MEASUREMENT OF GASTRIC MOTILITY BY USING INFRARED LIGHT FOR THE ASSESSMENT AND CLASSIFICATION OF CHRONIC STRESS

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Abstract—**This study is regarding the assessment of chronic stress by finding the gastric motility with the assistance of infrared rays. Measure of stress will be notice by numerous strategies like ele ctrogastrography and echogram. However these aren't appropriate for home use. In order that the most issue is to develop a non-invasive and compact measure system of gastric motility by infrared. This method consists of IR LEDs as supply and avalanche photodiode (APD) as detector. APD receives that transmission from IR LEDs and reflective on the stomach wall. AI is that the projected technique of classifying humans stress as a result of it's supported existing information. This thesis use NN for classifying the stress by the comparison of results with these computer science techniques.**

Keywords: Artificial intelligence, Avalanche photodiode, chronic stress, Gastric motility, Infrared rays

I. INTRODUCTION

Stress could be a natural physical and mental reaction to life experiences. Everybody expresses stress from time to time. For immediate, short things, stress will be useful to your health. However if your stress response doesn't stop firing, and these stress-level keep magnified way longer than is critical for survival it will cause severe health problems. Chronic stress will cause a spread of symptoms and have an effect on your overall well-being. For locating this we tend to measure the gastric motility.

A. Gastric Motility

Gastric motility refers to the movement of food from the mouth through the throat, esophagus, stomach and intestine.

Here we tend to area unit finding the motility within the space of pyloric region. The movement of food within the space between the small intestine and small intestine.

B. Case based Reasoning

Case-based reasoning (CBR) is one in all the main elements of the present project. In most literatures case based reasoning is outlined as a problem solving paradigm wherever past experiences guide

problem determination. At the best level of generality, four processes: Retrieve, Reuse, Revise and Retain

C. Neural Network

Artificial neural network (ANN) could be a biologically inspired structure
of process parts referred to as neurons. The network practicality is
decided by the design and also the kind of neurons utilized.

II. RELATED WORK

In this chapter some fascinating comes are going to be shown that area unit addressing stress detection from SC signals. The term SC applies to the phenomena of exosomatic activity of the skin once external voltage is applied. Once measurement SC ,two principals are vital. Skin Conductance level (SCL) which is associated with the specific amount of continuity over time (tonic value) and Skin Conductance Response (SCR) stands for the changes in SC. Studies have shown that SCR could be sensible of stress, anxiety and anger. Another development is that the non specific SCR fluctuations (NS.SCR) occur with no external stimulations. NS.SCR has an equivalent or a really similar form as specific SCR. SCR are often characterized by four parameters: Amplitude (SCR amp), Latency of response onset (SCR lat), Rise time of the response peak (SCR ris.t), and also the half time of the recovery time (SCR rec.tc) as shown in Fig. 1
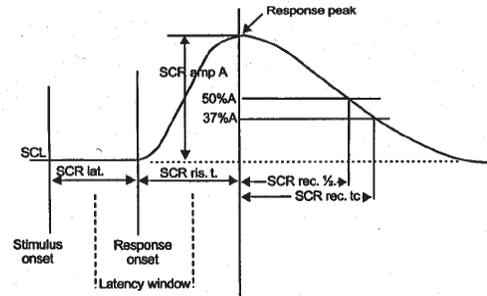

Fig 1. Schematic Skin Conductance Response (SCR) to a hypothetical stimulus

Possible conductor sides area unit the feet and also the palms. once hands used, typically the non- dominant is most well-liked. doable sites on the palm area unit the medial phalanx or the thenar and hypothenar eminences as shown in Fig. 2
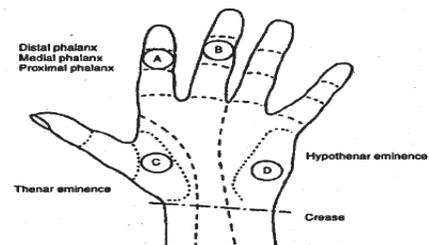

Fig 2. Palmar electrode

For the signal recording the projected manner is by applying constant dc voltage of zero,5V to the 2 electrodes and sixteen bit resolution (or higher) for the ADC conversion. Off line strategies will later be accustomed split the signal into the SCR and SCL values.

Ideally, associate conductor with double sided adhesive collar is needed alongside associate conductor paste associated at an surroundings of 24-26 astronomer and five hundredth humidness. Conjointly movements ought to be avoided. A crucial analysis has been done at that shows the signal behavior once the device isn't tight enough, or once some disturbance occur, if the topic is doing exercise or once device isn't properly connected see Fig. 3
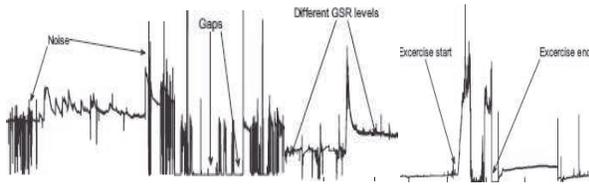
Fig 3**.** Change of signal due to factors other than stress

For gathering the signals the topic was having the device connected as a clock watch. It's obvious that sensors embodied in car's steering or maybe on the mechanical device can manufacture signals troublesome to decipher. Doable resolution for this, is sweet preprocessing and also the use of a second or additional external stress device signals to participate to the systems output. Finally the SCR form in information, as shown in figure 1, pushed researchers to use the corresponding detection technique.

III. EXPERIMENT

A. *Problem Formulation and Analysis*

In a fashionable society, mental stress is inevitable major problem and mental care become necessary. From now of several studies are dedicated to the quantitative observance of mental stress. The mental stress influences the gastric motility. The aim of this study is to develop a mensuration system of human gastric motility for quantification of mental stress and to classify them with the assistance of neural network. A mental stress mensuration system ought to be used simply in lifestyle. However, general measurements systems as CT, supersonic echogram and medical instrument aren't appropriate for home use. We've developed a non invasive and compact gastric motility mensuration system victimization near infrared light rays. Near infrared particularly wavelength of 700~1200nm incorporates a feature of comparatively low scattering and coefficient to skin and internal organs.

Therefore, it simply transmits into deep internals. Additionally, NIR makes mensuration system comparatively compact . Hence, we have a tendency to used NIR during this study. Traditional contracted activity of human abdomen happens at concerning 3c/m. Particularly once ingestion, this contracted activity will increase and additionally its amplitude will increase. This activity continues for 3 to 5 hours. Gastric motility is believed to be simply detected. Here we have a tendency to area unit aiming to use a ray having 900nm and it transmit for 10μs with 50 Hz.

B. *L293D*

L293D could be a typical motor driver or motor driver IC that permits DC motor to drive on either direction. L293D could be a 16 pin IC which may manage a group of 2 DC motors at the same time in any direction. Dual H- bridge motor driver integrated circuit (IC). It works on the thought of H-bridge. H-bridge could be a circuit that permits the voltage to be flown in either direction. As you recognize voltage got to amendment its direction for having the ability to rotate the motor in right-handed or anticlockwise direction, thus H-bridge IC area unit ideal for driving a DC motor.

During a single L293D chip there area unit 2 h-Bridge circuit within the IC which may rotate 2 dc motor severally. Due its size it's considerably employed in robotic application for dominant DC motors. Given below is that the pin diagram of a L293D motor controller. There are unit 2 modify pins on l293d. Pin one and pin nine, for having the ability to drive the motor, the pin one and nine got to be high. For driving the motor with left H-bridge you would like to modify pin one to high. And for right

H-Bridge you would like to create the pin nine to high. If anyone of the either pin1 or pin9 goes low then the motor within the corresponding section can suspend operating. It's sort of a switch.

C. *NodeMCU*

NodeMCU is open supply computer code for open supply supply prototyping board styles area unit out there. The name "NodeMCU" combines "node" and "MCU" properly speaking refers to the computer code instead of the associated development kits. Each the computer code and prototyping board styles area unit are open supply. The computer code uses the Lua scripting language. The computer code is predicated on the eLua project, and designed on the Espressif Non-Os SDK for ESP8266.it uses several open supply comes like lua-cjson and SPIFFS. Support for the 32-bit ESP32 has additionally been enforced. The prototyping hardware usually used could be a card functioning as a twin in-line package (DIP) that integrates a USB controller with a smaller surface mounted board containing the MCU and antenna.

D. *IR LED*

IR semiconductor diode (infrared light emitting diode) could be a state lighting (SSL) device that emits light within the infrared varies of electromagnetic wave spectrum.IR LEDs leave low cost, economical production of infrared ray, that is electromagnetic wave within the 700nm to 1mm vary. IR LEDs area unit helpful during a range of varieties of physical science, as well as many sorts of remote controls for televisions and different physical science. Used with infrared cameras, IR LEDs will act sort of a spot light whereas remaining invisible to the eye. Due to IR LEDs is employed in conjunction with variety of various varieties of sensors, they're turning into common in machine-to-machine (M2M) environments and net of Things (IoT) applications.

E. *Arduino software package*

Arduino is ASCII text file physical science platform supported easy-to-use hardware and software package. Arduino boards area unit ready to browse inputs-light on a detector, a finger on a button, or a twitter message – and switch it on output-activating a motor, turning on semiconductor diode, business one thing online. The Arduino Integrated Development surroundings – or Arduino software package (IDE) - contain a text editor for writing code, a message space, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to transfer programs and communicate with them. Programs written victimization Arduino software package (IDE) area unit referred to as sketches. These sketches area unit written within the text editor and area unit saved with the file extension .ino. The editor has options for cutting/pasting and for searching/replacing text.

The message space offers feedback whereas saving and commerce and additionally displays errors. The console displays text output by the Arduino software package (IDE), as well as complete error messages and different data. Rock bottom paw corner of the window displays the organized board and port. The toolbar buttons permit you to verify and transfer programs, create, open, and save sketches, and open the serial monitor.

IV. RESULT

In this experiment we tend to performed a chronic stress assessment by finding the gastric motility. The experiment are conducted when a meal. In order that we will simply notice the gastric motility in patients. Gastric motility activity is done once the patients are in rest position. From that we will classify the sort of stress by the CBR.

A. The Features on CBR platforms against expert classification

In this section the results are shown from the output of the 2 CBR platforms and are compared to expert's identification. The comparison is restricted to stressed and traditional while not the sub-categories terribly stressed and relaxed. Table one and a pair of shows the comparison of SC and foot slope options on each CBR platforms whereas table three shows SCR on MyCBR solely as a result of the Fuzzy CBR platform is devoted to slope options. The result's a helpful metric of the potency of the ways beneath take a look at.

For each case a classification from the knowledgeable is shown (column 1) and is compared to the expert's classification of the similar case (column three, 5, 7, 9) that the CMB platform produces. "1" is inserted once the cases have similar knowledgeable classification and "0" once totally different. The knowledgeable similarity row shows the proportion similarity of all the cases from the first and therefore the second similar case output of the CBR platforms. The knowledgeable similarity total row is that the total proportion with zero, half dozen weights for the first similar case and

with zero, four weight of the second similar case. The 0, 6 and 0, four weights were arbitrary chosen for the creation of one overall score.

What is shown in that the SC slope provides quite promising results with eighty three similarity to the knowledgeable classification on each fuzzy and Mycbr platforms. The foot slope conjointly provides sensible results that mean that SCR feature extraction algorithmic rule would like reexamination with the interpolation and 0 assignment techniques.

TABLE I SC SLOPE FEATURES ON CBR PLATFORMS AGAINST EXPERT'S CLASSIFICATION

Feature	Sc slope							
CBR platform		Fuzzy cbr				My Cbr		
Expert classification	Volvo case	1st similar case	" 1" correct," 0" false	2nd similar case	" 1" correct," 0" false	1st similar Case	" 1" correct," 0" false	2nd similar case	" 1" correct," 0" false
Stressed	1	5	1	6	0	5	1	11	1
Normal	2	13	1	16	0	13	1	15	1
Stressed	3	5	1	10	1	18	1	10	1
Normal	4	13	1	3	0	18	0	13	1
Stressed	5	1	1	3	1	1	1	11	1
Normal	6	1	0	7	0	1	0	7	0
Stressed	7	11	1	1	1	11	1	1	1
Stressed	8	7	1	11	1	11	1	2	0
Normal	9	10	0	6	1	10	0	18	0
Expert similarity (%)			0,83		0,50		0,72		0,83
Total (%)	0,70					0,77			

Expert classification	Volvo case	FT slope							
		fuzzy cbr				Mycbr			
		1st similar case	"1" correct,"0" false classification	2nd similar case	"1" correct,"0" false classification	1st similar Case	"1" correct,"0" false classification	2nd similar case	"1" correct,"0" false classification
Stressed	1	8	1	7	1	8	1	18	0
Normal	2	3	0	6	1	6	1	4	1
Stressed	3	2	0	6	0	15	0	14	1
Normal	4	2	1	3	0	15	1	10	0
Stressed	5	9	0	13	0	9	0	13	0
Normal	6	17	1	15	1	17	1	16	0
Stressed	7	3	1	2	0	15	0	4	0
Stressed	8	12	1	1	1	1	1	18	1
Normal	9	5	0	13	1	13	1	15	1
Expert similarity (%)			0,61		0,56		0,83		0,39
Total (%)		0,59				0,66			

TABLE III SCR FEATURES ON CBR PLATFORM AGAINST EXPERT'S CLASSIFICATION

Expert classification	Volvo case No	Mycbr			
		SCR			
		1st similar case	"1" correct, "0" false classification	2nd similar case	"1" correct, "0" false classification
Stressed	1	9	0	6	1
Normal	2	15	0	13	0
Stressed	3	4	0	6	0
Normal	4	3	0	14	0
Stressed	5	1	1	18	1
Normal	6	3	0	1	0
Stressed	7	16	1	1	1
Stressed	8	11	1	1	1
Normal	9	4	1	1	0
Expert similarity (%)			0,56		0,61
Total (%)		0,58			

B. *Neural Network Pattern Recognition and feature comparison*

Here the pattern recognition tool of matlab was to classify the 3 totally different options for stress detection of the nine Volvo cases. In pattern recognition confusion perform calculates the true/false results from examination network output classification with target categories i.e practician knowledgeable. The Matlab code and therefore the network used are shown and therefore the confusion results are within the following figures 4, 5, and 6. The results are as follows: foot slope sixty one.1%, SC slope thirty 8.9% and SCR thirty 8.9%. The results aren't thus promising within the experiment section each pattern recognition and fitting tool manufacture sensing the results. The most reason is that solely nine cases were used whereas within the experiment. Also, NN acts as a black box manufacturing totally different end in every iteration.
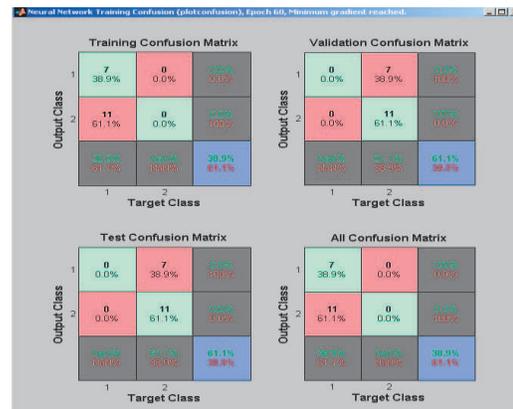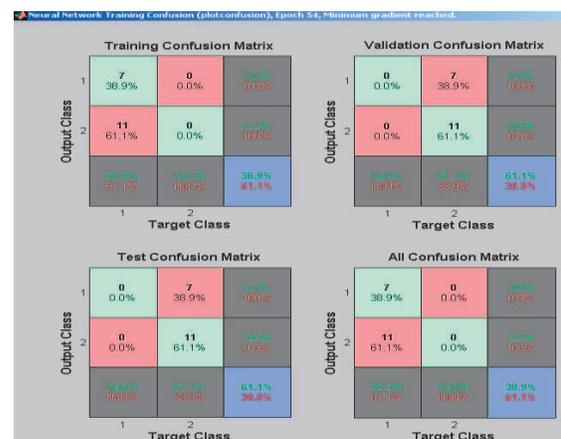

Fig 4. FT slope confusion
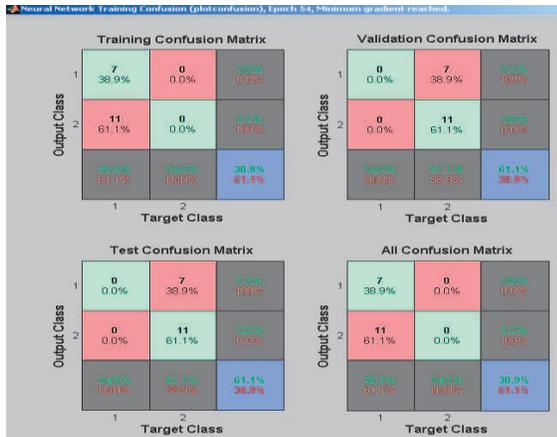

Fig 5. SC slope confusion

Fig 6. SCR confusion

V. CONCLUSION

From this experiment we will classify the stress by finding the gastric motility with the assistance of neural network and CBR. In future we will add the communication devices that alert the relatives of the patient and a doctor to send word the standing of their patient. And that we will embrace the music system that helps to scale back the stress sort of a music medical care.

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