T.C.
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Project name:

"ESTIMATION OF RESPIRATORY RATE FROM PHOTOPLETHYSMOGRAM DATA USING TIME-FREQUENCY SPECTRAL ESTIMATION"

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CONTENTS:

1. Research

a- Introduction

The human respiratory system is a series of organs responsible for taking in oxygen and expelling carbon dioxide. Respiratory rate refers to the breaths taken per minute. It is important for many clinical uses including detecting sleep apnea, sudden infant death syndrome, and chronic obstructive pulmonary disease, and measurements of respiratory rate are indicated in many intensive care and operative settings [1]. Continuous and non-invasive monitoring of respiratory rate could be very beneficial in improving the safety of patient.

In humans, the average rate of breathing is dependent upon age. Newborns up to 6 weeks take 30 to 60 breaths per minute, while the average resting respiratory rate for adults is 12 to 20 breaths per minute. Physical exertion also has an impact on respiratory rate and healthy adults can average 45 breaths per minute during strenuous exercise.[2]

b- Motivation

The aim of this project is to develop a mobile-based system estimating breaths that a person take per minute. A similar approach described in [3] will be used. The mobile phone will be placed on the person's upper chest lying at on the ground for recording acceleration changes using the built-in accelerometer of mobile device. Due to the movements of chest wall, each rise and fall will be counted as one cycle of respiration. The system will first filter the acceleration data and then analyze the patterns between the motion profile and breathing.

The another aim of this project is to develop an automated respiratory rate monitor that is economical, easy to use, easy to find, easy to update accurate and widely accessible.

This project will result in the development of an economical and easy reach method to enhance the medically ubiquitous accurate respiratory rate monitor and alarm system. The product developed by this project will answer that call and result in the improvement of patient monitoring and evaluation, which should lead to a decrease in medical errors and in morbidity and mortality.

c- Related Work

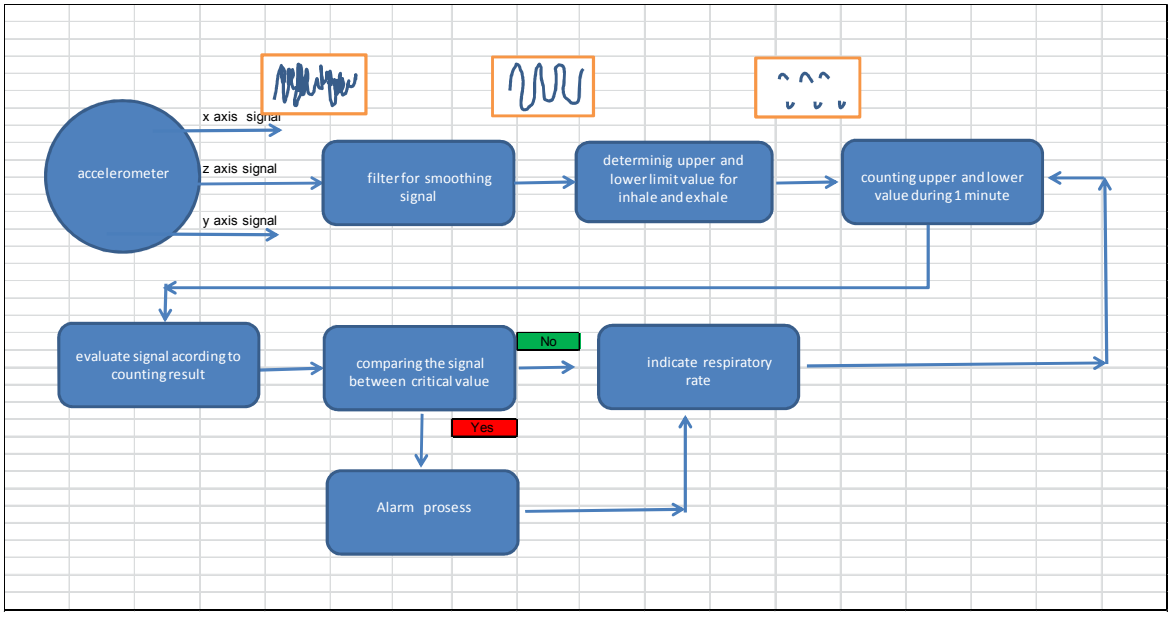
There are several tecnique to measure the respiratory rate estimation. Using such as infrared sensors, doopler signal, accelerometer, ultra sound sensors, biosensors, sound and vibration sensors are used for respiratory estimation device. Most of them dependent different kind of device and some other procedures which is cause waste of time. They also expensive to buy and too big to carry. For these reason estimating respiratory rate on mobile phone is both logical and cheap and it can customize easily.

New generation mobile phones accelerometers are reliable enough to contribute into the project. Mobility and easy usage fetaures are very important for the patients who has trouble with respiratory system.

d- Methodology

Phone which has accolerometer can produce error signal acording to x,y,z axis. We will use z axis signal. Z axis signal is produced when the phone moving to gravity direction. This signal can not use directly without filtering. There are some filtering calculation formulas. Guasian filter seems to be efficient for smoothing the signal which is coming from the accelerometer. After smoothing signal limits are determined according to patients age. Peaks are determined and counted in one minute. After this,value is evaluated and compared between critical value. If it is critical value first step alarm process will run after indicates the respiratory rate per minute on secreen.

e- Block Diagram



2.Proposal Report Outlıne:

f- Expected Result:

After the project, respiratory rate result coming from the mobile phone can compare medical device which is design respiratory rate monitoring. We will understand smooting filter and determinating peaks upper and lower side correct or incorrect. If there is a incorrect result we will check all filter and signal processing calculation and algorithm.

g- Timetable (Gantt Chart):

S/N	TASK	ASSINGMENT TO	DUR	%	Weeks														
					1st	2nd	3 rd	4 th	5 th	6 th	7 th	8 th	9 th	10 th	11 th	12 th	13 th	14 th	15 th
1	Requirment Analysis	İ.L.DURAN A.TOPATAN H.ÖZCAN	29	100	x	x	x	x	x										
2	preperig proposal	İ.L.DURAN A.TOPATAN H.ÖZCAN	20	90			X	X	X										
3	Reading medical artical about respiratory system	İ.L.DURAN A.TOPATAN H.ÖZCAN	35	80		X	X	X	X	X	X								
4	taking algorthms	İ.L.DURAN A.TOPATAN H.ÖZCAN							X	X									
5	Resource signal filters and calculations	İ.L.DURAN A.TOPATAN H.ÖZCAN							X	X	X	X							
6	Design	İ.L.DURAN A.TOPATAN H.ÖZCAN										X	X	X	X				
7	Implementation	İ.L.DURAN A.TOPATAN H.ÖZCAN												X	X	X	X		
8	Testing & Maintanance	İ.L.DURAN A.TOPATAN H.ÖZCAN															X	X	X
9																			

h-Referance:

[1] K. H. Chon, S. Dash, “Estimation of Respiratory Rate From Photoplethysmogram Data Using Time-Frequency Spectral Estimation”, IEEE Transactions on Biomedical Engineering, vol. 56, no. 8, pp. 2054-2063, 2009.

[2]Respiratory System: Facts, Function and Diseases
Kim Ann Zimmermann, LiveScience ContributorDate: 22 August 2012 Time: 05:40 PM ET

[3] V. Chandrasekaran, \Measuring Vital Signs Using Smart Phones", Master's Thesis, Univeristy
Of North Texas, December 2010.