

## Stress Detection using Human Galvanic Skin Response

Susmita Das<sup>1</sup> Sumedha Majumder<sup>2</sup> Debasmita Gangopadhyay<sup>3</sup> Purba Choudhury<sup>4</sup> Punam Panji<sup>5</sup>

<sup>1</sup>Assistant Professor <sup>2,3,4,5</sup>Student

<sup>1,2,3,4,5</sup>Department of Electronics & Instrumentation Engineering

<sup>1,2,3,4,5</sup>Narula Institute of Technology Kolkata, India

**Abstract**— Human beings need to control different mental situations which can lead the person suffering from dangerous conditions, in both the long and short term. Stress may increase the risk of cardiac problems. In this work, the design is a Galvanic Skin Response (GSR) based stress sensor. With the efficient use of the device performance, GSR is able to detect the different states of each user. In this innovative research work the scheme of stress reduction is depicted for the persons having some serious problem during stress. The measurement of skin resistance is taken from a living human body to study the different mental conditions at normal and under emotionally charged conditions. The study of the way to make relaxed with a visual effect on the patient is shown here with experimental cases applied on some human beings.

**Key words:** GSR; Stress; Skin Resistance; EDR

### I. INTRODUCTION

All tissues in the human body including skin have the ability to conduct electricity. Indeed, this is how nerves function to convey information from one part of the body to another [1]. The skin also has electrical activity, which is in constant, slight variation, and can be measured and charted. The skin's electrical conductivity fluctuates based on certain bodily conditions, and this fluctuation is called the Galvanic Skin Response. In 1849, Dubois-Reymond in Germany first observed that human skin was electrically active. In 1878, in Switzerland, Hermann and Luchsinger demonstrated a connection between EDA and sweat glands. Vigourous (France, 1879), working with emotionally distressed patients, was the first researcher to relate EDA to psychological activity. Galvanic Skin Response (GSR) device in order to detect the different conductance of the skin when a person is under stress or when not [2]. GSR is one of several Electro Dermal Response (EDR) [3]. EDRs are changes in the electrical properties of a person's skin caused by an interaction between environmental events and the individual's psychological state. The change is caused by the degree to which a person's sweat glands are active. Psychological stress tends to make the glands more active and this lowers the skin's resistance. GSR is a method to measure the electrical conductance of the skin as it varies with changes in the environment around an individual. When an individual is aroused or excited, the moisture levels in the skin vary causing its electrical conductance to change. This is due to the fact that sweat glands are controlled by the sympathetic nervous system, and this change in conductance can indirectly be a measure of the mental activities [4].

### II. METHODOLOGY

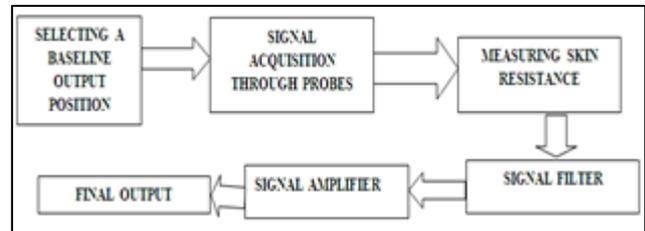


Fig. 1: Block Diagram of the project work

There are strong reasons behind this research work idea with a great social impact. There are studies which indicate the stress increases the risk of cardiac problem. In this work progression, design of a stress sensor based on GSR with low power consumption is processed. With a visual effect such as showing a picture of someone very close to the patient or playing any joyful video in front of the patient may be a way to calm down the stressed person.

The source of the skin resistance is chosen as a living skin of a human being to get the EDR. At normal or unstressed condition, the output resistance information is collected from the skin of fingers. The output under emotionally charged condition with visual effects is also acquired. While gathering the information about the person it has been observed that the output resistance value is changing with the visual effects applied on the stressed person. So, this method may make the person relaxed and save from any severe health problem. The circuitry is implemented for the measurement of the skin resistance and to show the output of mental condition LED is connected. IC MCP 6002, diodes, other essential electronic components and 9 volt battery supply is used to design the circuit. The probes to measure the skin resistance is made with a Velcro tape wrapped with a copper foil connected with a wire. There should be an arrangement to show the stress level using a meter arrangement setting up a threshold value of stressed condition. If the value is under the threshold value then the person is in normal state and if the value is beyond the level then the person is overstressed. There the stress relief method can be applied.

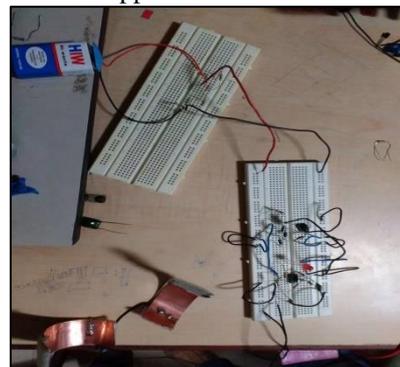


Fig. 2: Snapshot of the project work

### III. RESULTS

#### A. Study-1

	RESISTANCE (Mohm)
Case - 1	3.1
Case - 2	2.9
Case - 3	2.5

Table 1: In Case of Normal Condition

#### B. Study-2

	RESISTANCE (Mohm)
Case - 1	2.2
Case - 2	2.4
Case - 3	2.1

Table 2: In Case of Emotionally Charged Condition

From the above case studies it can be noticed that the skin resistance of a living body is changing according to the emotion developed within the human being. The results may differ at day, night and depending on the food habits, age of the person, physical activities too.

### IV. FUTURE SCOPE

In future, using this plan Lie Detector can be made for polygraph test. Analyzing the output graphs the performance of the system can be made efficient with proper controlling algorithm. With the advancement of the arrangement this model can be represented as a Truth meter also. To discriminate the stress level at working place and at home also can be done with this stress meter. The stress relief arrangement should be made portable with the model.

### V. CONCLUSION

The designed system should be different for men and women due to the hormonal reaction inside the human body. This system would not differentiate between the exact stressed conditions or the person is falsely trying to make himself or herself in charged condition. This area of the work can be an initiative for a better application in various fields.

### ACKNOWLEDGMENT

The authors are very much thankful to EIE Dept. for their cooperation.

### REFERENCES

- [1] Galvanic Skin Response, Wise Geek.
- [2] A Stress Sensor Based on Galvanic Skin Response (GSR) Controlled by ZigBee, María Viqueira Villarejo, Begoña García Zapirain and Amaia Méndez Zorrilla, *Sensors* 2012, 12, 6075-6101; doi:10.3390/s120506075, ISSN 1424-8220.
- [3] Galvanic Skin Response as a Measure of Soldier Stress, Chuck H. Perala and Bruce S. Sterling, ARL-TR-4114, May 2007.
- [4] Electrodermal activity, Wikipedia.