of a VA with a device called GlucoCheck, a non-invasive glucose monitor developed at Kennesaw State University. This integration holds significant potential for improving patient care and monitoring glucose levels in a user-friendly manner. VA integrated into healthcare systems offer clinical relevance by improving patient care and streamlining workflows. They enhance efficiency through administrative tasks automation, enable accurate and faster documentation, and provide decision support for healthcare professionals.**

***Index Terms*—voice assistants, healthcare, glucose estimation.**

I. Introduction

In today's rapidly advancing era of technology and artificial intelligence, interactive voice assistants (VA) have become crucial applications. These VA systems, integrated into voice-controlled devices and smartphones, utilize natural language processing, speech synthesis, and voice recognition to understand and execute human commands.This paper explores the implementation and interaction of a VA with GlucoCheck, a non-invasive glucose monitor developed at Kennesaw State University [1], [2]. Unlike traditional glucose monitoring methods that require blood samples, GlucoCheck offers a more user-friendly and painless approach. It utilizes innovative technology to measure blood glucose levels without the need for finger pricking or drawing blood. The device aims to provide a convenient and accessible way for individuals, especially those with diabetes or other glucose-related conditions, to monitor their glucose levels regularly by using a clip attached to a finger or other accessible extremity and irradiates a NIR laser light of 650 nm and 5mW voltage. On the other side of the clip, a Raspberry Pi camera captures the diffraction grating images. A small computer board extracts data from the images and applies a machine learning model to generate estimates of blood glucose concentration. The data is saved to an InfluxDB time-series database for continuous data collection. A middleware is included to ensure the confidentiality of the data in the database server. Figure 1 illustrates the architectural integration GlucoCheck with pervasive devices.

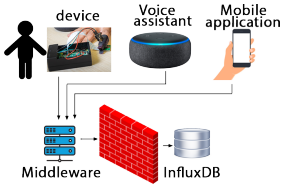

Fig. 1. Architectural integration of GlucoCheck with VA.

II. Procedure

The Alexa Skill *GlucoCheck* was implemented as a connection to the GlucoCheck device where it provides voice-enabled services such as (i) checking glucose value (most recent, maximum, minimum, and average values); (ii) providing recorded date and time of the requested values; (iii) alerting users when requested value is out of the safe range. GlucoCheck by speaking voice commands to an Alexa voice-controlled device. The request is then sent to Amazon Alexa Service, which uses speech recognition and natural language processing. If the request matches a developed intent, Alexa invokes the skill to fulfill it. AWS Lambda accesses the InfluxDB database and runs a Python Lambda function to retrieve the requested information. Finally, Alexa generates a response from the request JSON body and communicates it to the users.

III. Conclusion

By leveraging VA capabilities, users can interact with GlucoCheck through natural language commands, eliminating the need for visual interaction with their phones or other devices. This feature is of utmost importance for visually impaired individuals who may face challenges in accessing and interpreting data through traditional visual interfaces. The voice assistant relays the information back audibly, providing real-time feedback without requiring them to read the data visually. This not only enhances accessibility but also promotes independence and self-management of their health conditions.

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References

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