SENSOR BASED MULTI-ALERT SYSTEM FOR HUMAN SAFETY

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Abstract: In this work, we present one application that is useful to all people who need help during any medical emergency or safety purpose. The application developed is practical and feasible and needs real-time, fast, and reliable data processing. Our system will specially help those people who are suffering from heart problems and also addresses problems related to women safety. Health Monitoring System offers a lot of benefits to lives of people especially for those who have chronic disease and need daily observation. The damage caused because of failure in seeking medical attention at right time is much more severe and it cannot be compensated. Our system defines a sensor based application which will aid people whenever needed. This application is practical and feasible for smart phones. Our system will help those people who face sudden heart problems and also deal with women/child security issues. Women safety is a major issue in this merciless world. Security measures need to be taken in order to help women in need. This one application will be able to seek help for the users in different circumstances.

Index Terms **– Heart rate sensor, sound sensor, touch pressure sensor, wearable device.**

I. INTRODUCTION

This system is completely based on sensors. It is micro-Environment sensing system built for Android application in which we have used a number of sensors i.e. Touch Pressure, heartbeat sensor, GPS etc. We used these sensors and developed an android application. We are living in 21st century which is the century of technology and innovations. Smartphone is one of the examples of innovation made in this century. Today Smartphones are having wide ranges of sensing computation and storage resources. We used sensors and developed an android application. The concept of micro-environment sensing is built on both context sensing and context-awareness applications, yet differs in its emphasis on perceiving immediate surroundings from the Smartphones perspective. In mobile systems, context-awareness is a computing technology that incorporates information about the current environment of a mobile user to provide more relevant services to the user. It is a key component of ubiquitous or pervasive computing and has attracted many research efforts in the past decade. Most context-aware applications (via mobile phone sensing) are human-centric, recognizing contexts from user's perspective (e.g., indoor/outdoor, at home/in office, driving/walking.) Such information supports services according to user's situation.

II. RELATED WORK

A. Existing Work:

There are existing systems that monitor heart rate of users but they are very bulky and also not cost efficient. These systems are used only for pulse monitoring purpose. Also, there are many applications for women safety but they are only single functionality based applications. So, a user if wants to make use of multiple functionalities, he/she has to install or use different applications for different purposes in his/her system which causes inconvenience to them.

Disadvantages of Existing System

1. No system for alerting people about irregular heart rate of user.
2. Delay caused in aiding medical and security help to users.
3. Existing systems are bulky and costly.
4. Different applications for different functionalities causing inconvenience to users.

B. Proposed Work:

In proposed system, we are providing a multi-alert platform which is based on different sensors like heart rate sensor, sound sensor and touch-pressure sensor. Today, most of the people are using smartphones and thus we are making use of smartphone sensors like sound and touch-pressure which makes our system more cost effective.

In this system, we are providing single platform which supports multiple functionalities. User has to just install one application and can take the benefits of alerting people in different circumstances. This system supports heart monitoring which will alert people when there heart record crosses the minimum or maximum threshold value. It sends messages with

GPS location of the user so that immediate help is provided by people and hospitals. Also, this system contributes in helping women in dangerous situations. When a women encompasses some threat then she can press the power button of her smartphone multiple times and an emergency alert message is sent to the registered people and nearby police station.

Advantages of Proposed System

1. Sends alert messages with GPS so there is no delay in providing help to the users.
2. Provides alerts in different situations using single application.
3. Cost effective.
4. User friendly.

III. PROBLEM STATEMENT

To develop a sensor based mobile application which will help and alert people regarding uncertain heart problems and will also contribute in women safety.

IV. Relevant Mathematics with the Project

3.1 Algorithm 1:

The K-nearest-neighbour (KNN) algorithm measures the distance between a query scenario and a set of scenarios in the data set. Suppose we have a data set of 6 Service Request scenarios, each containing 6 features and one result as displayed.

Service Request	Point2		Point1		Point2 falling within 20 meters distance	Same Service Request Already Raised	Attach SR to existing SR
	Longitude2	Latitude2	Longitude1	Latitude1			
SR1	X2	Y2	X1	Y1	No	No	No
SR2	X3	Y3	X4	Y4	No	No	No
SR3	X2	Y2	X1	Y1	Yes	Yes	Yes
SR4	X5	Y5	X6	Y6	No	No	No
SR5	X3	Y3	X4	Y4	Yes	Yes	Yes
SR6	X2	Y2	X1	Y1	Yes	Yes	Yes

Table 3.1: Service Request and a corresponding result

Distances:
We can compute the distance between two scenarios using some distance function, where are scenarios composed of features. Euclidean distance measuring

$$d_E(x,y) = \sum_{i=1}^{N} \sqrt{x_i{}^2 - y_i{}^2}$$

Algorithm for Distance functions:
As stated previously, we are only considering absolute (Equation 1) and Euclidean (Equation 2) distance functions.
1. User raised Service Request
2. Get confirmation on SR number
3. Capture Longitude and Latitude from the SR.
4. Compare the distance from point represented by Longitude and Latitude of new SR with all other open SR in Garbage or Road network Queue using Euclidean distance measuring formula.
5. Check the distance from new SR point to respective open SR points falling within 20mtrs
6. If within 20 metres then attach the SR to the existing open SR falling within 20mtrs
7. If not within 20 meters then it will be a new SR in queue.
In above formula i- is the SR number open in queue.

Xi is the Longitude of ith SR and Yi is the Latitude of ith SR.
X is the Longitude of New SR and Y is the Latitude of New SR.
N is the number of open SR.

3.2 Algorithm 2:

Algorithm for Distance functions (Haversign algorithm): As stated previously, we are only considering absolute (Equation 1) and Euclidean (Equation 2) distance functions. 1. User raised Service Request 2. Get confirmation on SR number 3. Capture Longitude and Latitude from the SR. 4. Compare the distance from point represented by Longitude and Latitude of new SR with all other open SR in Garbage or Road network Queue using Euclidean distance measuring formula. 5. Check the distance from new SR point to respective open SR points falling within 20mtrs 6. If within 20 metres then attach the SR to the existing open SR falling within 20mtrs 7. If not within 20 meters then it will be a new SR in queue. In above formula i- is the SR number open in queue. Xi is the Longitude of ith SR and Yi is the Latitude of ith SR. X is the Longitude of New SR and Y is the Latitude of New SR. N is the number of open SR.

V. System Architecture

We have proposed a system for specially heartbeat patients. In our system we have developed an application which will check heartbeat and send notification to nearest places or people who use this application. Heartbeat sensor data is used to detect pulse rate and also use one algorithm for finding nearest people. This algorithm is the KNN algorithm. Also, we have developed a touch press system which will send notification to nearest people. When the user feels unsafe or in danger then user can immediately inform to preregister mobile number via SMS. User just need to press screen for few seconds.

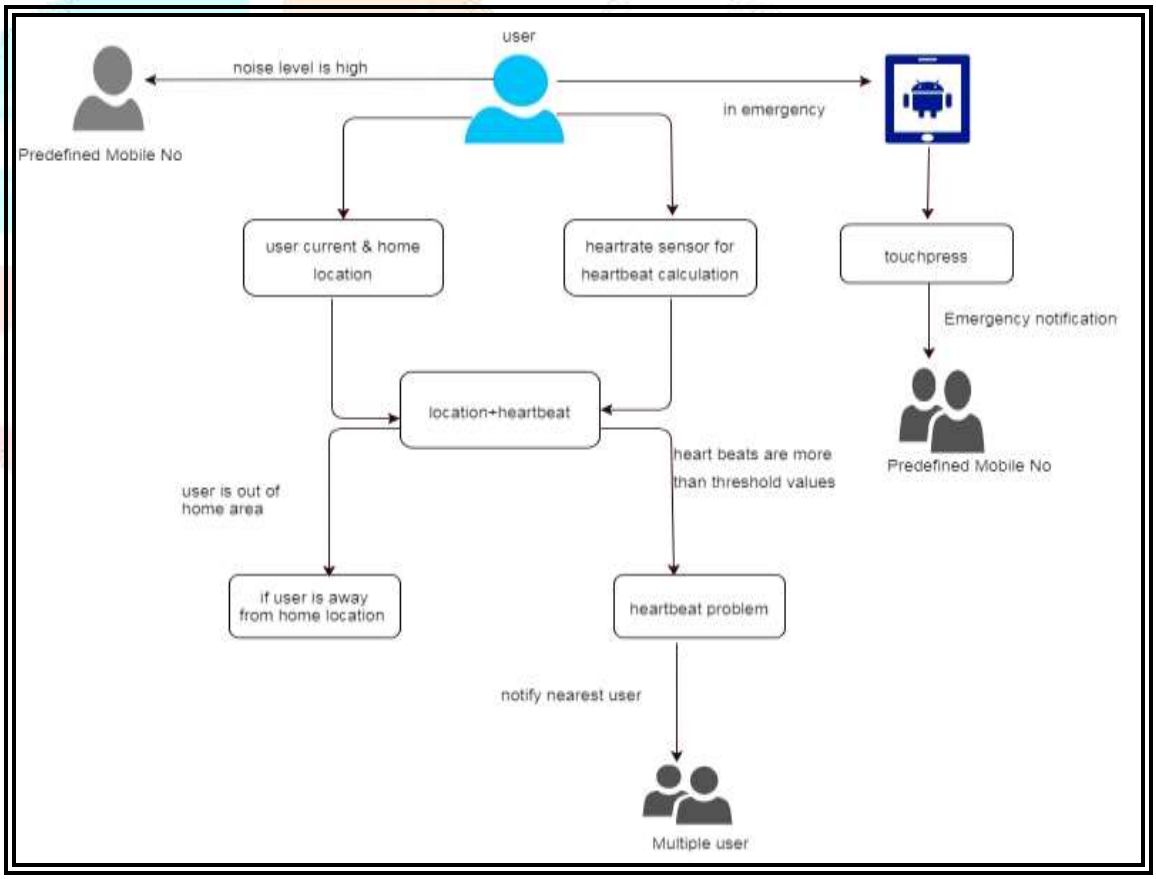


Fig: System Architecture

VI. Evaluation

Initially user needs to register to this system. After registration, his/her data will be stored in database and accordingly his/her location will be recorded through GPS. Based on this data, the evaluation is done in the following ways:

- **Heart Monitoring Rate System**
  Once user completes the registration process, system continuously monitors his/her pulse using heart rate sensor. According to the threshold specified, if the pulse recorded goes beyond the max threshold or below the min threshold

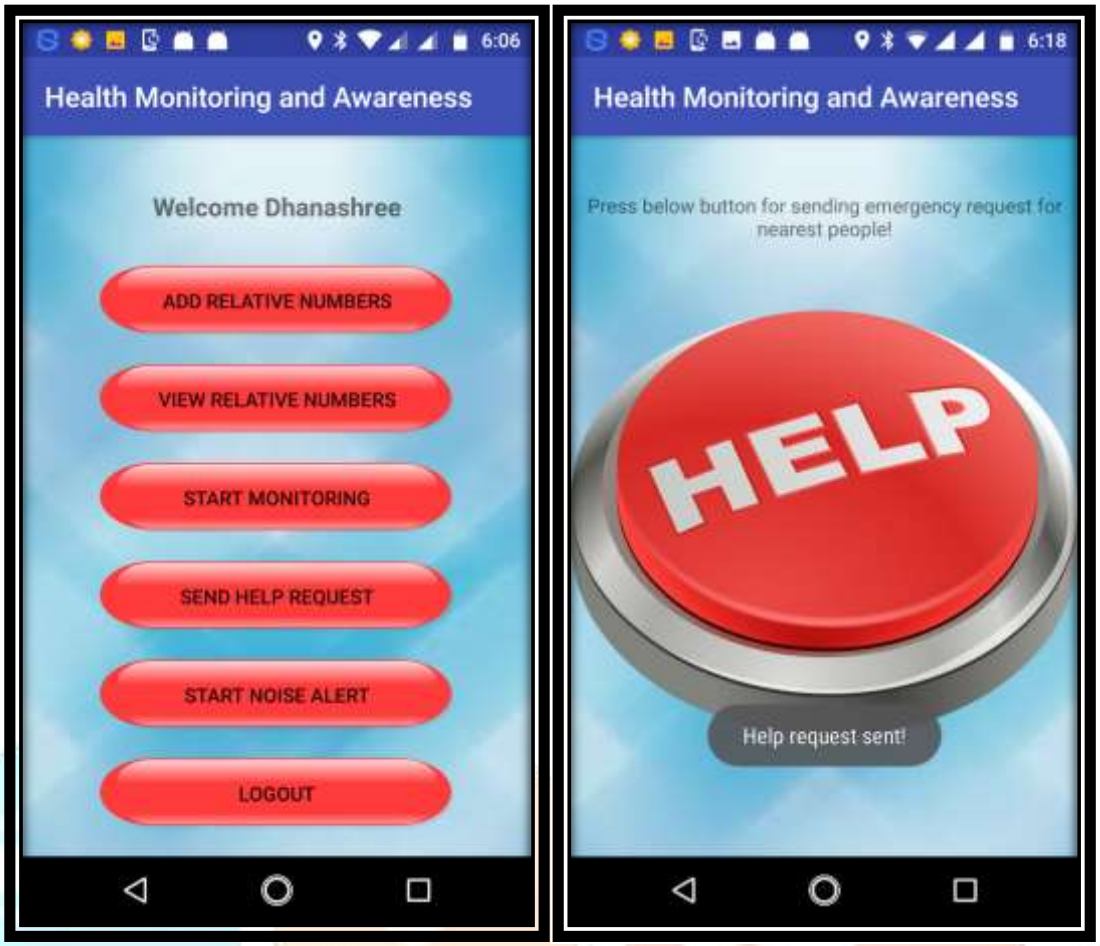
then alert system gets activated and alert messages are sent to the people whose information is provided by the user during registration and also, the nearby hospitals are informed using KNN and haversign algorithm.

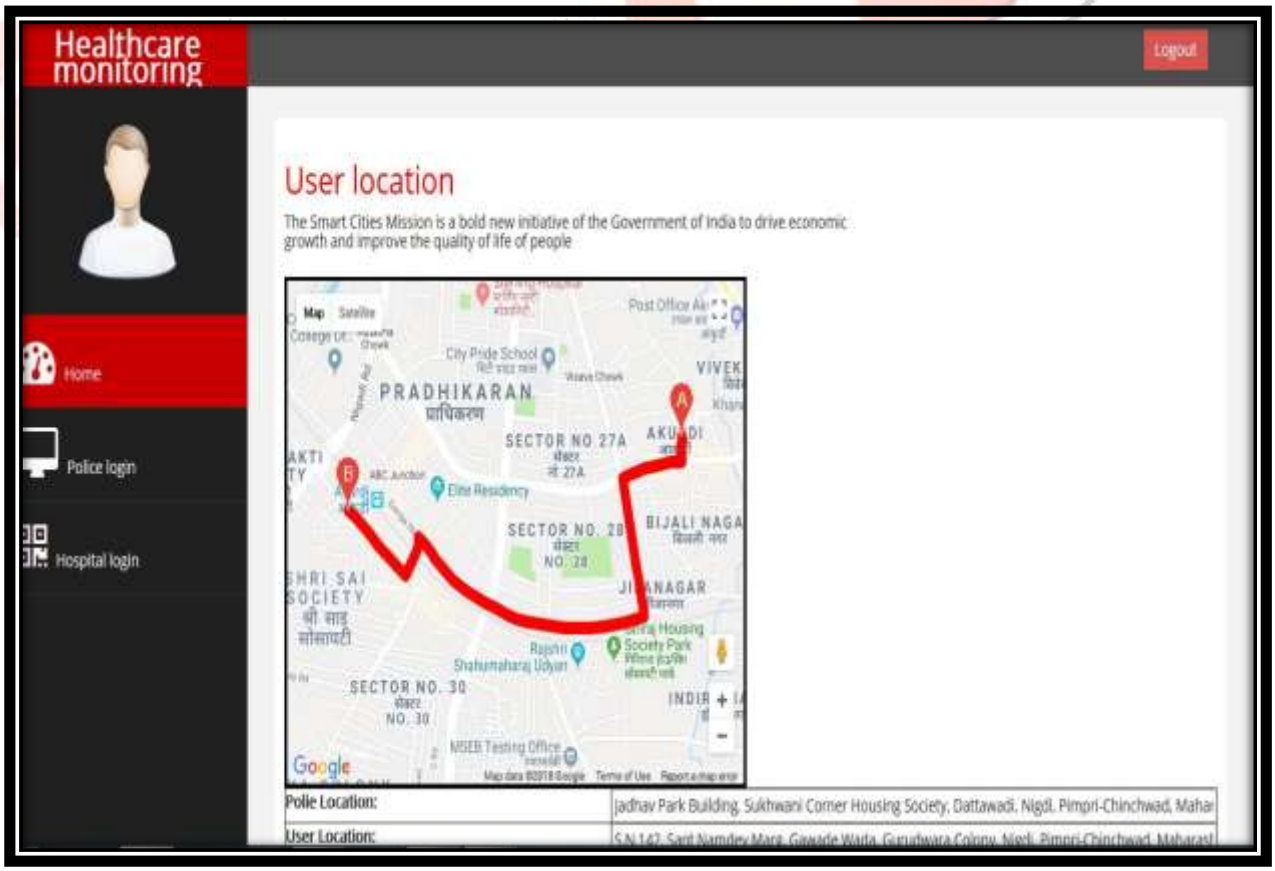
Fig: Heart Monitor System

- **Women Safety**
  To ensure security of women, touch pressure sensor and sound sensor of the smartphone has been used. By continuously pressing the power button of smartphone, alert system gets activated and thus, women can seek immediate help. When power button is pressed for two to three times, alert messages are sent to the people specified by user while registration and to the nearby police stations.
  Similarly, the sound sensor of smartphone keeps on recording the intensity of the sound(noise) and when it detects a sound whose intensity crosses the pre-defined threshold, alert system gets activated and notifies registered people and nearby police stations.

Fig: Noise Detection and Touch press

- **Result:**
  In this paper we have proposed a multi-alert system for heart monitoring and women safety issues. The goal of our experiment is to monitor heart rate and to prevent the delay caused in aiding people for heart related problems. This system also ensures the security and safety of women in danger.


6:06
Health Monitoring and Awareness
Welcome Dhanashree
ADD RELATIVE NUMBERS
VIEW RELATIVE NUMBERS
START MONITORING
SEND HELP REQUEST
START NOISE ALERT
LOGOUT
6:18
Health Monitoring and Awareness
Press below button for sending emergency request for nearest people!
HELP
Help request sent!


Healthcare monitoring
Logout
User location
The Smart Cities Mission is a bold new initiative of the Government of India to drive economic growth and improve the quality of life of people
Home
Police login
Hospital login
PRADHIKARAN
SECTOR NO 27A
SECTOR NO. 28
SECTOR NO. 30
BIJALI NAGA
Elite Residency
Google
Polie Location:
Jadhav Park Building, Sukhwani Corner Housing Society, Dattawadi, Nigdi, Pimpri-Chinchwad, Mahar
User Location:

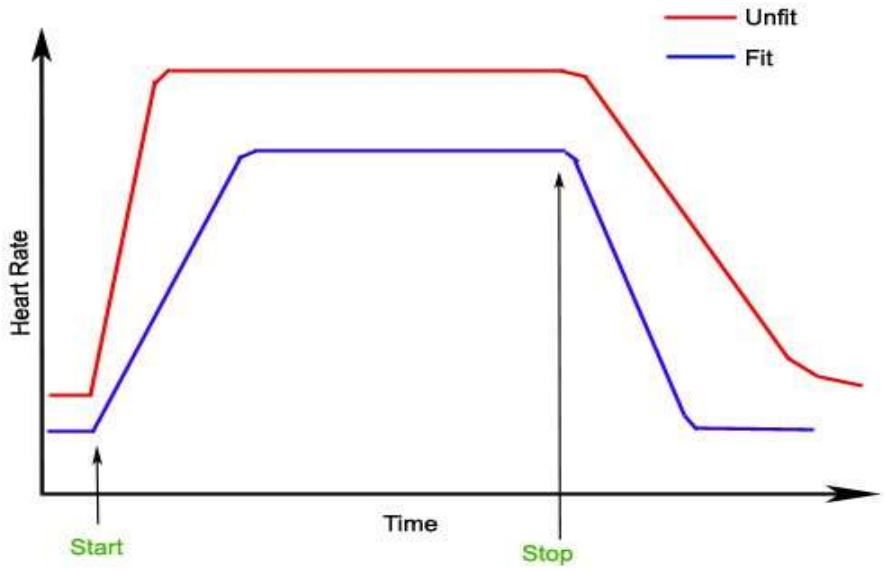


Fig: Graph of Heart Monitoring

VII. CONCLUSION

Our project aimed to build a sensor based multi-alert system for human safety. We present the design, implementation and evaluation based on android, practical platform for micro-environment sensing using smart phones via collaboration among built-in sensors. The platform automatically collects sensor inputs and providing fine-grained environment information to upper layer applications. Using that information, we provide multi-alerts for people suffering from heart related problems and for women encountering dangerous situations. In short, our application is characterized as a safety app, providing medical aid and creating awareness in society through use of smart phones. In future, we will be adding many more circumstances to this system, in which user may need help. Thus, this single system will be able to help users in different situations.

REFERENCES

[1] Accurate Heart Rate Monitoring During Physical Exercises Using PPG Andriy Temko, Senior Member, IEEE

[2] T. Bajarin, Z. Zhang, Z. Pi, B. Liu, TROIKA: A General Framework for Heart Rate Monitoring Us-ing Wrist-Type Photoplethysmographic Signals During Intensive Physical Exercise," IEEE Trans Biomed Eng, v. 62, pp. 522- 531, 2015.

[3] R. Schroeder, Aram V. Chobanian, MD George L. Bakris, MD Henry R. Black, MD William C. Cushman, MD Lee A. Green, MD, MPH Joseph L. Izzo, Jr, MD Daniel W. Jones, MD Barry J. Materson, MD, MBA Suzanne Oparil, MD Jackson T. Wright, Jr, MD, PhD Edward J. Roccella, PhD, MPH, "The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure" (2003)

[4] Z. Zhang," Photoplethysmography-Based Heart Rate Monitoring in Physical Activities via Joint Sparse Spectrum Reconstruction", IEEE Trans Biomed Eng, v.62, pp. 1902-1910, 2015

[5] M. Ram, K. V. Madhav, E. H. Krishna, N. R. Komalla, and K.A. Reddy, "A novel approach for motion artifact reduction in PPG signals" based on AS-LMS adaptive lter, IEEE Trans Instrum Meas, v. 61, pp. 1445 1457, 2012.

[6] Premkumar, CibiChakkaravarthi, Keerthana, Ravivarma, Sharmila,"ONE TOUCH ALARM SYSTEM FOR WOMENS SAFETY USING GSM", International Journal of Science, Technology and Management Volume No 04, Special Issue No.01, March 2015

[7] IMS Institute for Healthcare Informatics, Patient options expand as mobile healthcare apps address wellness and chronic disease treatment needs, 2015

[8] Apple, Your heart rate. What it means, and where on Apple Watch you'll find it. https://support.apple.com/en-us/HT204666 (Accessed 22 February 2017)

[9] Ben Lovejoy, How accurate is the Apple Watch heart-rate monitor 2015

[10] Jonathan G. Howlett, Acute coronary syndromes. (Accessed 21February 2017)