

COMMUNICATION APPROACH THROUGH HANDHELD DEVICES FOR DISABLED PATIENT BASED ON BIOMETRIC

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ABSTRACT

Patients with several physical disabilities have communication difficulties. These issues are cared through 'nurse call button' has been widely used by patients at health care centers to alert a nurse or a doctor whenever they need a help. But it simply produces a beep sound at the specific station the responder has to visit the patient's room to identify their intention. Thus, in this project, alternative communication is proposed utilizing widely available handheld devices such as smart phones, tablets. As a result, complex sentences or instructions can be delivered to the intended respondent via Biometric command; patient can provide their biometric whenever they need help can specify it through this. Even in emergency condition, MEMS can measures the position of patient starts calculating heart rate and respiration rate and indicate that patient is in critical condition pass message to nurse station and doctor via GSM with that details. In addition, the device can also be reprogrammed according to the user preference needs. By this, improved life of disabled can be saved.

Keywords: Nurse Call button, biometric, MEMS, Arduino, GSM, rehabilitation.

I. INTRODUCTION

Communication with a person with speech and physical disability can be challenging. Several multiple physical injuries might also hinder a person's ability to speak, write and unable to change their position. While he or she remain conscious, they would have trouble to request something they need or convey their intention. Thus, Biometric with their inbuilt commands is becomes one of the simplest but yet effective means of communication for a patient with fair or good cognitive level. The commands can be given as per the patient needs and programmed in it. Based on the needs of the patient they provide their

biometric kept on their bed or nearby. The commands can be sent to the microcontroller in which it can convey what is the need of the patient can be texted to the caretaker using gadgets. In this, GSM plays a major role for transmitting and receiving the comments. Medicine remainder can help to improve health of the patient by remaining their tablets at right time to the attenders.

In addition, plenty of efforts have also seen given to provide a proper tool for disabled patient to communicate with their non-disabled counterpart. Most of them are based on wearable instruments such as gloves that sense the movement and generate specific interpretation out of it. Morse code can also be used for this area to solve critics. Using Morse code to fulfill the need of a patient is nearly a vast method go on. Initially, patient has to know Morse code with dots, dashes how they have to give an impulse correctly for dashes and dots. It may be complicated for a patient. Such efforts were quite expensive for a disabled person.

In this paper, the development of a device that can relay information through existing handheld devices such as smartphones is discussed. Utilizing the biometric, the following section will also explain in detail how such system can be implemented at minimum cost as well as its performance and functionality.

II. HARDWARE COMPONENTS

a. MEMS SENSOR:

Micro-electromechanical system (MEMS) is a process technology used to create tiny integrated device or system that combined mechanical and electrical components. They are fabricated using integrated circuit (IC) bath processing techniques and can range in size from control and actuate on the micro scale, and generate effect on the macro scale. MEMS consist of mechanical microstructure,

micro sensors, micro actuators and microelectronics, all integrated on to the same silicon chip. Micro sensors detect changes in the system's environment by measuring mechanical, thermal, magnetic, chemical or electromagnetic information or phenomena. Microelectronics process this information and signal the micro actuators to react and create some form of changes to the environment.

b. HEART BEAT SENSOR:

The principle behind the working of the heart beat sensor is photo plethysmograph. According to this principle, the changes in the volume of blood are measured by the changes in the intensity of the light passing through that organ. Usually, the light source in a heartbeat sensor would be an IR LED and the detector would be any photo detector like a photo diode, an LDR (Light Dependent Resistor) or a phototransistor.

c. RESPIRATORY SENSOR:

The respiratory sensor is used to monitor abdominal or thoracic breathing in biofeedback application such as stress management and relaxation training. The sensor is usually placed in the abdominal area, with the central part of the sensor just above the navel. The sensor should be placed tight enough to prevent loss of tension.

d. ARDUINO MEGA 2560:

The Arduino mega 2560 is a microcontroller board based on the AT mega 2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

e. GSM MODEM:

Global System for Mobile Communication (GSM) is an open and digital cellular technology used for transmitting mobile voice and data services which operates at 850 MHz, 900 MHz, 1800 MHz, and 1900 MHz frequency bands. A GSM modem requires a SIM card to be operated over a network range subscribed by the network operator. It can be connected to a computer through serial, USB or Bluetooth connection.

f. BUZZER:

A buzzer is a mechanical, electromechanical, electroacoustic or piezoelectric audio signaling device. A piezoelectric buzzer can be driven by an oscillating electronic circuit or other audio signaling source.

III. METHODOLOGY

This method is used to reduce the disadvantages of the existing method i.e. hand gloves for disabled patient to communicate with attendant. The existing method has various disadvantages such as high complexity, high cost, occurrence of error, communication for short distance. In order to overcome the problems in the existing method this new method of communication approach between patient and attendant through biometric method. This work provides an easy way of communication between patient and the caretaker. This device consists of Arduino board, GSM, buzzer, MEMS sensor, fingerprint sensor, heart rate sensor and respiration rate sensor. In this project, Arduino mega 2560 is used to connect with the sensor. It has 74 pins through which the external sensor is connected. It will provide the instruction to the sensors in order to calculate the biological parameter such as heart rate and respiration rate.

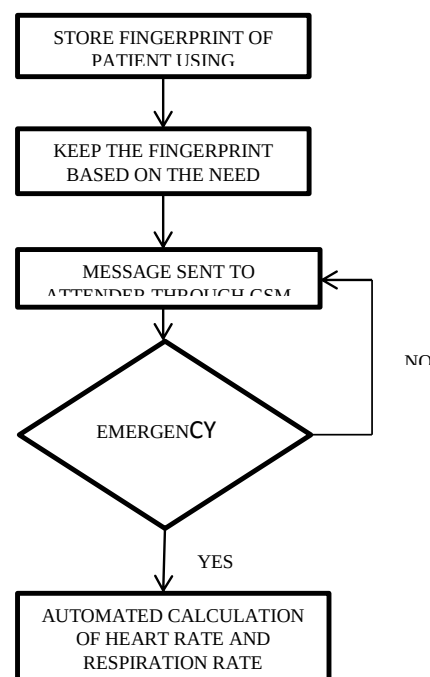
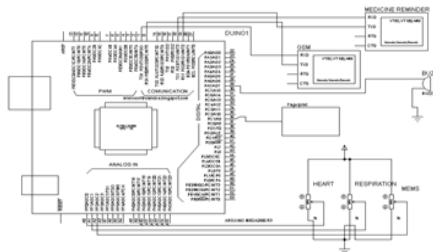
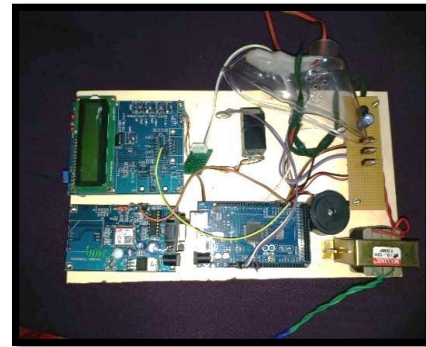


Figure 1 Flowchart**IV. WORKING**

Each fingerprint of the patient programed for each basic need of patient such as food, water, excretion, switching on/off fan, medicine. Based on the requirement patient keep their fingerprint in the biometric sensor and the message of the need are sent to the caretaker or attender through GSM. Due to which attender can easily understand the need of the patient and do the need of the patient immediately, which will reduce the time for finding the need of the disable patient. In case of any emergency or abnormal condition of patient, the patient could not able to keep their fingerprint in the sensor. During such condition with the help of the MEMS sensor detect the abnormality and automatically calculate the heart rate and respiration rate of patient during abnormal condition. This message of abnormal condition of patient, and parameter measurements are sent to caretaker through GSM. And also has medicine reminder, which gives the details of medicine and its timing to be given to patient are sent as message to the caretaker through GSM for every 5minutes.

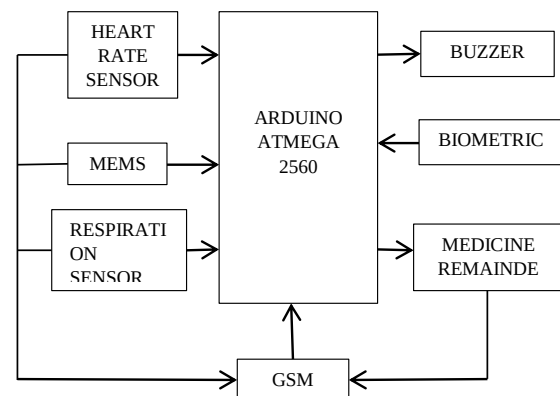
**Figure 2: Circuit design of the system**

This device is connected with the bed of the patient which helps the patient to easily access to it. This device will provide less complexity when compared with the existing device. It produce less error and easily available to patient with low cost. And to use this device patient doesn't need any knowledge of method to use the device since this device operates by just keeping the fingerprint in the biometric sensor and the device do the need to the patient. This device is not only used for the disabled patient but it is also used for the post-surgery patient after major operation.

**Figure 3 Hardware composition**

The fingerprint of the patient are taken and stored through biometric sensor. Fingerprint sensor consist of two main steps i.e. getting fingerprint of patient and conforming the fingerprint. In order to take the biometric of the patient, first the fingerprint is enrolled in the device which means the fingerprints are kept on the sensor. Then the fingerprint features are gathered and are stored which is done through getting the fingerprint. After the finger is taken away from sensor it is indicated as delete of fingerprint.

In order to conform the fingerprint, again the fingerprint is enrolled, get, and delete. After completing the two steps of the fingerprint sensor patient can use the device normally by just keeping the finger on sensor to communicate with the caretaker that helps to fulfill their need.

**Figure 4 Block Diagram****V. OUTPUT**

With the implemented system, patient can provide their biometric based on his/her need it can generate SMS to the caretaker mobile phone which

was that need. Additionally, medicine reminders can which indicate drugs to care taker.

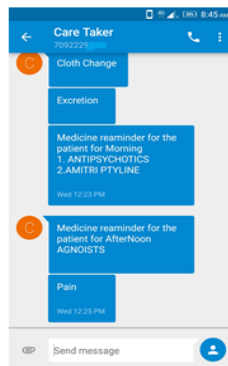


Figure 5 Message delivered

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