International Journal on Future Revolution in Computer Science & Communication Engineering
Volume: 4 Issue: 9
ISSN: 2454-4248
81 – 84

Design of Telemonitoring Medical Record of Cardiac Arrhythmia Patients Based on RFID and WEB

Febriyansyah Ramadhan[1]*, Wahyu Kusuma Raharja[2]
1)Program Master of Electrical Engineering, Gunadarma University, Depok, Indonesia
2)Program Master of Electrical Engineering, Gunadarma University, Depok, Indonesia
* *e-mail:febriyansyah.ramadhan@gmail.com*

***Abstract*—**Heartbeat detection for arthytmia sufferers repeatedly done to maximum result monitoring. All this time, arrhythmia is still diagnosed by doctors by using paper graph of Electrocardiography (ECG). Then the patient visits the doctor regularly to check. In this research aims to build telemonitoring medical records that can know and identify arrhythmias in case of abnormalities in the heart, so doctors can monitor heart abnormalities through the website. In this research, monitoring patients with arrhythmias based on the identity of patients who have been enrolled. The RFID that has been administered by the patient serves as the patient's identity at the time of cardiac arrhythmia detection. System building software is with the PHP programming language for the website, Wireshark to identify the delay of sending data to the web page and Sql to build the database. The average time required for the sending of the results of arrhythmia detection is 429 milliseconds. The system has been built can display on the web page in the form of cardiac arrhythmia detection and timing verification as well as know the identity of patients based on RFID.

Keywords- *telemonitoring, cardiac arrhythmias, RFID, web, database*

*****

I. INTRODUCTION

Heart is a very important human organ, used to pumping blood throughout the body and blood is pumped into the lungs, place of blood gets oxygen and leaves carbon dioxide. The number one record in the world that causes death and disability caused by heart disease. Hypertension causes at least 45% of deaths from heart disease and 51% of deaths from stroke. Deaths caused by cardiovascular disease, especially coronary heart disease and stroke are expected will continue to increase to 23.3 million deaths by 2030 [1]. The heart is a very important organ in our body that we must guard, every time to check up to a doctor the most important thing is to check the heartbeat and blood pressure. Relating to the heart, arrhythmia or heart rhythm disturbance is the natural human heartbeat rhythm that is not normal in its condition. Heart rhythm abnormalities can be used as early signs of a serious heart attack [2].

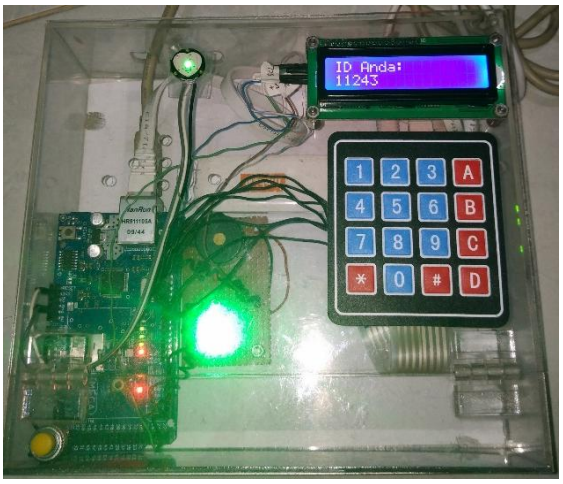

Fig. 1 Heart Arrhythmias Detector [6]

Heartbeat monitoring for arrhytmia patients is repeatedly done to maximum results monitoring [3]. On these conditions is expected to monitor easily using web-based concept with database storage media so that doctors can perform monitoring via personal computer or mobile phone and the patient can check the arrhythmia up at home, it is very useful if the patient's location is far from the hospital or the limitations medical devices for monitoring of arrhythmias regularly.

Previous research has made heart arrhythmia detector with Arduino and optical sensor [4]. Developed further by monitoring arrhythmias remotely [5] As in Fig. 1. that can be accessed by smart phones and personal computer by online to be monitored by the doctor.

II. TELEMONITORING DESIGN METHODOLOGY

Based on the design methodology used, it can determine what specifications will be needed to build and design the system. Fig. 2 is a telemonitoring design that has been built to connect patients with physicians without the separation distance, so that patients with arrhythmias can perform home care but are always monitored by a doctor or paramedic through the website. Some of the most important of these innovations can benefit the patients and doctors or paramedics as in routine checks to visit the doctor every day, the patient's distance to the hospital and the cost of hospitalization.

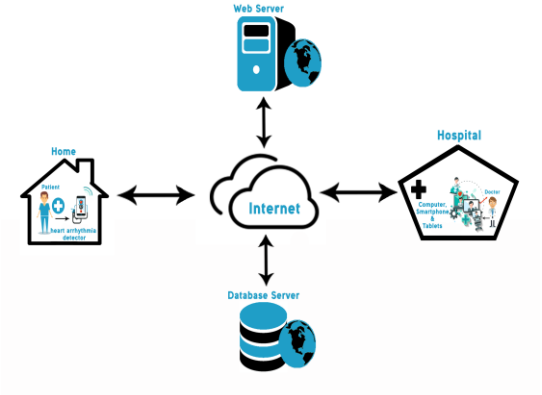

Fig. 2 The Telemonitoring design of cardiac arrhytmias

 ISSN: 2454-4248
81 – 84

2.1. Design of telemonitoring system of cardiac arrhythmia

Telemonitoring is a mobile sensor implementation that facilitates physiological remote monitoring by utilizing Internet media as a communication medium between home patients and doctors in hospitals [6]. Fig. 3 is a flow chart from the beginning of a patient who performs the examination of the arrhythmia disease to completion and can be seen and analyzed by a doctor or paramedic about the type of arrhythmia suffered by patient.

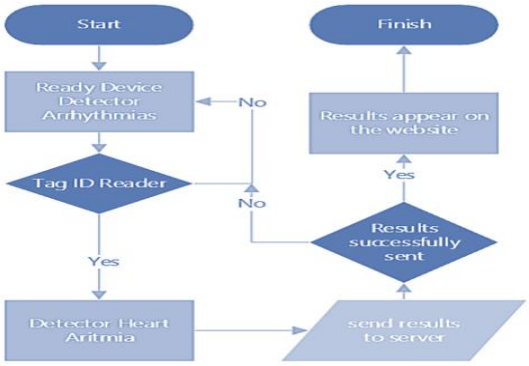

Fig. 3 Telemonitoring flow chart of cardiac arrhytmias

2.2. Implementation of cardiac arrhythmia telemonitoring system

In the implementation stage RFID is required for the identity of the patient, arrhythmia detector, wireless connection, interface for doctors and databases. Fig. 4 is a technical process of telemonitor implementation of cardiac arrhythmias. Furthermore, the system can transmit real-time data when detecting arrhythmia over long distances. The results of the detection are transferred in accordance with the protocol in which the data is transferred is a state of detection at the time of checking.

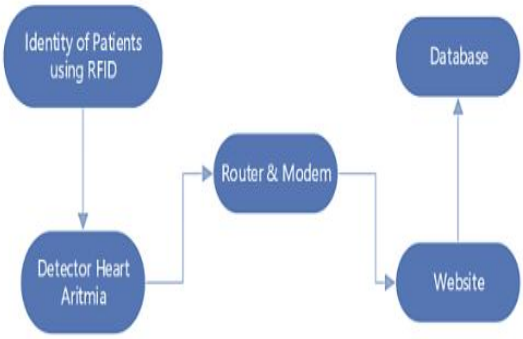

Fig. 4 The technical process of telemonitor implementation of cardiac arrhythmias

2.3. RFID Mifare RC522

Mifare RC522 RFID Reader is an IC-based MFRC522 module that can read RFID, as it already contains the components required by MFRC522 to work. This module can be used directly by MCU by using SPI interface, with supply voltage equal to 3,3V. MFRC522 is a product of NXP that uses a fully integrated 13.56MHz non-contact communication card chip for reading and writing [7].

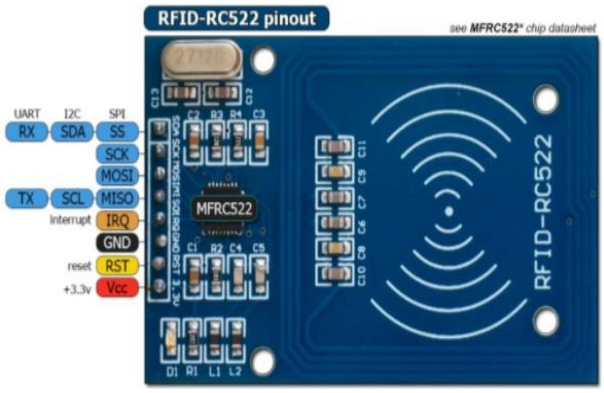

Fig. 5 RFID RC522 Reader Module

2.4. Design Website and Database

Website pages to display the results of cardiac arrhythmia examination using the HTML programming language as the appearance and design of web pages, CSS to make web page design to look more attractive, PHP for data processing results of arrhythmia detection to be stored on the database. Fig. 6 is a web design of telemonitoring cardiac arrhythmias.

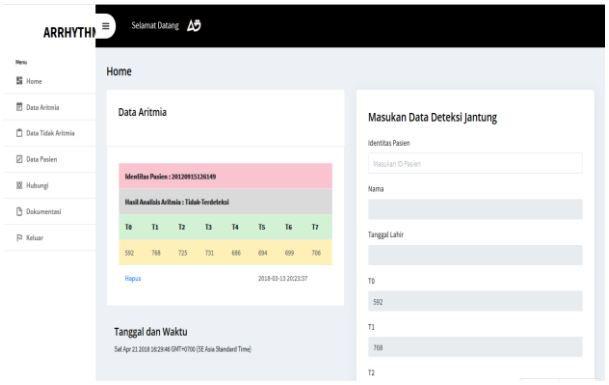

Fig. 6 Display of telemonitoring website of cardiac arrhythmias

Database using XAMPP MySql, the use of this database is good enough and commonly used when creating a website. First create a database with the name of the arrhythmia, then describe the table and field that will be used in the database. Fig. 7 designed the database with MySQL XAMPP.

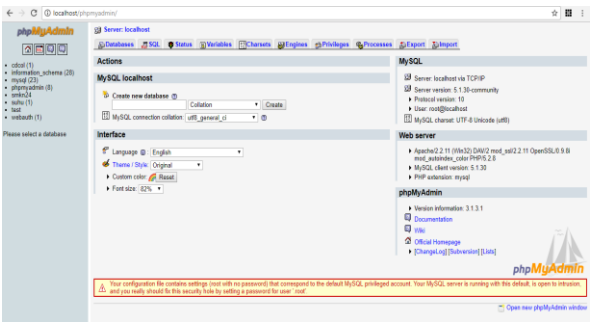

Fig. 7 Display database with MySQL XAMPP

 ISSN: 2454-4248
81 – 84

III. RESULT AND DISCUSSION

This test is performed to determine whether the telemonitor system can work properly and to know how far the performance of this device as expected.

3.1. RFID as the patient's identity

On the telemonitor cardiac arrhythmia, RFID is used as the patient's identity. Each patient is given RFID as an identity when it detects cardiac arrhythmias. Fig. 8 represents the identity of a patient who has been tagged with RFID on the cardiac arrhythmia detector device.

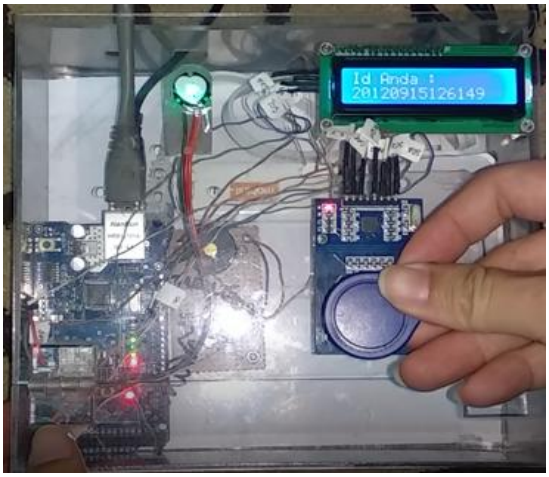

Fig. 8 Identity of patients with RFID on cardiac arrhythmia detector

Then in Fig. 9 is the result of patient's identity that has been sent on the website page. If the patient's identity has been registered on the website page then the patient's personal data will appear on the "Masukan Data Deteksi Jantung" form.

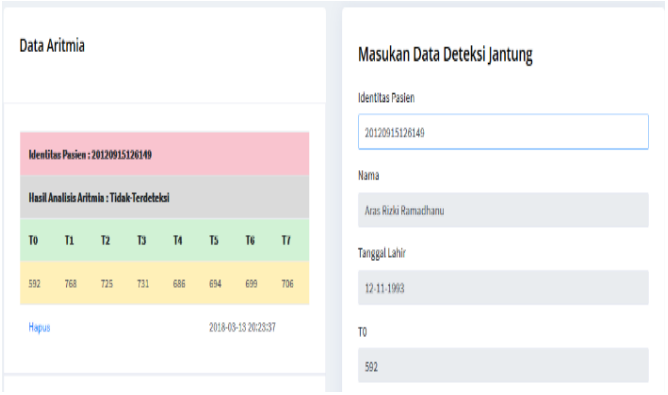

Fig. 9 The patient's identity on the website page

3.2. Results of patient's medical record data

Here is a view that is used to display the results of the medical record of arrhythmia detection, the timing data of arrhythmia can be stored and displayed on the website page http://deteksi-artimia.000webhostapp.com as in Fig. 10. Indicates that the patient has checked and recorded his medical data on 13 March 2018 at 20:23 with the first heartbeat interval until the eighth was shown at T0 to T7. Result of arrhythmia analysis "Tidak-Terdeteksi" or Not Detected.

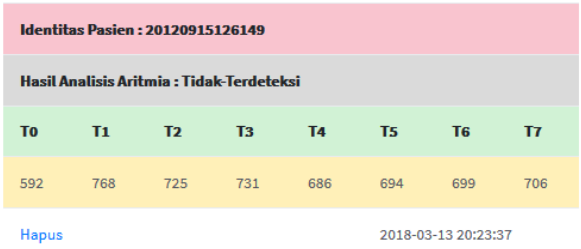

Fig. 10 Display of the results timming examination of arrhythmia on WEB

Fig. 11 is the result of checking the patient's arrhythmia detection periodically. Based on this data the doctor can perform an analysis of the state of patients with arrhythmia in providing more treatment.

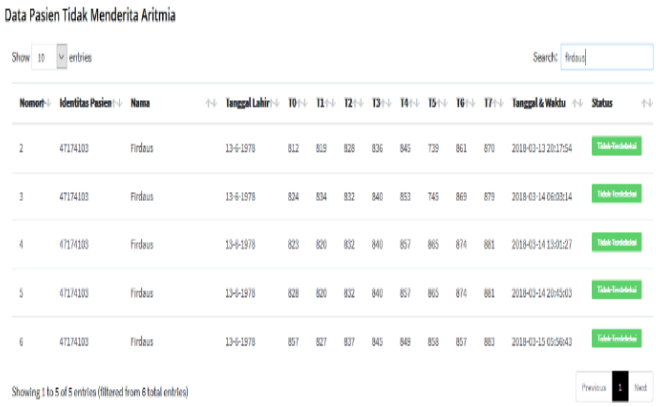

Fig. 11 Display of the results of periodic inspections on the WEB

3.3. Registering a new patient

On the "Data Pasien" menu there is an "Tambah Data" tab as shown in Fig. 12 is a form view to add new patient's identity data. When the patient has been registered it will get a unique ID so that each patient has an identity number that is not owned by anyone. In accordance with the RFID tags obtained by the patient.

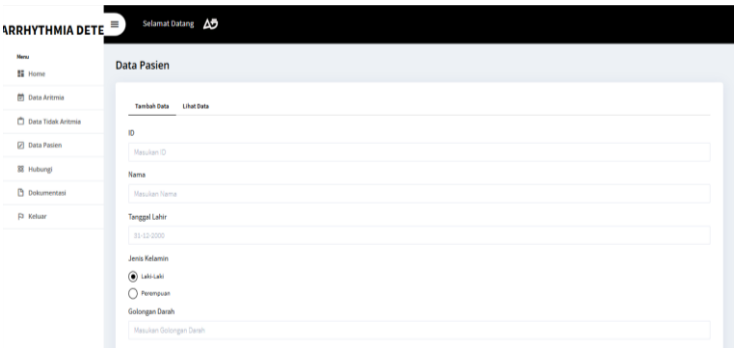

Fig. 12 Display of add new patient form on WEB

After filling the form on the page, the patient has been successfully registered and has been stored in the database as in Fig.13.

 ISSN: 2454-4248
81 – 84

+ Options

	no	id	nama	umur	jenis_kelamin	golongan_darah	alamat
Edit Copy Delete	843	1321921680	Febriyansyah Ramadhan	23-02-1993	Laki-Laki	O	JL.Serut Rt:09/04 No:61 Jakarta Timur Cipayung Pon...
Edit Copy Delete	845	47174103	Firdaus	13-6-2017	Laki-Laki	A	Jl. Raya Ceger RT:05/06 Jakarta Timur Cipayung Ceg...
Edit Copy Delete	846	7312715626176	Trisa Meidina	29-5-2001	Perempuan	O	JL. Merdeka Barat No.11 Jakarta Pusat
Edit Copy Delete	847	361456810251	Vyta Octasheyra	27-10-1989	Perempuan	O	JL. Pondok Indah No.23 Blok C
Edit Copy Delete	848	20120915126149	Aras Rizki Ramadhanu	12-11-1993	Laki-Laki	AB	Jl. Bekasi Raya No 13 Blok A1

Check all With selected: Edit Copy Delete Export

Fig. 13 Display data of patients who have been registered on the database

3.4. Transmission time of detection results to website

This test aims to find out the Delay (Latency) or Response Time of the system since the start of sending data from the detection of arrhythmia until the data is sent on the website page. The process of testing Delay (Latency) sending data from one point to another point to which its purpose is represented in milliseconds.

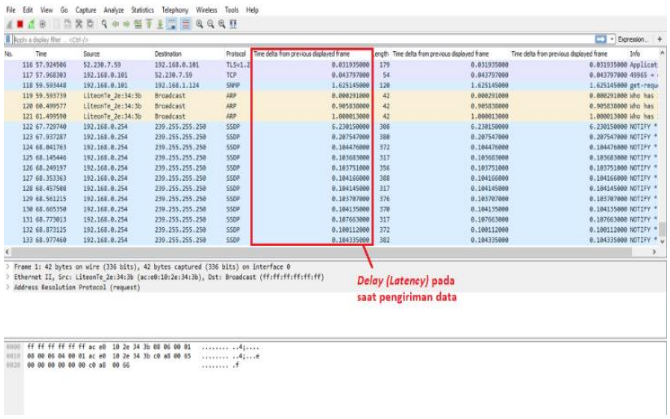

Fig. 14 Delay (Latency) at the time of data transmission

At the time of this test is done by using wireshark software by taking the Delay (Latency), the value of Delay (Latency) that has been obtained on wireshark software shown in Fig.14 results of the data submission summed and taken the average value for 1 shipment [8]. Furthermore, there were 10 experiments with the results as in Table 1.

TABLE 1 DELAY DELIVERY OF ARRHYTHMIA EXAMINATION RESULTS TO THE WEBSITE

Testing	Value Delay (ms)
1	453
2	449
3	423
4	438
5	331
6	596
7	401
8	306
9	412
10	489
Average	429

The results of Delay (Latency) test in Table 1 resulted in an average delivery time of 429 milliseconds by performing 10 trials of cardiac arrhythmia transmission data sent to the web page.

IV. CONCLUSIONS

Design of telemonitoring medical records for cardiac arrhythmias based on RFID and the web has succeeded in displaying inspection data, recording the results of arrhythmia detection and screening time on web pages. The design of this telemonitor can be accessed at http://deteksi-artimia.000webhostapp.com website address and the data has been successfully saved in the database. The average time the process of sending results from the examination on the cardiac arrhythmia telemonitoring design to the website was 429 milliseconds.

REFERENCES

[1] WHO. 2007. Pencegahan dan Pengendalian Infeksi Saluran Pernapasan Akut (ISPA) Yang Cenderung Menjadi Epidemi dan Pandemi di Fasilitas Pelayanan Kesehatan. Pedoman Interim WHO. Alih Bahasa: Trust Indonesia. Jakarta.

[2] Sukoco A., 2006, Desain Alat Deteksi Dini dan Mandiri Aritmia, sjd.pdii.lipi.go.id/admin/jurnal/6308494502.pdf, obtained date November 10, 2012.

[3] Wahyu Kusuma R., Al Aziz, Musa P., 2015, Design of Arrhythmia Detection Device Based on Fingertip Pulse Sensor, International Conference on Electrical Systems, Technology & Information (ICESTI) 2015, Bali.

[4] Babiker S.F., Liena Elrayah Abdel-Khair, Samah M. Elbasheer, 2011, Microcontroller Based Heart Rate Monitor using Fingertip Sensors, UofKEJ Vol. 1 Issue 2 pp. 4751,October 2011.

[5] Mathilde C Hermans1,2, MSc; Martijn S Van Mourik1, MSc; Hermie J Hermens3, Ir, PhD; Jan Baan Jr1, MD, PhD; Marije M Vis1, MD, PhD. Remote Monitoring of Patients Undergoing Transcatheter Aortic Valve Replacement: A Framework for Postprocedural Telemonitoring. JMIR Cardio 2018.

[6] Wahyu Kusuma R., Swelandiah E.P., Ridha I., Yasman R., 2017, Rancang Bangun Alat Telemonitor Aritmia Jantung Berbasis Web, National Seminar on Vocational and Technology (SEMNASVOKTEK) 2017, Denpasar-Bali.

[7] Nugraha, Charolos Hanung Aji Agung. (2016). Penghitung Laju Menggunakan RFID Berbasis Arduino. Universitas Santa Dharma : Teknik Elektro, Fakultas Sains dan Teknologi, February 19, 2016.

[8] Ferdy Adriant, M., Mardianto, Is. (2015). Implementasi Wireshark Untuk Penyadapan (Sniffing) Paket Data Jaringan, National Seminar Cendekiawan 2015. ISSN: 2460-8696. 2015.