International Journal of Technology Diffusion
Volume 11 • Issue 1 • January-March 2020

Smart Wearable Health Device for Heart Rate and Temperature Measurements

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ABSTRACT

Lack of communication can be seen in many aspects, such as public health, and recycling. We found that in public health people suffer from lack of facilities and it may lead to death, but building new hospitals is not the right solution, but improved communication is. To solve both problems with a simple solution, the Internet of Things (IoT) had to be involved. So, we proposed a solution, which is a WHD (wearable health device) that measures temperature and heart rate for the patient and compares them to a database, it consists of Arduino Nano wired to both LM35 temperature sensor and pulse sensor. The readings are displayed on an OLED screen, as well as on a mobile application called ThingView. If the readings are abnormal, an action would be taken either to contact a relative or the ambulance, depending on its severity. It would decrease the trips to hospitals. We have tested for the device's efficiency and sensor calibration, and the results were promising. The competence of the pulse sensor is very high as its relative error is ± 0.07. The temperature sensor (LM35) has very low relative error which is ± 0.00356. The final cost was computed to be $26.5.

KEYWORDS

Heart Rate Measurement, Smart Application, Smart Devices, Temperature Measurement, Wearable Health Device

INTRODUCTION

The topic under spotlight recently is concerning lack of communication, and it is an imprtant problem. Where communication is lacking in more than a field, one of that is public health. Lately, it was noticed that the number of deaths increased in hospitals; due to the deficiency of facilities to host patients, while some patients were hosted although their situations were not as dangerous. To avoid such accidents from happening, we decided to "communicate." First, we started looking for prior solutions, one solution was glasses for blind people which helps them avoid obstacles and depend on themselves, instead of needing a companion everywhere, or even visiting the poorly-facilitated hospitals every now and then. The glasses sure had strengths, including its high sensitivity to bodies, but unfortunately, the weaknesses were more. It was not helpful for all stages of blindness so not all people benefited from it and it did not have an affordable cost, besides its size was not small, so it was hard for blind to use. So, we found our own solution, after reading a lot of research papers and

DOI: 10.4018/IJTD.2020010102

adding new function that we think could be helpful, the idea was found to perfectly meet our design requirements. Some of the design requirements included testing for is the device's durability, and it endured a lot of environmental conditions while its efficiency was not affected. We also tested for its cost and fortunately, we managed to keep it below 27$. As well as, relative error was computed using the equation ((Measured Value-Actual value)/Measured value) to be $\pm$ 0.07. That proved the results are promising.

What Will Happen if This Problem is Solved?

Since there are so many deaths due to the lack of facilities, especially people of older ages as previously mentioned. Overcoming this challenge will result in the following:

1. Increasing the probability of fatal disease early detection by monitoring the gradual changes in the human body;
2. Increasing the patients' awareness of their health condition by displaying their pulse rate and temperature measurements on a regular basis;
3. Improving the patient's experience and self-control when dealing with urgent or sudden situations by giving them instructions according to their health condition;
4. Encouraging the wearable health device users to maintain their health and enhance their lifestyles by steadily collect their data and display the data graphically in an easy manner to show the improvement or declining of their condition;
5. Decreasing the probability of deaths due to lateness. As it takes time for the patient in case of emergencies to call an ambulance or inform a relative or a neighbor, the device does that for him. If any sudden change in the patient's measurements occurs, the device automatically informs his doctor and someone of his acquaintances whom he specifies at the device settings when he first buys it.

What Will Happen if This Problem is Not Solved?

Even though our proposed work is classified as a non-vital life management device, the name does not indicate that it is any less important. In fact, if this problem is not solved, the following is predicted to take place:

1. Overall health statistics will decline all over the country, and the estimated rates of obesity and related health issues will arise;
2. Average deaths count due to the lack of facilities in hospitals will continue increasing;
3. The ministry's continuous expenditure on importing new facilities will lead to the local income decline over the whole country;
4. A significant upsurge in poverty rates will be observed among local citizens, especially those of low incomes due to spending most or even all of their savings on health medications and doctor appointments for a turn to use health care services.

RELATED WORK

In this section indicates wearable devices presented in recent years by other researchers. Lavallière et al. (2016) found that the well-being, safety, and health can be enhanced by the wearable devices and Quantified-self utilizing the leverage interventions. Glance et al. (2016) studied the effect of a wearable digital activity tracker on well-being and health. the findings found that the activity level of the participants increased and maintained at least ten thousands steps per day through the time of the study. Dunne et al. (2007) indicates that the well-being, safety, and health can be improved in the work environment by the wearable devices. Shirouzu et al. (2015) studied the stress reasons between

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Lillian Ndagire, Gilbert Maiga, Benedict Oyoand James Basuta (2023). *International Journal of Innovation in the Digital Economy (pp. 1-15).*
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