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Versatile Personal Flotation Device (VPFD)

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ABSTRACT: The Versatile Personal Flotation Device (VPFD) project aims to redesign and improve a life jacket from a standard life jacket to a multipurpose life jacket equipped with Global Positioning System (GPS) sensor and a pulse rate sensor, which will assist individuals who use it. This innovation is aimed primarily at flight passengers, but it may also be utilized by search and rescue teams. This innovation idea is utilizing the GPS on the life jacket to allow the search and rescue crew to make a maneuver while saving a significant amount of time. In addition, this innovation can be used to trace the victims' exact location. The pulse rate sensor is attached to the wrist loop so that it is always in contact with the victim's skin and can distinguish between critical and normal sufferers by providing an accurate pulse reading. LEDs flash according to the victims' condition based on pulse reading besides as survivor indicator during dark time. The use of solar panel in this innovation is highlighted as the usage can functions up to 10 hours. The VPFD is capable to obtain the survival heart rate reading and at the same time the coordinate of the location through BLYNK application. As a result, the heart rate sensor and the GPS on the VPFD were featured to help the search and rescue team to get the real time data about the survivor's health condition and current location and coordinate. Based on questionnaire distributed to dedicated respondents shows that 92% of the respondents agreed that the newly fabricated VPFD can reduce the search and rescue time operation and improve the safety, meanwhile 94% respondents strongly satisfied with this new innovation.

Keywords: Life Jacket; Global Positioning System (GPS); Heart Rate Sensors.

1. INTRODUCTION

This innovation is to designed and developed to improve the efficiency of search and rescue (SAR) operation in searching missing victims by improving and fabricating the common life jacket to a new versatile life jacket with pulse rate sensor and GPS device as the main function as stress by Loay etl, (2019) and Alexandra (2019). Our project, VPFD, is a personal floatation device embedded with Global Positioning Sensors (GPS) built-in inside the jacket and the pulse rate sensor in a spring loop on one side of the jacket's arm hole to make them waterproof and easier for the passenger to put on the wrist strap with the pulse rate sensor while putting on the jacket. Our project is also to design the life jacket with an LED to indicate the victim's health condition prior to the signal received by the pulse rate sensor to indicate the victim's condition whether the victim is critical or normal. Our project is also designed with an external solar panel to support the electrical power to the power bank and can also act as the second power generator in case the main power source is broken as mention by Attia etl. (2014).

2. METHODOLOGY

Hybrid integration systems are very popular nowadays because of time saving and cost effective but at the same time the developed circuit can be used according to different functions according to the needs of the users. This innovative product developed consists of three main segments, namely:

i. Input supply
ii. Various sensors devices and circuits
iii. Output device

In addition, this innovation embedded with Global Positioning Sensors (GPS) for tracking purposes with BLYNK Application, Heart Rate Sensors to monitor the heartbeat of the victims, LED display that can prioritize the condition of the victims for fast rescue mission and also powered by solar panel battery for last lasting usage during the search and rescue mission. As a result of this hybrid innovation, search and rescue mission can be carried out effectively with the help of information from GPS, Hearts Beat Sensors and LED indicators.

3. RESULTS & DISCUSSION

Idea by utilizing the GPS on the life jacket to allow the search and rescue crew to make a manoeuvre while saving a significant amount of time. In addition,

this innovation can be used to pinpoint the victims' exact location. The pulse rate sensor is attached to the wrist loop so that it is always in contact with the victim's skin and can distinguish between critical and normal sufferers by providing an accurate pulse reading. LEDs flash according to the victims' condition based on this reading. Fig. 1 show the complete VPFD module that is attached with the life jacket.

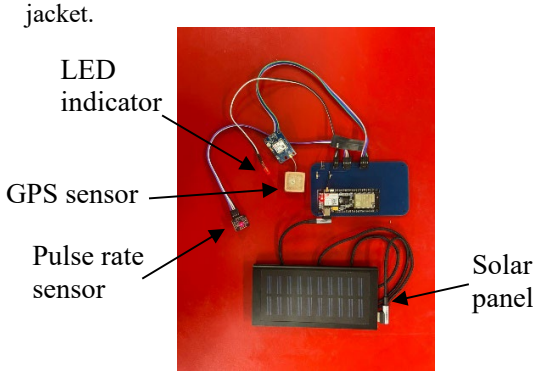

Figure 1. Complete VPFD module

BLYNK application is used for monitoring the data from VPFD module. Fig. 2 shows the BLYNK application that also embedded with the information regarding the victim heart rate.

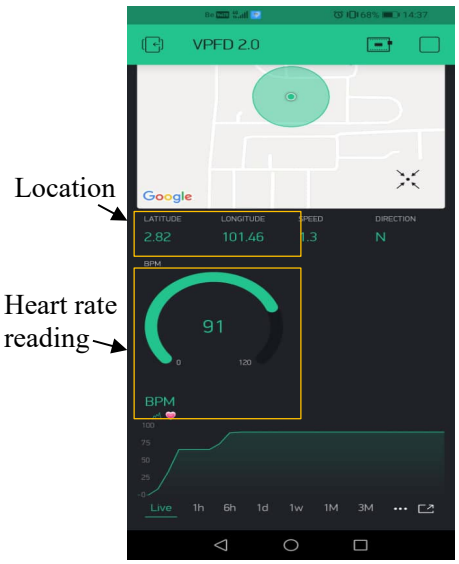

Figure 2. BLYNK application

Figure 2 show the complete life jacket that embedded with heart rate sensor, GPS detector, solar panel and LED display.

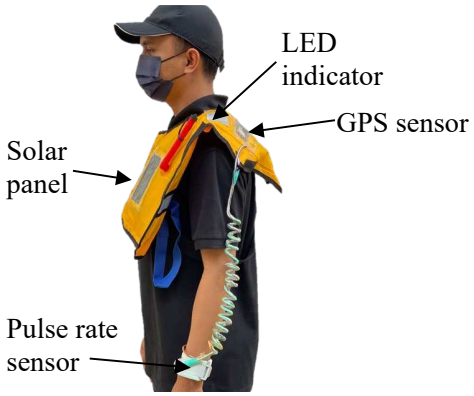

Figure 3. Complete life jacket embedded with sensors

Measuring the effectiveness of this innovation, a questionnaire was distributed among students, lecturers in Politeknik Banting Selangor, and related aviation's industries personnel's. The questionnaire is separated into THREE (3) segment which are the hardware, software and overall product. Table 1 shows the tabulation of respondents.

Table 1. Numbers of respondents

Backgrounds		Number of respondents
Students	Polytechnics	25
Lecturers	Polytechnics	15
Aviation Personnel's	License Aircraft Technician	8
	License Aircraft Engineer (LAE)	2
	Aircraft Pilot	2
Total		52

Table 2. Survey Responses

No	Item	Yes (%)	No (%)
1.	It is easy to use the VPFD during emergency because it is user friendly.	40 (77)	12 (23)
2.	The additional sensors at the life jacket are high quality.	45 (87)	7 (13)
3.	The use of this VPFD can reduce the Search and Rescue time operations.	48 (92)	4 (8)
4.	The information provided by the system is simple to comprehend.	45 (87)	7 (13)
5.	The system benefits Search and Rescue operation, particularly in terms of safety.	48 (92)	4 (8)

6.	It is easy to learn about the system.	40 (77)	12 (23)
7.	Is this product's innovative technology make the Search and Rescue operation easier?	45 (87)	7 (13)
8.	Do you believe this innovation will make it easier for you to complete your task?	40 (77)	12 (23)
9.	Overall, are you satisfied with this new innovation.	49 (94)	3 (6)

Table 2 shows the results of the questionnaire distributed to respondents.

4. CONCLUSION

Versatile Personal Flotation Device (VPFD) is a credible guide for further enhancement in safety for variety field. VPFD is an invented life jacket that produce an outcome of data of survival such as heart rate reading and the location that helps in search and rescue operation. Furthermore, in the methodology section, it is clearly demonstrated the features and functionality of VPFD that have safety features and designated for the use in increasing the safety of the user. In addition, the innovation of the heart rate sensor in the life jacket that works along with the LED indicator which can instantly note by the rescue team to determine which survivals that need to be safe first. This is supported by questionnaires distributed to 52 respondents in which 92% of the respondents agreed that the newly fabricated VPFD can reduce the search and rescue time operation and improve the safety, meanwhile 94% respondents strongly satisfied with this new innovation.

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