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A SURVEY ON CARDIAC DETECTION, MONITORING AND ALERTING TO HEART PATIENTS

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ABSTRACT - *The application of heart beat sensor for elderly people have been introduced in order to monitor the change in the patient's health condition. The heart beat rate is examined through ECG. This paper uses the ECG instrument in order to record the heartbeat of the patients, when the patients pulse reaches to the peak range. We also use sensor to sense the patient's pulse rate periodically in order to ensure the range of the pulse whether it is at normal rate or not. If the pulse rate increased above the normal range of a body, then the changes occurs in the ECG values and signals the patient via a buzzer to indicate heart attack. The in-house is designed on Raspberry-pi kit. The GSM which is connected to the raspberry-pi to trace the location of the heart patient in order to intimate to the near-by hospitals. The hand-held wearable device like a watch is always being wearied by the heart patients in which a buzzer is attached which alerts the patients and it will be intimated to the closest relations of the patient in need of emergency, if the pulse rate had been crossed the normal range. Once the alert has been heard by the patient, immediately patient location is traced and the resulted data of the person location will be sent to the near-by hospitals. Furthermore, an encryption encoder based on asymmetric cryptography is used which will be set in case of sending an email to the hospitals regarding the pulse range and the condition of the patient , while travelling from the current spot to the hospital. By default, the normal pulse rate will be set to 80MHz. We present an extraordinary experimental result in order to safeguard and minimize the death of the heartpatients.*

Keyterms *—EC Ginstrument, IOT, Buzzer, GSM, Heart Beat Rate, Pulse Range, Raspberry pi.*

I. INTRODUCTION

The cardiac monitoring refers to the continuous or intermediate monitoring of heart activity, generally by electrocardiography with the assessment of the patient's condition respective to the cardiac rhythm.

The heart beat sensor is contingent on the fundamentals of the sketch plethysmography. It measures the difference in amount of blood via several parts of the body. For this applications the checking the heart rate is necessary, and it should be informed to patients if there is high fluctuation in their pulse. The quantity of blood flow is determined by the heart pulses and the signal pulses are identical to the heart beat pulses.

GSM is established in 1982 to create a standard for mobile cellular radio system which operates at 900 MHZ. GSM provides the detail of functions and requirement but do not address any hardware.

The main motive of this GSM is to reduce the work load of the designers. GSM modem is a wireless medium that is combined with GSM wireless network. It uses two cables, Serial or USB in order to connect with the computer. It should be inserted into the required slot. For GSM modems, the sim card is required. The GSM modems supports the set of AT commands. It is used for reading and writing the message provided by the end user, sending and receiving messages, examines the strength of the signal, examines the battery level and so on. The main component required for GSM, is sim card. It has to be inserted into the modem. The sim card which is to be inserted should have the minimum balance. In order to send the SMS and it should be around the network range. The transmission and reception pins has to be connected to the raspberry pi in a reverse order. Now turn on the GSM module and allow few seconds.

GPS is designed for many application. They are classified as SLX and PAX. SLX uses the ceramic antenna while PAX is not. GPS based system is used to locate any object or person that is tracked. The main advantage of raspberry pi, it is self-computerized with own operating system. When GPS device is connected to raspberry pi, it is like connecting the device to computer. The location of the person is determined using their latitude and longitude.

II. LITERATURE SURVEY

A. Monitoring Cardiac Stress Using Features Extracted from S1 Heart Sounds

The paper is based on heart beat sound by which the moment of heart is identified. The heart is monitored based on the analysis of heart beat. ssThe mechanism they focussed is clustering mechanism, from which the outliers are remove and ensures the appropriate condition of the patient against noise during heart beat recording. They monitor the heart beat using acoustic signal of heart. The patient's heart beat is recorded using data acquision system, where the storage of database is very complex and hardware software design takes more time. When the data is transferred from file based system to database special training is required. Damage or variation in database will affect the performance of the system. This project can also be used in dialysis of kidney and identifying the heart failure. But they have shown only 80 percent of accuracy in their work. They only focus on provide the appropriate data on the collected data.

B. Respiration Rate Measurement Under 1-D Body Motion Using Single Continuous-Wave Doppler radar Vital Sign Detection System

This paper records the vital signs of the patients using Doppler radar. When there is drastic moment in the body motion, the accuracy of the detection is declined
. Even the breathing moment of the human cannot be easily detected if there is displacement in the body. The Doppler radar used in this project is used to recognize physiological moment in the body. By recognising the moment the respiratory rate is identified. From the short distance, it can identify the respiratory rate. When there in moment with the patient, there may be decline in the accuracy of the data or sometimes may lead to false data. The proposed system in my project can be used to recognise the heart beat of the patient even they are in motion. This can also be useful if the person is travelling from one place to another.

C. Algorithms for Smartphone and Tablet Image Analysis for Healthcare Applications

This project deals about monitoring the health condition of the heart patients using image which will be send via Smartphone. This uses the application called as Pinch Zoom app which is used to recognize the image using colour recognition of the image and provide appropriate treatment to the patients via the application. But this project does not focus much on three dimensional object. The remedies can be given to the patients only when the image of the impacts of the diseases or wounds is given. It uses Arduino kit to collect the data and sending messages through application. It does not provide any automated analysis of current health condition of the patient. Only through recognition of image the first aid can be given. This can be overcome by analysing the patient condition using sensor and intimating necessary first aid through GSM to mobiles, if there is abnormal condition. Only if the person has smart phone, this application will be successful.

D. An embedded Mobile ECG Reasoning System for elderly patients

The major part of this paper insists on periodic monitoring of the heart patients (or old people), in case of abnormal changes. ECG instrument is used to signal the heart diseases. If any of the error occurs in identifying the condition of the patient or irregular caring of medical treatment leads to drawback of the experimental results. The system proposes embedded mobile ECG monitoring system that checks the ECG signal and RF sensor is used to sense the patients when they are alone. The experiment showed the mobility, usability and the performance which have an regular relationship with the users. Here in this system, the heart patients will be wearing a wristband which is of RF tag which allows a faster treatment on before reaching to the hospitals. Although, it may have extra-ordinary care towards the heart patients, the system suffers from security problem on information of attacks which must be investigated in the future.

E. Predictive Monitoring of Mobile Patients by Combining Clinical Observations with Data from Wearable Sensors

The paper illustrates of monitoring the physiological condition with the low-powered wearable sensors. Despite the use of data's being collected from various systems where some work must be undertaken including the monitoring of the health condition of the heart patients which may also possess the false alerts. This paper brings the proposed system of continuously monitoring the heart beat rate using some device which can be wearied by the heart patients. This system uses the vector machine which determines certain parameters under a ROC curve giving the unique data. Compliance of the patient would be high in case of wearing any of the sensors continuously on the body. The system proposes on estimating the parameter that benefits the heart patients on continuous monitoring of the pulse range of the patient. However, it is highly risky on a group of mobile patients to deliver the feedback of each patient since it varies significantly between various individuals.

F. Wavelet-Transform-Based Data-Length-Variation technique for Fast Heart Rate Detection Using 5.8-GHz CW Doppler radar.

The continuous monitoring and detection of instrument that are without the contact with the human body is used to measure the heart beat range of a human body. The instruments are used with the Doppler shift to the base band of analysing the signal of the heart beat rate which would realize the quick detection of the heart beat. If the value of the

magnitude is higher than the heart beat rate in frequency spectrum, then it will be incorrectly signals the range of the heart beat value. The frequency of the wavelet of the heart beat rate is not the same with respect to the change in the heart beat of the date length. This system is able to demolish the respiratory system by determining the peak range of the heart beat rate of the human body which would be proposed with even more new techniques in the future researches.

G. Heart Rate Detection during Sleep Using a Flexible RF Resonator and Injection-Locked PLL Sensor

Novel non-intrusive technologies for wrist pulse revelation have been advanced and suggested as systems for sleep auditing, using three forms of radio frequency (RF) sensors. The three forms of RF sensors for heart rate measurement on wrist are a malleable RF single resonator, array resonators, and an injection-locked PLL resonator sensor. To authenticate the act of the new RF systems, we correlated heart rates among pre-sleep time and post sleep onset time. Heart rates of 10 subjects were measured using the RF systems amid sleep. All three RF devices encountered heart rates at 0.2 to 1 mm gap from the skin of the wrist over clothes made of cotton fabric. The wrist pulse signals of a malleable RF single resonator were steady with the signals attained by a compactable piezo-electric transducer as an allusion. Then we fixed that the heart rate later sleep onset time somewhat declined correlated to previous sleep. In outcome, the RF system can be applied as a non-contact non-intrusive approach for measuring heart rates all along sleep.

H. Detection of heart beat automatically during seating position

This project focuses on continuous monitoring of elderly people health. But collecting the data from the required patients is hidden to the patients. It uses BCG and from the data it is used to detect automatic and non-conscious heart rate checking system. It uses two sensors namely, force sensors and high-gain amplifiers which is used to monitor the BCG. Digital signal pre- processing is deployed to build the SNR and an algorithm to axiomatically and the recorded heart rate is calculated from it. But this project only deals with the person who is under seated position. It should always focus on the ideal person who is located in the single position. The collected BCG recordings is compared with the ECG recordings. But this value is not so accurate.

I. GSM and Internet Services-Based System for Out-of-Hospital Follow-Up of Cardiac Patients

In this platform three information entities are used to enable heart patients about their heart rate out of hospital flow up and monitoring. The patients must belong to any one of the following specific risk group, that is, arterial hypertension, malignant arrhythmias, heart failure, and post infarction rehabilitation. They are provided with a portable device, a cellular phone and a wireless application platform to transmit the message to doctor. but in our project specific risk group and device are same but whenever heart rate increases to abnormal level the message will be automatically sent to heart patient's family members and they can intimate to their family doctor. In the above platform they patients need to intimate to the doctor .In most of the time the heart patient may not be in conscious state, when they are affected by the disease. So we have introduced this new concept of sending the message to family members. By doing so they can take necessary steps in the initial stage itself instead of doing it in the chronic stage.

J. VLSI based complex detector for the body sensor network

An integration technique is used with a instrument, ECG QRS detector to sense our body mainly, to the heart patients of monitoring their heart beat rate. In the ECG instrument, the noise is eliminated by a morphology method. The multiple pixels of accumulated modulus is enhanced to react as a low-pass filter to activate the QRS complex which would improve from signal to the noise ratio. The system is experimented on arrhythmia database on wearing a device to detect in case of any physiological effects like a heart attack to the heart patients. This system proposed the VLSI architecture on high rate of detecting and with high speed to indicate the experimental results. Since, this system has an user-friendly VLSI architecture, it provides priory alerts on frequency of the component of the signal. If the bandwidth is overlapped between the QRS complex and with the other components, even then this system will keep on working. The QRS values is achieved experimentally with the ECG values that favourably makes this system to work efficiently.

K. Detection of heart beat locations through ballistocardiographic signal using fiber optic sensor.

The digital signal is processed for detecting the heartbeat of the heart patients using a Bragg grating (FBG) sensor. The heart rate is measured during the imaging process which credits to this system. They aimed to design with multiple parameters in generating the algorithm of detection of the range of values of the heart patients. The proposed system of this paper has achieved in showing the experimental results on semi-real-time (online) with respective to the heart beat resolution. System has a low-delay legible in computing its power within its requirements. Even though, the system is of with low delay in its processing it also has a limitation that using of ballistocardiogram which of difficult task in dealing with the waveform of the amplitude in the source signal. However, the multiple parameters in optimizing the detection of the heart attacks is achieved with respect to the heart positions of the patients. The proposed system would enable the progression on multiple body locations to enhance the reliability measurements.

References	Technologies	Focus	Advantages	Disadvantages	Domain
Jonathan Herzig, Amitai Bickel,Arie Eitan, and Nathan Intrator IEEE Transactions on Biomedical Engineering , 2013	**Monitoring Cardiac Stress Using Features Extracted from S1 Heart Sounds**	The paper is based on heart beat sound by hich the moment of heart is identified. The heart is monitored based on the analysis of heart beat.	This project can also be used in dialysis of kidney and identifying the heart failure	Damage or variation in database will affect the performance of the system.	Clustering mechanism and acoustic signal.
Jianxuan Tu, *Student Member, IEEE*, Taesong Hwang, *Member, IEEE*, and Jenshan Lin, *Fellow, IEEE*,",MAY 2015	**Respiration Rate Measurement Under 1-D Body Motion Using Single Continuous-Wave Doppler radar Vital Sign Detection System**	This paper records the vital signs of the patients using Doppler radar. When there is drastic moment in the body motion, the accuracy of the detection is declined.	Doppler radar uses low transmitting power and low power consumption and are usually small in size.	When there in moment with the patient, there may be decline in the accuracy of the data or sometimes may lead to false data.	The Doppler radar used to recognize physiological moment.
Paul J.F. White, (Student Member, IEEE), Blake W. Podaima and Marcia R.Friesen	**Algorithms for Smartphone and Tablet Image Analysis for Healthcare Applications**	This project deals about monitoring the health condition of the heart patients using image which will be send via Smartphone.	The treatment can be given by r-+ecognising the image which will be user friendly for the user without any training.	The remedies can be given to the patients only when the image of the impacts of the diseases or wounds is given. Only through recognition of image the first aid can be given.	Pinch Zoom app for image recognition.
Dong-Her Shih, Hsiu-Sen Chiang, Binshan Lin, *Member, IEEE*, and Shih-Bin Lin, VOL. 14, NO. 3, MAY 2010	**An embedded Mobile ECG Reasoning System for elderly patients**	The major part of this paper insists on periodic monitoring of the heart patients (or old people), in case of abnormal changes. ECG instrument is used to signal the heart diseases.	The heart patients will be wearing a wristband which is of RF tag which allows a faster treatment on before reaching to the hospitals.	The system suffers from security problem on information of attacks which must be investigated in the future.	RF tagger placed in wrist band.
Lei Clifton, David A. Clifton, Marco A. F. Pimentel, Peter J. Watkinson, and Lionel Tarassenko, VOL. 18, NO. 3, MAY 2014	**Predictive Monitoring of Mobile Patients by Combining Clinical Observations with Data from Wearable Sensors**	The paper illustrates on monitoring the physiological condition with low powered wearable sensors. It continuously monitoring the heart beat rate using some device which can be wearied by the heart patients.	This paper brings the proposed system of continuously monitoring the heart beat rate using some device which can be wearied by the heart patients.	It is highly risky on a group of mobile patients to deliver the feedback of each patient since it varies significantly between various individuals.	Wearable ECG sensors.
Meiyu Li and Jenshan Lin, Fellow, IEEE	**Wavelet-Transform-Based Data-**	This paper deals with continuous monitoring and	Detection of instrument are without the	If the value of the magnitude is higher than the	CW Doppler radar

	Length-Variation technique for Fast Heart Rate Detection Using 5.8- GHz CW Doppler radar.	detection of instrument that are without the contact with the human body is used to measure the heart beat range of a human body.	contact with the human body.	heart beat rate in frequency spectrum, then it will be incorrectly signals the range of the heart beat value.	
Sung Woo Kim, Soo Beom Choi, Yong-Jun An, Byung-Hyun Kim, Student Member, Deok WonKim, Life Member, and Jong-Gwan Yook, Senior Member	**Heart Rate Detection during Sleep Using a Flexible RF Resonator and Injection-Locked PLL Sensor**	Novel non-intrusive technologies for wrist pulse revelation have been advanced and suggested as systems for sleep auditing, using three forms of radio frequency (RF) sensors.	The cardiac attacks can be identified if the patient is sleeping or unconscious	They only compare heart beat during sleep based on between pre-sleep time and post sleep onset time	Novel non-intrusive technologies and PLL sensor
P. S. Luna, R. Pallàs, *Fellow Member*, IEEE," VOL. 13, NO. 3, MARCH 2015	**Detection of heart beat automatically during seating position**	This project focuses on continuous monitoring of elderly people health. It uses BCG and from the data it is used to detect automatic and non-conscious heart rate checking system.	It is used to detect automatic and non-conscious heart rate checking system.	Collecting the data from the required patients is hidden to the patients	Digital signal pre-processing is deployed to build the SNR
Carlos H. Salvador, Member, IEEE, Mario Pascual Carrasco, Miguel A. González de Mingo, , Luis Sosa Martín, Miguel A. Cavero, Ignacio Fernández Lozano, and José Luis Monteagudo, Member	**GSM and Internet Services-Based System for Out-of-Hospital Follow-Up of Cardiac Patients**	In this platform three information entities are used to enable heart patients about their heart rate out of hospital flow up and monitoring.	They are provided with a portable device, a cellular phone and a wireless application platform to transmit the message to doctor.	Messages are intimated only to the patients though the patient is unconscious.	GSM for sending messages
Shih-LunChen, *Member, IEEE*,Min-Chun Tuan, Ho-Yin Lee and Ting-Lan Lin, *Member, IEEE* DOI 10.1109/ACCESS.2017.2679123, IEEE Access.	**VLSI based complex detector for the body sensor network**	An integration technique is used with a instrument, ECG QRS detector to sense our body mainly, to the heart patients of monitoring their heart beat rate.	The noise is eliminated by a morphology method. The QRS values is achieved experimentally with the ECG values.	VLSI can cost lots of money to get the technologies and to find out the things.	QRS detector to sense the body.
Mariusz Krej, Łukasz Dziuda, *Member, IEEE*, and Franciszek Wojciech Skibniewski, VOL. 19, NO. 4, JULY 2015	**Detection of heart beat locations through ballistocardiographic signal using fiber optic sensor.**	The digital signal is processed for detecting the heartbeat of the heart patients using a Bragg grating (FBG) sensor	It will enable the progression on multiple body locations to enhance the reliability measurements.	Using BC is a difficult task in dealing with the waveform of the amplitude in the source signal.	ballistocardiographic signal and fiber optic sensor

Table 1 Literature Survey

III. CONCLUSION

In past days, if there is change in heart beat it can be recognised only in the hospital. This project helps the patient to identify their medical status by monitoring their pulse regularly. The messages provided through GSM to the patient's relatives help them to identify the current health condition of the person and providing first aid will reduce the risk of danger. If the person is admitted in the hospital, he may not be under full surveillance.
If there is changes in the patient pulse condition when he is not under the surveillance, the message will be intimated to the same hospital which can reduce the death of patients. By doing so, the emergency condition of the patient can be noticed.

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