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Respiration Monitoring System

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Abstract: To monitor stress condition of a person by measuring Respiration rate and to display the data in a LCD. Using this we evaluate ten bio medical parameters. We have a tendency to developing "An Innovative Approach to enhance the operating potency of Programmers in IT Industries by measure stress level". The Respiration rate sensing element developed mistreatment. Biotronics is employed to live Respiration rate of constant person, is employed as alternative input file for stress monitor. This input sent to Microcontroller "Arduino" measure stress. This program to calculate stress is calculated at the front end and the data displayed in Data Base for further assessment.

Index Terms: Medical sensor, capaciflector, planar respiration sensor, sensor interfacing.

INTRODUCTION

Non-invasive evaluation of vital signals is a new frontier of patient health monitoring. In particular, for health observation of premature infants (which includes the vital sign, temperature and pressure monitoring) non-invasive nature of the detector device is critically necessary. Apnea, that is one among the foremost chronic disorders conspicuously common in baby infants, is characterized by the partial or complete halt of respiration. Statistics show that almost all of the infants who are under 1000gm in weight with less than 29 weeks of gestational age develop apnea syndrome. To detect apnea, these infants need to go through a sleep study named polysomnography (PSG), which is a cumbersome process that requires numerous wires and electrodes to be placed in their chests and bodies. It also requires a specially trained sleep expert to analyze the acquired respiration data to detect apnea. Since the skin of premature children is exceptionally delicate, the obtrusiveness of the procedure makes it truly uncomfortable for them. In this work we've projected a miniaturized wearable respiration observance device that may be placed within a mask or nasal tubing and therefore eliminates the requirement for attaching electrodes to skin. The front-end of the device may be a PVDF based mostly pyroelectric electrical device. Unlike the PVDF based piezoelectric transducer which has been used in chest belt for pulsatile vibration monitoring due to respiration, pyroelectric transducer based system doesn't need high exactness filters to eliminate the noise and artifacts due to alternative body movements that don't seem to be related to respiration. The planned detector discovers the modification in temperature due to respiration and detect an symptom event if the amplitude of the respiratory signal is lower than the 20% of the regular breathing amplitude for consecutive 10–15 seconds. It consists of a front-end charge amplifier for converting the charge signal produced by the transducer into a voltage signal, a hysteresis comparator (Schmitt trigger) to identify if that voltage signal lies within the threshold limit that indicates apnea or hypoapnea and a time to voltage converter (TVC) and a counter block to detect the time duration of an apneic event.

LITERATURE SURVEY

LITERATURE SURVEY 1:

We propose a simplified structural textile capacitive respiration sensor (TCRS) for respiration observance system. The TCRS is invented with conductive textile and Polyester, and it's an easy bedded design.

LITERATURE SURVEY 2:

Design and development of a piezoelectric polyvinylidene fluoride (PVDF) thin film based mostly nasal device to watch human respiration pattern (RP) from every naris at the same time is given during this paper.

LITERATURE SURVEY 3:

In this work, a textile-based respiratory sensing system is given. Highly versatile polymeric optical fibers (POFs) that react to applied pressure were integrated into a carrier material to make a wearable sensing system. **LITERATURE SURVEY 4:**

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In this work, we tend to show that with off-the-shelf wireless fidelity devices, fine-grained sleep data sort of a person's respiration, sleeping postures and rollovers is with success extracted.

EXISTING METHOD

We first present a physiological background on the major origin of HR and BP fluctuations. Here, a mathematical model of the autonomic-cardiac regulation is conferred, followed by an improvement of mathematical model to clarify autonomic-cardiorespiratory regulation. Through out this section, we've a bent to propose a mathematical illustration for neuro mechanical and mechanical coupling of vas and respiration systems, We conjointly introduce a equation to model RR regulation that primarily originates from the medullary centre within the brain stem, that is influenced by voluntary actions and chemoreflex.

A. Physiological Background:

Heart rate variability (HRV) or time unit fluctuations round the mean time unit are generated by the sympathetic and parasympathetic nervous systems . For healthy people, the HRV spectrum shows 2predominant peaks: one at low frequency around 0.1Hz related to blood pressure biofeedback; the opposite one at higher frequency around 0.25Hz is named RSA. RSA is principally generated through 2 mechanisms: neural-based modulation of viscus cranial nerve activation by the medullary centre, and neuro mechanical-based modulation of viscus cranial nerve activation by lung stretch-receptor reflex.

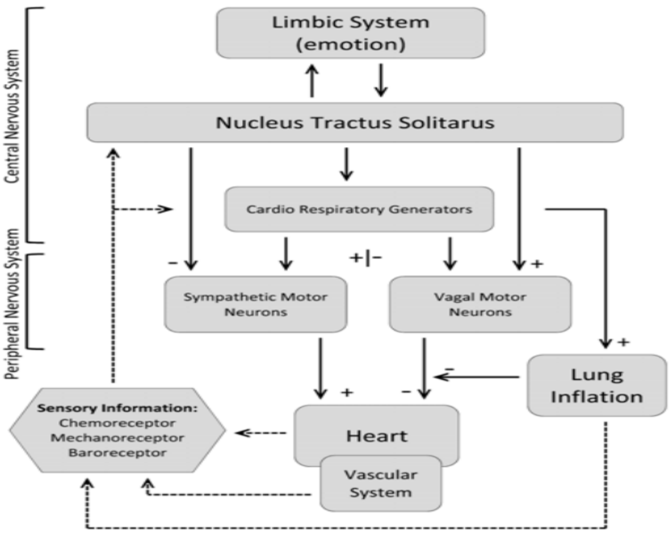

Fig. 0. Schematic diagram of interactions between cardiovascular, respiratory and nervous systems

B. Autonomic -Cardiac Regulation:

we have a tendency to introduce a physiology-based mathematical model of the autonomic cardiac regulation having nonlinear and delayed dynamic interactions, that describe the dynamics of HR and BR regulation

C. Autonomic-Cardio Respiratory:

In this study, we have a tendency to improve our previous mathematical model of autonomic-cardiac regulation by modeling cardio vascular and respiration systems. Further, we have a tendency to introduce a equation representing dynamic of respiration rhythm originated within the medullary respiratory centre.

PROPOSED METHOD:

The pneumotacathograph is a clinical instrument that requires the use of a face mask, which is fitted with a differential pressure sensor to measure the expiratory airflow. Many modern-day instruments also have the ability to measure CO_2, via an infrared sensor. A further clinical device, developed by PMD Solutions is a small, wireless sensor attached to the rib cage. It has a piezoelectric sensors that is used to measure the mechanics of respiration.

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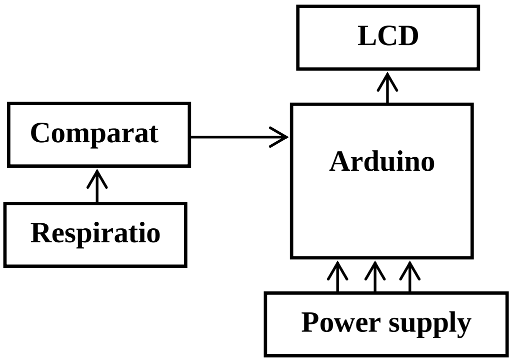
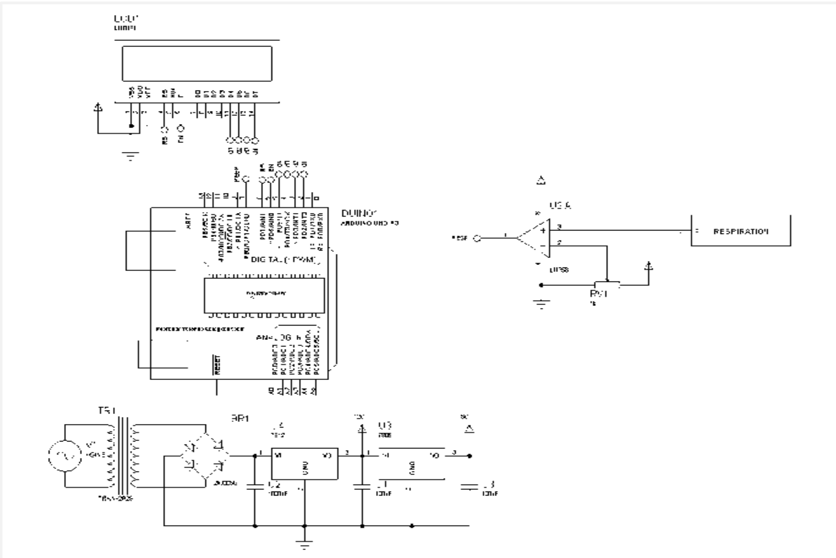
BLOCK DIAGRAM:



CIRCUIT DIAGRAM :



THE CAPACIFLECTOR AS A RESPIRATION SENSOR:

The capaciflector is essentially a modified form of a planar capacitor structure. It has a third electrode between the ground plane and sensor electrode. This is termed the reflector electrode and its purpose is to project the electric flux out of plane in the direction of the object being detected. The structure of the capaciflector is shown in Fig. 1. The sensor and reflector electrodes are driven at the same electric potential. As an object moves towards the capaciflector (or changes its permittivity in some manner) then the result is a change in capacitance, which can be measured. When used as a respiration sensor the device is mounted on the chest, which becomes the 'object' depicted in Fig 1.

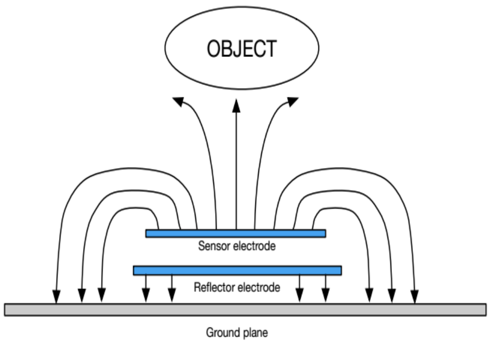


Fig. 1. The structure of a capaciflector depicting the three electrodes and direction of electric flux.

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A. Capaciflector construction

A prototype capaciflector was made using copper foil (100 µm thickness, Rapid Electronics) for the electrode material and paper (100 µm thickness, Niceday 80 gsm, white) as the dielectric layers, which separates the electrodes. An additional paper layer was also used to insulate the sensor electrode from the human body. The choice of materials was quite arbitrary, but copper and paper offer a low-cost and flexible solution for good conductivity and insulation respectively. The multilayered device was mounted within a 3D printed housing, which was printed on an Objet Connex 350. This printer has the capability producing materials with varying degrees of compliance, from flexible through to rigid hence providing a range of mounting options to the chest (conformal or rigid).

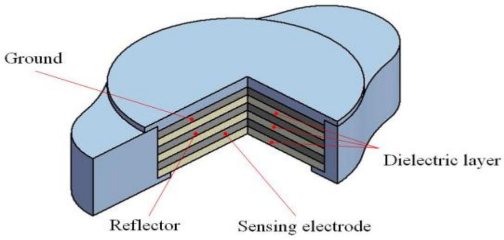

Fig. 2. An exploded view of the capaciflector showing the electrode and dielectric layers, together with the 3D printed housing (not to scale)

B. Capaciflector simulation

The behavior of the capaciflector was simulated using the COMSOL Multiphysics package. The copper electrodes and work insulation layers were modelled in close proximity with an object. The surrounding medium was modelled as being air (relative permittivity 1) and the object was positioned 3 mm away from the sensing electrode. The object is a crude representation of the chest and was modelled as a 3 cm thick cylinder of diameter 15 cm having the same permittivity as water (80 at room temperature).

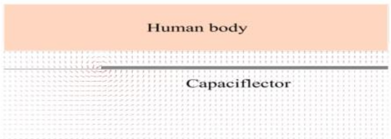

Fig. 4. A simulation of the capaciflector showing the effect of an object on the electrical flux surrounding the device.

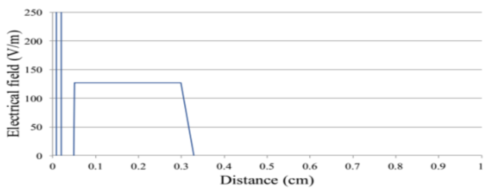

Fig. 5. A plot of electric field strength along the central axis outwards from the capaciflector. (Note that the plot has been truncated to remove the peak between the reflector and ground electrodes.)

Fig. 6 shows the system block diagram used for testing. The chosen single board computer was the low-cost Raspberry Pi 3, which has an inbuilt 802.11n Wireless LAN module. The generated data can therefore be monitored at any remote location with good WiFi reception. The capaciflector was mounted on the chest using double sided medical-grade tape. Owing to the thickness of the packaging, the sensing electrode is at a distance of around 3 mm from the skin.

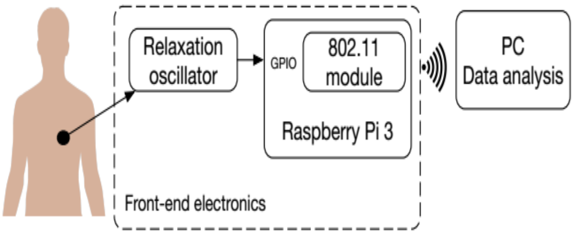

Fig. 6. A system block diagram of the test setup showing the capaciflector mounted on the chest, the front-end electronics and the remote data analysis capability provided by a WiFi connection.

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CONCLUSION

This work has shown that a capaciflector, normally used for proximity measurement, can be used as a respiration sensor by mounting the device on a human torso. The change in capacitance is strongly correlated to the breathing cycle. The device is potentially inexpensive to produce and can be configured as a wireless sensor and interfaced to a remote wireless system, or an app on a smartphone.

REFERENCES

1. S. D. Min, Y. Yun, and H. Shin, "Simplified Structural Textile Respiration Sensor Based on Capacitive Pressure Sensing Method," IEEE Sensors Journal, vol. 14, no. 9, pp. 3245-3251, Sep 2014.
2. G. R. Manjunatha, K. Rajanna, D. R. Mahapatra, M. M. Nayak, U. M. Krishnaswamy, and R. Srinivasa, "Polyvinylidene fluoride film based nasal sensor to monitor human respiration pattern: An initial clinical study," Journal of Clinical Monitoring and Computing, vol. 27, no. 6, pp. 647-657, Dec 2013.
3. M. Krehel, M. Schmid, R. M. Rossi, L. F. Boesel, G. L. Bona, and L. J. Scherer, "An Optical Fibre-Based Sensor for Respiratory Monitoring," Sensors, vol. 14, no. 7, pp. 13088-13101, Jul 2014.
4. X. Liu, J. Cao, S. Tang, and J. Wen, "Wi-Sleep: Contactless sleep monitoring via WiFi signals," in Real-Time Systems Symposium (RTSS), 2014 IEEE, 2014, pp. 346-355: IEEE.
5. Z. Chen et al., "Unobtrusive sleep monitoring using smartphones," in Pervasive Computing Technologies for Healthcare (PervasiveHealth), 2013 7th International Conference on, 2013, pp. 145-152: IEEE.
6. Y. Yamana, S. Tsukamoto, K. Mukai, H. Maki, H. Ogawa, and Y. Yonezawa, "A sensor for monitoring pulse rate, respiration rhythm, and body movement in bed," Conf Proc IEEE Eng Med Biol Soc, vol. 2011, pp. 5323-6, 2011.
7. Beda, D. M. Simpson, N. C. Carvalho, and A. R. S. Carvalho, "Low-frequency heart rate variability is related to the breath-to-breath variability in the respiratory pattern," Psychophysiology, vol. 51, no. 2, pp. 197-205, Feb 2014.
8. K. J. Kim, Y. M. Chang, S. Yoon, and H. J. Kim, "A novel piezoelectric PVDF film-based physiological sensing belt for a complementary respiration and heartbeat monitoring system," Integrated Ferroelectrics, vol. 107, pp. 53-68, 2009.
9. J. Tu, T. Hwang, and J. Lin, "Respiration rate measurement under 1-d body motion using single continuouswave doppler radar vital sign detection system," IEEE Trans. Microw. Theory Techn., vol. 64, no. 6, pp. 1937– 1946, 2016
10. M. Zakrzewski, A. Vehkaoja, A. S. Joutsen, K. T. Palovuori, and J. J. Vanhala, "Noncontact respiration monitoring during sleep with microwave doppler radar," IEEE Sensors J., vol. 15, no. 10, pp. 5683–5693, 2015.

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