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Design and Development of Respiratory Rate Calculators Patients with Breath Disorders

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Abstract: ***The simplest breathing rate measurement technique is done by placing the palm of the hand on the diaphragm or chest where we perform calculations when the lungs are expiratory and inspiring using the stopwatch. Calculation of breaths per minute by using manual methods like this is less effective and still needs to enter data and input it in real time. Therefore, tools will be made using electronic methods that are easier to use, fast and precise to handle patients through breathing rates, the way this tool works is by using an oxygen mask that has been equipped with a condensor mic sensor that is able to catch the breath that will be counted in 60 seconds and displayed on the 2x16 LCD (Liquid Cristal Display) screen.***

Keywords: Respiratory rate

1. Introduction

Respiratory measuring instrument is a technique that is used to determine the amount of breath a person has for one minute. In observing the respiratory rate measuring device is able to monitor the amount of breath and display abnormalities in a patient. In its classification the number of breaths per minute a man can be distinguished into three groups, namely the normal one called eupnea, breathing above the average is called tachypnea, while the below-average breathing is called bradypnea. The technique of observing the amount of breath itself is done by placing a micondensor sensor on the bottom of the oxygen mask that will detect one minute of breath.

Today's medical world has developed a variety of breath taking techniques per minute which is very easy for medical person. Patient monitor is one device that is able to display the amount of breath per minute in real time, where the amount of breath per minute is taken from the ECG signal attached to the chest of a patient. The results of changes in the amount of breath of a patient will appear in the form of sinusoidal waves that illustrate the occurrence of pulling and breathing breath per minute.

Monitoring respiration rate is one of the most important actions in the world of health, because if we know the number of breath abnormalities in a patient from the beginning then a nurse or doctor can provide rapid treatment in these patients. Self monitoring respiration is currently being done manually in a number of middle to lower health installations where a nurse just attaches the palm of the hand to the chest of a patient then a nurse observes the patient's chest gusts and pulls using stopwatch assistance and manual recording. For that we need a tool that can calculate the number of breaths every minute automatically and can display the amount of breath during real time on the LCD display, so that the nurses simply record the breath results every minute.

Observations in the field still use breathing techniques manually. Therefore, a study was conducted to develop monitoring of respiratory rate with an electronic method that is easier to use, fast and precise to handle patients through breathing rate, so the research want to do is to use an oxygen mask that has been equipped with a condensor mic sensor that is able to catch the gust the breath will be counted within 60 seconds and displayed on the LCD (Liquid Cristal Display) 2x16 screen.

2. Research Methods

To answer the research objectives, the research design used was to use pre experimental method with the type of after-study design because the final result of measurement tool compared with the control group.

Research tool is measuring module which turned the LCD screen that calculate the respiratory rate for one minute. This output will be forwarded and conditioned by the FC 04 sound sensor module which has a 1/0 outputan.

3. Result and Discussion

Breathing is a process of taking oxygen (O_2) and removing carbon dioxide (CO_2) along with water vapor. Oxygen is needed by all cells in the body in biochemical reactions to produce energy in the form of ATP (adenosine tri phosphate). The purpose of respiration is actually to form ATP which is needed for the whole body of life activities. The process of the exchange of O_2 and CO_2 gas can be divided into two, namely:

1) External respiration, which is the exchange of O_2 in the alveolus with CO_2 in the blood.
2) Internal respiration, which is the exchange of O_2 gas with CO_2 from the bloodstream with body cells.

Respiratory examination is done by counting the number of breaths in one minute. The examination uses frequencies other than the frequency of examination as well as assessing the depth and rhythm of the technical movements / breathing properties which are aimed at knowing the general condition of the client, knowing the progress of the disease, and helping to establish a diagnosis. Measurement of respiratory levels in humans is carried out during rest or calm and involves estimating the number of breaths a minute, thinking several times the chest moves upwards.

Type of breathing

1) Chyne Stroke is a breathing that occurs gradually and then becomes squeaky and stops altogether (Apnoe) for a few seconds to then become deep again. Examples include drug poisoning, heart disease, lung disease, chronic kidney disease, and bleeding in the central nerve.
2) Biot is deep and shallow breathing that accompanies irregular Apnoe. Examples such as mengingitis
3) Kusmaul is inspiration and expiration breathing at the same length and depth, so that breathing becomes slow and deep. Examples include drug poisoning and alcohol, diabetes and uremia. [1]

Human respiratory organs consist of :

1) The nose is the path of entry of air in the nasal cavity the air will experience filtering and heating
2) Farink is the intersection of the throat with the esophagus
3) Larink has a syringe
4) Trachea is the airway from the nose to the lungs
5) Bronchhus is tracheal branching left and right
6) Bronkhiolus: is a bronchial branching
7) Alveolus where O_2 and CO_2 exchange occurs

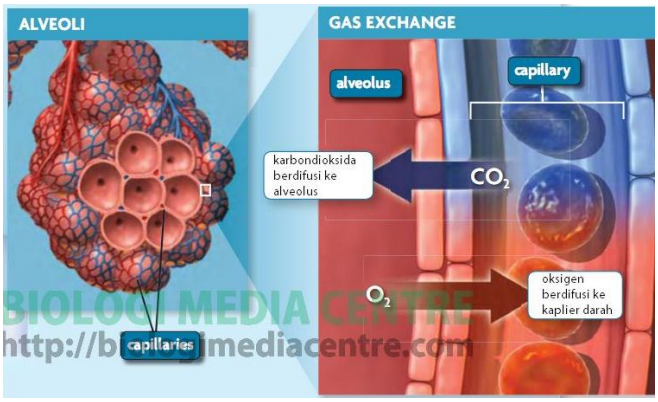

Figure 1: Respiratory organs in humans

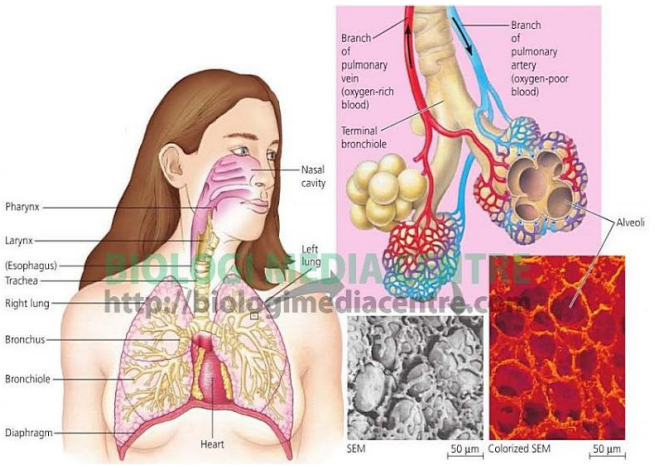

Figure 2: Normal and Abnormal Respiration Rate and Patterns [2]

Respiratory rate

Respiratory rate is a physiological parameter that is very important to monitor the condition of the patient both in health and critical conditions. Respiratory rate serves to provide information about the condition of the respiratory system's performance. Respiratory rate is to calculate the amount of breathing in one minute. The value of respiratory examination is one indicator to determine the function of the respiratory system which consists of maintaining oxygen exchange and carbon dioxide in the lungs and acid-base regulation [3].

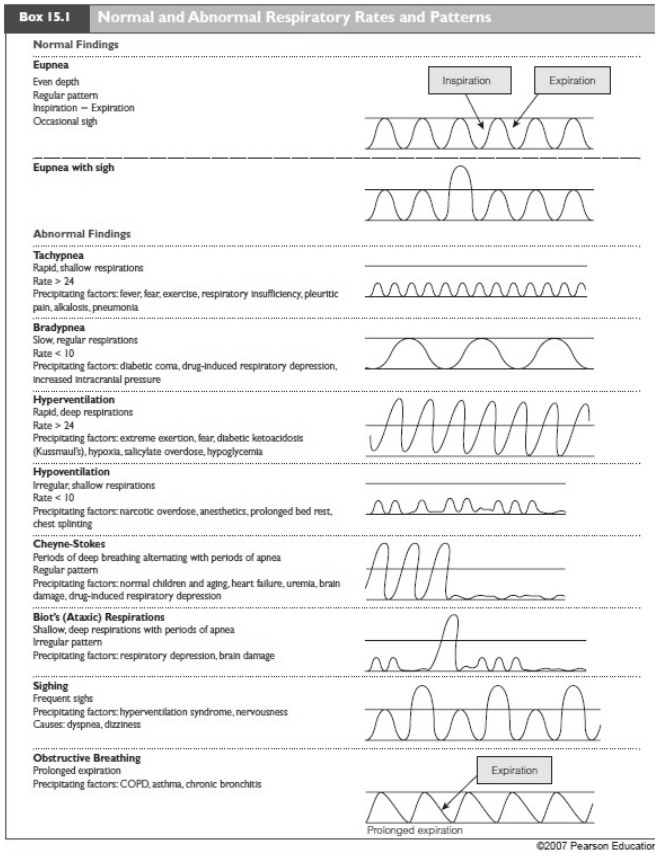

Figure 3: Normal and Abnormal Respiration Rate and Patterns

In the picture above you can see the waveform and respiratory rate of patients in normal and abnormal conditions. From the picture above we can estimate the diagnosis of the patient's condition.

Diagram Block

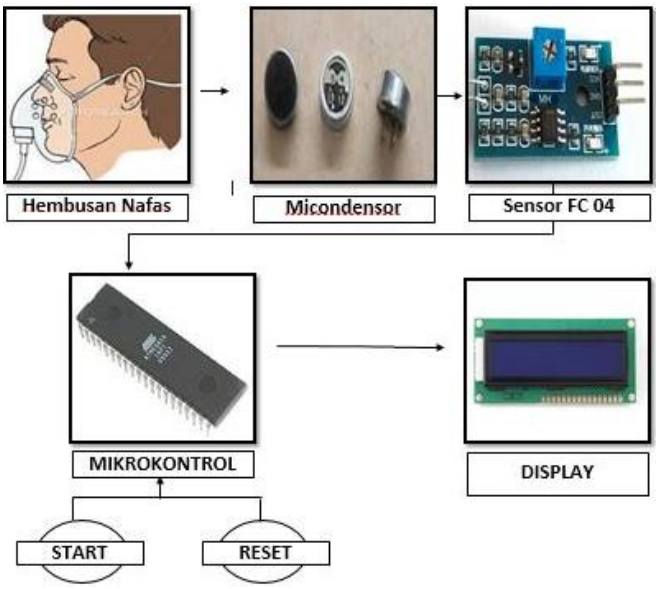

Figure 4: Diagram Block

When the breathing rate measuring module is turned on on the LCD screen, the "press start" command will appear where we can calculate the respiratory rate for one minute. The breath coming out of the patient's nose will be received by the micondensor, the output of the condenser is in the form of AC waves, but has a very small voltage order in units of Mv. This output will be forwarded and conditioned by the FC 04 sound sensor module which has a 1/0 outputan. The output in the form of 1/0 logic will enter the adc port which will be conditioned by the program comparator on the microcontroller so that it can calculate the patient's breath which results will appear on the LCD display.

Works of FC 04 Module

FC 04 Voice Module is a module that is capable of receiving voice input. The voice input is received by the mocondensor which in principle converts sound waves to AC signals. The AC air conditioner will be strengthened again by the 393 op-amp on the sound module. The FC 04 module can be set the sensitivity level through multitoned. The output of the sound sensor is 1/0.

Minimum System Series

In making a minimum module, the system uses atmega 16 microcontroller IC, and the 12MHz crystal is used. At the minimum the system made the FC 04 sound sensor that outputs a digital output in the form of 1/0 in the ADC port.7. Here is how to do the system setup / testing:

1. Measure the incoming voltage at 10 feet (vcc) and 11 (ground). 5 VDC
2. For the parameter respiration rate, enter the adc.0 port
3. Give a response in the form of a blow to the micondensor, and see the LED indicator on the FC 04 sensor will light up
4. The LCD display itself has 16 feet where the first leg is Gnd, the second foot is connected with VCC of 5 Volts, feet, RS feet (register select) is an LCD foot that serves to provide logic 1 and 0 as data registers connected at the foot of Portc 5, foot R / W (read or write mode) that is able to determine the read or write mode of DB0 - DB7, that is, by giving a low logic for read and high for writem that enters Portc 4, db 5 and db 8 includes Portc 1.2, and 3 which has the task of sending communication lines from the microcontroller to the 2 x 16 LCD, while the Led + and Led legs - function for the color of the LED that lights up on the LCD [4]
5. To adjust the brignest on the LCD can rotate the multitone located on the side of the LCD
6. The "START" button is connected to portd.4, while the "RESSET" button is connected to portd. Which can be tested for functions when the program is filled in atmega 16 microcontroller IC [5]

4. Conclusion

Based on the results of module creation can be summarized as follows:

1) The breathing rate measuring module is turned on on the LCD screen.
2) Breathing rate received by the micondensor, the output of the condenser is in the form of AC waves.
3) Output will be forwarded and conditioned by the FC 04 sound sensor module which has a 1/0 outputan.
4) The output in the form of 1/0 logic will enter the adc port which will be conditioned by the program comparator on the microcontroller so that it can calculate the patient's breath which results will appear on the LCD display.

References

[1] Destina, Mega. 2014. *Pemeriksaan Respiration Rate*. http://megadestina.blogspot.co.id/2014/03/pemeriksaan-frekuensi-pernafasan.html (Accesed January 27th, 2016)
[2] Education Inc, Persion. 2007. *Normal and Abnormal Respiratory Rates and Patterns*
[3] Karthik Mohan Rao, B.G. Sudarshan. 2015. A Review On Different Technical Specifications Of Respiratory Rate Monitors. *International Journal of Research in Engineering and Technology*, RV College Of Engineering, Bengaluru, India. eISSN: 2319-1163 | pISSN: 2321-7308.
[4] Maulana. 2010. pinout LCD 2x 16 (Data pin LCD dengan konfigurasi). http://maulamu.blogspot.co.id/2013/04/pinout-lcd-2x16-data-pin-lcd-dengan.html (Accesed January 28th, 2016)
[5] Winoto, Ardi. 2006. *Belajar Mikrokontroler Atmel AVR At mega 16 Step By Step*. Yogyakarta : Gava Media