Efficient Low Power Intelligent Health Care Monitoring System using IOT

Revu Smile, N. M. Ramalingeswara Rao

Abstract*: The present paper presents wellbeing checking framework for patients. In every one of the cases existences of individual behind the patient in current days are hard to screen, even in the medicinal services focus it might have the shot of possibility to happen uneven things in basic conditions. Keeping in mind the end goal to evade this issue this frame work will fare the well and effectively exchange data of patient to relatives, as well even the patient was not in the premises of healing facility. Data of the patient can be sent to relatives and alarms them by sending message. By utilizing this framework we can get GPS information of the patient, thereof we can rapidly get involves in basic circumstances. We can locate the patient fall discovery by the status of patient and can have an eye without being there with persistent. The major factor that play important role in wearables is power consumption, the least power drowning model has been developed in this system. And the controller runs Real Time Operating System (RTOS) to execute tasks almost at the same time. The cloud service used here is the amazon IoT, and there is a chance to analyze the data with machine learning models to predict the future abnormal situations.

Index Terms*: : *Accelerometer, ECG signal acquisition, Fall detection, GPS, GSM-GPRS, IoT, Machine learning, Power modes, RTOS .

I. INTRODUCTION

Medicinal issues of mankind are been extending ordinarily in current days due to different reasons. In every point of view proximity of individual behind the patient couldn't be conceivable. As of present human administrations centers are having a brief time of staff as of this conditions it was very difficult to screen relentlessly in order to time, thereby this clever therapeutic administrations system used to screen the patient without the closeness of the person. Thereby it decreases the cost of helpful and work cost.

Remembering the ultimate objective to get understanding physiological banner using the beat sensor, it contains surface mounted gadgets. There the picked up beat banner will be sent and set away in the controller unit. In this manner in order to know the region of the patient we use GPS following, which contains GPS radio wire and GPS burden up to track the region of the patient, information of region will be given as extent of scope and longitude alongside course, time, number of satellites used to get the zone and range from the sea level. GPS information will be given by utilizing satellite data. So as to stay away from transmission mistake, it sends The checksum. The GPS information sends to the controller unit.

Fall acknowledgment of patient can know by the estimation of speed over ground which can be taken from yield estimations of GPS. As speed over ground regard changes, it exhibits the falling of the patient occurs. Be that as it may, estimations of speed over the ground are not in the careful edge so as to stay away from that and to get a speed over the ground a motivating force by using an accelerometer. It fills in as bearings heading of x, y. As of modifies in course of x-heading, the regard will changes to positive to negative or negative to positive. Same will happen to y-bearing too. Change in regard gives the fall acknowledgment of the patient. It will similarly send and puts in the controller unit. The picked up information must be sent to human administrations center and to a required relative in fundamental conditions remembering the ultimate objective to report that using a GSM unit. By using AT directions persevering information is been transmitted to required individuals. As of login by username and secret phrase into the server, we went into the spot of which assigned for the task to be finished. Data found the opportunity to be kept in server some alliance gives server supreme living course of action to use. It gives username and mystery word to login in the record. Consequently, information gets to microcontroller burden up gets invigorated from time to time. It sends information to the server by time to time. Transmission oversight may be possible for this circumstance there remembering the true objective to decide it gives a token system. By token system, we can without quite a bit of a stretch notice goof of transmission. As of informational index in the server, we can in like manner watch the patient information by login into the record.

II. SYSTEM ARCHITECTURE

A. ECG Acquisition

With a specific end goal to screen the medical problems first and fore most thing is to recognize the ECG flag of the patient now and again by utilizing beat sensor. It comprises of heartbeat sensor board which comprises of surface mounted devices like capacitors, resister, amplifiers, ADC. Which can works at 3.3-5v.Has 24 inch shading coded link with standard male headers. Header part gives light beams which needs to goes into body achieves blood rate there gives the impression of beams from it produces ECG esteem. Sensor must be kept either at finger or at ear. We utilize ear cut for ear cartilage heart rate estimation. Generally in the event that we need to quantify at finger

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Revu Smile, Electronics and Communication Engineering , Godavari inst. Of Engineering and Technology, Rajahmundry, India.

N.M.Ramalingeswara Rao, Electronics and Communication Engineering , Godavari inst. Of Engineering and Technology, Rajahmundry, India.

part utilize straight forward sticker to shield sensor. There ECG flag has taken from male headers by associating it into required ports of controller unit. In request to watch flag we gets into the arduino programming there we watch the signal. From flag we can without much of a stretch screen the patient heart rates from any place we.

B. Global positioning system

GPS is using to find the patient zone, which has a GPS board and accepting the wire. Board will contain surface mounted gadgets which can work under two voltage conditions as 3.3 and 12v. Exchanging of voltages should be conceivable by adjustment of catch in the board. It is a low power usage equipment normal at 22mv. It has +11ns high precision time beats. It gives the yield as show headers which are yield of national marine contraptions association(NMEA) like GGA, GSA, GSV, RMC. In which we go for GPGGA header which gives the information of required like time, scope and longitude esteems, various satellites used to get the information, range from sea level, checksum. Information given by GPS will be taken from satellites which include GPS radio wire works under repeat of 1575.42MH under the voltage of 3-5v. Beginning force has given to the board by keeping the receiving wire at one spot where the inception of satellites to tomahawks the area is been begun. So as to tomahawks radio wire by satellites will take some time. It comprises of max 232 ic which offers parallel to sequential data. GPS is been related with microcontroller burden up to get tranquil area, the required affiliation been made and seen the yield of GPS burden up.

C. Accelerometer

The essential worry in the system is to the recognizable proof of falling event of the patient, it ought to be particularly exact in the fundamental condition in this manner it prompts to make a move with no time. It works with the guideline of alter in course. Starting it sets the directional estimations of patient been considered in x, y-tomahawks. On the off chance that changes happened in both of the headings the estimations of changes to positive to negative or As of characteristics changes, it gives the falling event of the patient. Another strategy for recognizing fall event which won't be careful from estimations of GPS esteem, it gives the course of action of information where speed over ground regard will be there as the estimation of speed over ground changes it prompts falling event of the patient. It just gives an estimation of abrupt changes it won't work in all cases. So as to get the advantage of changing using the accelerometer. Its information similarly sent and saved with a microcontroller board.

D. *GSM/GPRS*

As of data there at microcontroller board, in anomalous conditions, it offers insinuation to required family individual and besides cautions, social protection concentrates also by using GSM board. It consequently hints as esteem surpasses to the sets esteem. Along these lines, a brief move can be made placed in weird conditions. In solicitation to send information to the server using GPRS, it sends from Arduino board to server made, by this data can share without including the outsider along these lines the security of data can be kept up.

E. Microcontroller Board

Microcontroller Board is based on ATmega 328 which operates at 5v.It consists of digital and analog GPIO pin. which has flash memory of 32KB.By using this memory outputs of different level taken as input. Set the predefined value for heart rate, GPS, accelerometer under abnormal conditions sms alerts will be send through GSM. And data will be posted to the amazon IoT server through GPRS.

F. Amazon IoT

Web of things is blasting in each aspects, it is particularly basic to be exists in healthcare. Which reduces human endeavours in various technologies. Required data is put away at microcontroller unit. Information to be keep in server all together access, it expects place to access in server. Some associations give paid server to access in which required information is been placed. As information is been put into server by program which takes required data into server there we can without much of a stretch access. Information taken from microcontroller load up is changes from time to time. AWS IoT gives secure, bi-directional correspondence between Internet-associated gadgets, for example, sensors, actuators, inserted small scale controllers, or keen apparatuses and the AWS Cloud. This empowers you to gather telemetry information from different gadgets and store and investigate the information. You can likewise make applications that empower your clients to control these gadgets from their telephones or tablets.

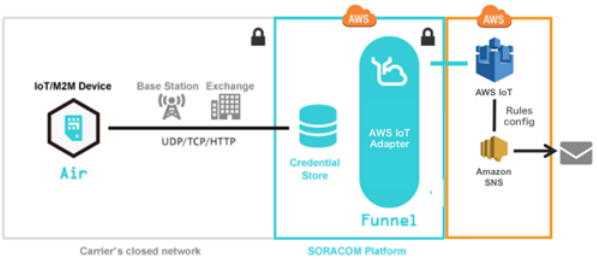

Fig 1: AWS Flow

III. HEALTHCARE MONITORING IMPLEMENTATION

A. ECG signal monitoring

To watch ECG flag male header of heartbeat sensor kept in required port of microcontroller there it perceives

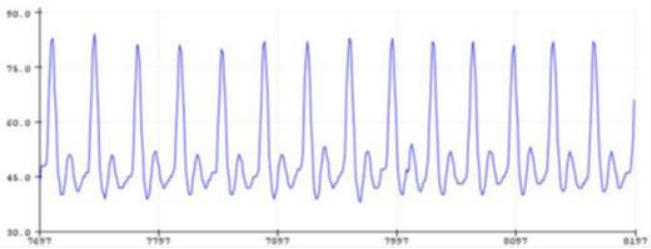

Fig 2: ECG Signal from Pulse sensor

Required signals. From the flag effectively understand by the normal individual esteems been made by composing program. From flag esteems we perceive irregular conditions effortlessly and can make a move in basic situations. Or we discover flag scope of hustling and dropping conditions. In request to get precise flag we need to cover beat sensor to stay away from escape of light rays. After going from ADC it gets exact signal. Male headers ought to be deliberately associated with get correct flag.

B. GPS

Parameters has to considered is global positioning system fix data GPGGA. Information required will be in GGA in those unnecessary information also be there, so there by writing program the required data only can be accessed from GGA. Other parameters RMC and GSA are not required in this system. Here the information got has undesirable term along with required information, required data has be taken which is beneath picture. Shows scope and longitude estimation of the patient, by these qualities we can discover area of patient.

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$GPRMC,074316.000,A,1658.8604,N,08213.4282,E,0.21,17.94,040617,,,A*51
$GPVTG,17.94,T,,M,0.21,N,0.39,K,A*0F
$GPGGA,074317.000,1658.8602,N,08213.4282,E,1,9,0.91,-20.8,M,-71.4,M,,*61
$GPGLL,1658.8602,N,08213.4282,E,074317.000,A,A*5D
$GPGSA,A,3,19,17,28,11,07,06,01,13,30,,,,1.25,0.91,0.85*04
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$GPGSV,3,2,12,07,37,144,31,06,36,192,36,01,25,046,31,13,23,281,17*7F
$GPGSV,3,3,12,11,12,041,25,03,07,102,,09,02,164,,193,,,*7F
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$GPGSV,3,3,12,11,12,041,25,03,07,102,,09,02,164,,193,,,*7F
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Fig 3: NMEA Data from GPS

C. Accelerometer

Estimations of headings will be appeared in the yield of accelerometer, as alters in the course prompts fall of patient. If bearing of qualities changes then GSM will sends SMS alarms to required individual.

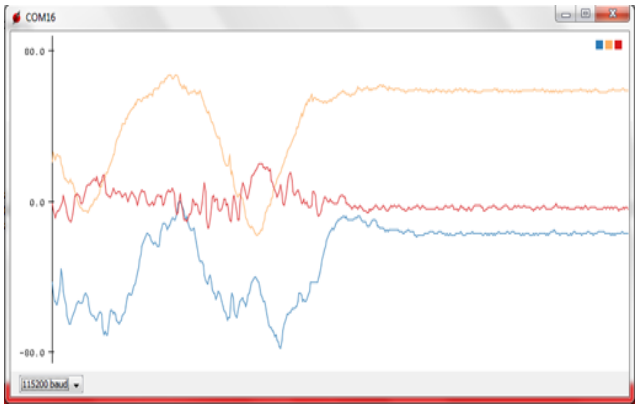


Fig 4: Accelerometer graphs

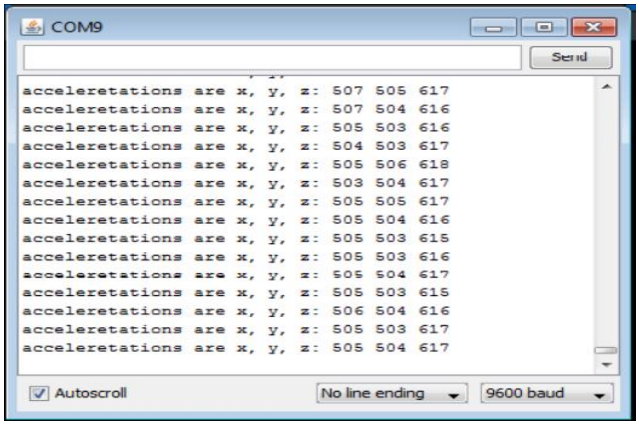
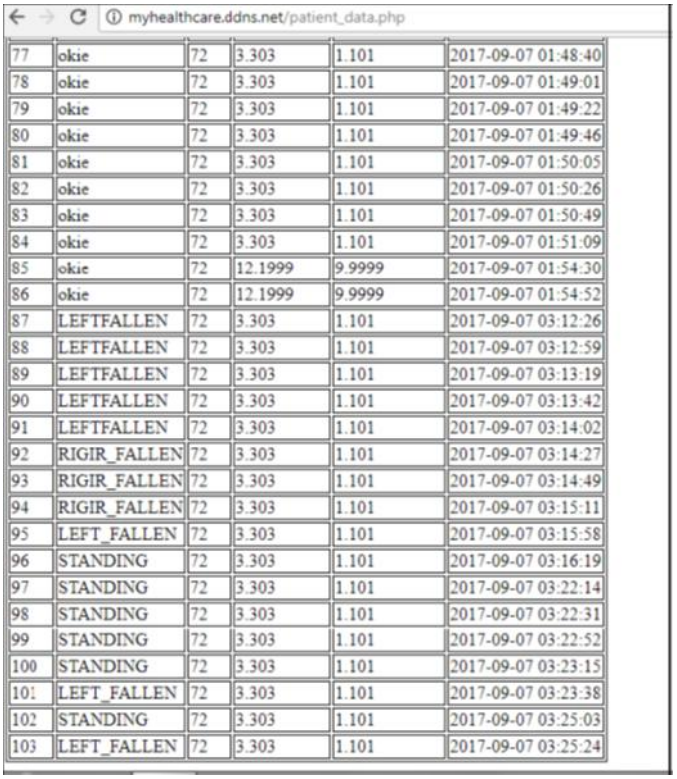


Fig 5: Accelerometer values

D. GSM/GPRS

In strange conditions changes in the qualities in flag of ECG, accelerometer than its begins sending alarms to the number. Required information of the patient is been placed in the server of amazon by utilizing GPRS, so we can without much of a stretch access the patient data by login in to server.



77	okie	72	3.303	1.101	2017-09-07 01:48:40
78	okie	72	3.303	1.101	2017-09-07 01:49:01
79	okie	72	3.303	1.101	2017-09-07 01:49:22
80	okie	72	3.303	1.101	2017-09-07 01:49:46
81	okie	72	3.303	1.101	2017-09-07 01:50:05
82	okie	72	3.303	1.101	2017-09-07 01:50:26
83	okie	72	3.303	1.101	2017-09-07 01:50:49
84	okie	72	3.303	1.101	2017-09-07 01:51:09
85	okie	72	12.1999	9.9999	2017-09-07 01:54:30
86	okie	72	12.1999	9.9999	2017-09-07 01:54:52
87	LEFTFALLEN	72	3.303	1.101	2017-09-07 03:12:26
88	LEFTFALLEN	72	3.303	1.101	2017-09-07 03:12:59
89	LEFTFALLEN	72	3.303	1.101	2017-09-07 03:13:19
90	LEFTFALLEN	72	3.303	1.101	2017-09-07 03:13:42
91	LEFTFALLEN	72	3.303	1.101	2017-09-07 03:14:02
92	RIGIR_FALLEN	72	3.303	1.101	2017-09-07 03:14:27
93	RIGIR_FALLEN	72	3.303	1.101	2017-09-07 03:14:49
94	RIGIR_FALLEN	72	3.303	1.101	2017-09-07 03:15:11
95	LEFT_FALLEN	72	3.303	1.101	2017-09-07 03:15:58
96	STANDING	72	3.303	1.101	2017-09-07 03:16:19
97	STANDING	72	3.303	1.101	2017-09-07 03:22:14
98	STANDING	72	3.303	1.101	2017-09-07 03:22:31
99	STANDING	72	3.303	1.101	2017-09-07 03:22:52
100	STANDING	72	3.303	1.101	2017-09-07 03:23:15
101	LEFT_FALLEN	72	3.303	1.101	2017-09-07 03:23:38
102	STANDING	72	3.303	1.101	2017-09-07 03:25:03
103	LEFT_FALLEN	72	3.303	1.101	2017-09-07 03:25:24

Fig 6: Person's position saved to server

E. System integration

Introduction of system, getting beginning of heartbeat sensor getting GGA flag and flag from accelerometer received. After accepting heartbeat sensor than ascertain BPM. Condition apply BPM more noteworthy Bh and BPM lower than Bl than sends parcels there sends SMS to required person. If condition not appropriate at that point likewise sends packet. After receiving GGA signal, calculates scope and longitude estimation of the patient than sends bundles and SMS. After accepting sign from accelerometer it computes directional readings of x, y, z there sends bundles as of nonstop to the stream graph sends SMS.

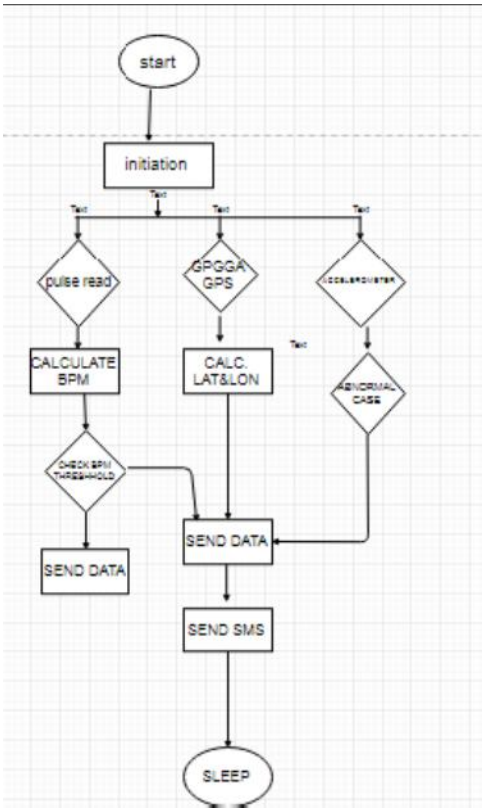


Fig 7: system working flow

F. Monitoring Emergency Conditions and Status

- Accelerometer status: normal, ECG: normal, then patient status: NORMAL.
- Accelerometer: normal to abnormal, ECG: normal then patient status: lying NORMAL.
- Accelerometer: abnormal to normal, ECG: normal then patient status: standing NORMAL.
- Accelerometer: abnormal, ECG: abnormal, then patient status: falling down RESCUE.

IV. POWER MODES

Following are some power consumption details
Microcontroller power calculations:

- Current drawn in power down sleep mode:25 micro amperes.
- In normal mode: 20-30mA.
- GSM draws less than 2mA in sleep mode and up to 7mA in idle mode at 4v.
- GPS draws 45mA in idle mode and less than 5mA in sleep mode.
- And other sensors all together draws around 5mA

Total power consumption is around 60mW.

V. RTOS

A part of the operating system called the scheduler is responsible for deciding which program to run when, and provides the illusion of simultaneous execution by rapidly switching between each program.

The type of an operating system is defined by how the scheduler decides which program to run when. For example, the scheduler used in a multi user operating system (such as Unix) will ensure each user gets a fair amount of the processing time. As another example, the scheduler in a desk top operating system (such as Windows) will try and ensure the computer remains responsive to its user.

The scheduler in a Real Time Operating System (RTOS) is designed to provide a predictable (normally described as deterministic) execution pattern. This is particularly of interest to embedded systems as embedded systems often have real time requirements. A real time requirements is one that specifies that the embedded system must respond to a certain event within a strictly defined time (the deadline).

FreeRTOS:

FreeRTOS is a class of RTOS that is designed to be small enough to run on a microcontroller - although its use is not limited to microcontroller applications.

Here in this system microcontroller ATmega328p runs FreeRTOS.

VI. CONCLUSION

By utilizing this sort of frameworks in social insurance will cause simplicity of observing senior person, by this framework we effortlessly handle strange conditions too. No need of essence of individual with patient. By utilizing raspberry pi and machine learning of amazon IoT will be taken the paper to next level, which can predict the future abnormal conditions of the person by the previous data analysis. Data set in server can be access from anywhere. This sort of framework must be received progressively for simplicity of getting to tolerant data, to effortlessly maintain a strategic distance from irregular conditions..

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AUTHORS PROFILE

Revu smile : Currently doing Master of technology in Electronics and communication department in GIET college rajamahendravaram. Completed B.Tech in B.V.C college of engineering, rajamahendravaram. Did a project embedded systems titled as "Implementation of voice based authentication system".

N.M.Ramalingeswara Rao : Asst**.** prof in GIET college of engineering in ECE department with 7 years experience. Completed masters in GIET in 2012. Published 5 papers. And guiding students on their academic projects.