Develop Very Low Cost Flex Sensor Using Aluminum (Al) Foil Paper

Sudhakar P. Sarkate
Ad-hoc Assistant Professor
Degree College Of Physical Education, H.V.P.M., Amravati A Multi-faulty
Autonomous College, Amravati 444605.(MS)

Abstract- *In this paper presents the very low cost flex Sensor, designed with easily available materials. The flex sensor works due to movement of the body that changes the resistance of the sensor according to the bending angle of the body. Flex sensor are used to resistive carbon materials like a graphite. In this flex sensor are many applications, human machine interfaces, and robotics, medical, automotive. The proposed flex sensor produces different resistance values corresponding to the bending radius.*

Keywords- Aluminum (Al) foils paper, canvas tape, cleaning pad, pencil, wire.

I. INTRODUCTION

A low cost flex sensor are specifically designed to the various application, and flex sensor also called bend sensor, measures the amount of deflection caused by bending the sensor. New technical innovation is required to overcome the challenged faced by the designer and scientists to meet the requirement of consumer. The merging of technology and medical science has made the task like complicated surgery by robotic arm simpler; to capture the motion of human limbs sensors can be used. Among sensors, flex sensor is very attractive for automatic control of different application (robotic arm, robotic machine etc).

Development a very low cost flex sensor with easily available materials used such as, aluminum foil paper, cleaning pad, canvas tape, pencil etc is represented for a very low cost flex sensor. This sensor consist of two conductive layer of thin aluminum foil and abrasive cleaning pad with some pencil graphite powder(work as a variable resistor) and a acetate sheet for flexibility. The proposed flex sensor is novel in comparison to because it uses low cost easily available materials. The proposed flex sensor is also précised and accurate. The proposed flex sensor is simple and it can be easily used for automation controlling of different arduino based robotic machine.

II. LITERATURE REVIEW

1. Novel design of low cost flex sensor for automatic controlling of robotic car (jamini Prasad burman):

This paper mainly focused on the automatic controlling of robotic car and flex sensor. The paper discussed a novel technique to design a flex sensor using daily used materials for controlling of robotic car. Enhance the use of conventional robots by adding human intelligence as decision is taken by operator and working capability of robots.

2. Design and development of a cost effective flex sensors for recognition of international sign language through the motion of hand (Dr. Shantanu K. Dixit & Mr. Nitin S. Shingi.):

This paper mainly focused on the Design and development of a cost effective flex sensors for recognition of international sign language through the motion of hand, Robotic hand is a Human like hand which performs the tasks that human performs with his hands.

III. DEVELOP SYSTEM

In this develop system, we will, Aluminum (Al) foils paper, canvas tape, cleaning pad, pencil, wire.

These sensors will be mechanism of the designed flex sensor is shown in Figure1, The flex sensor consists of two conductive layer of Aluminum (Al) foil paper (food wrapping film) soldered with 12cm long wire at either end of each plate and in middle of this abrasive cleaning pad (3M scotch brite) is used as resistive material. Pencil Graphite powder (collecting from useless pencil) is attached in the middle of the aluminum foil paper and canvas tape is used to attach both the upper & lower Aluminum (Al) plate and it is covered with channel file sheet that can help for flexibility. The structural block diagram of the designed flex sensor is shown in Figure 2.

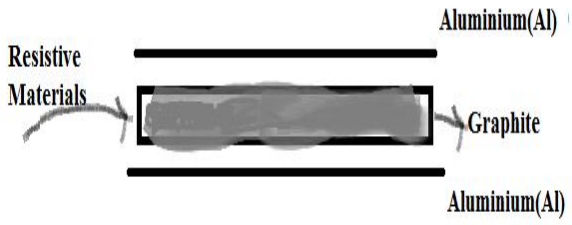

Figure 1. Mechanism Of the Develop Flex Sensor.

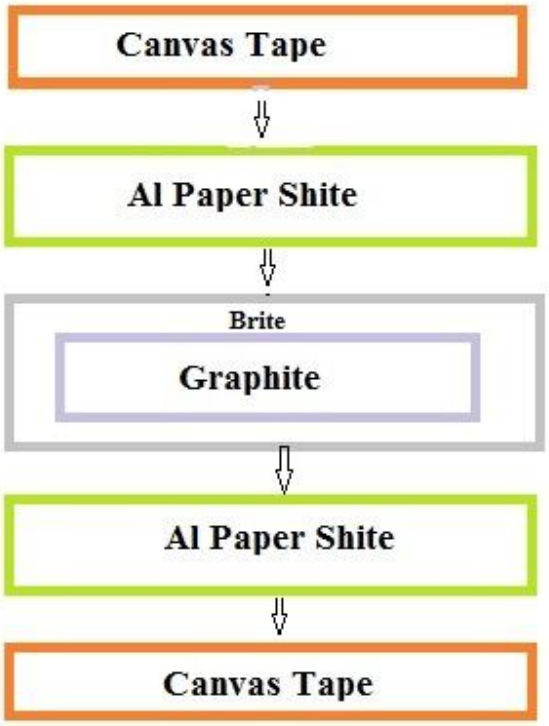

Figure 2. Block Diagram Of the Develop Flex Sensor.

IV. WORKING AND PRINCIPLE

The working principle of develop flex sensor depends upon bending phenomenon. When it is in normal condition i.e. 180°, resistance offered by it is maximum. Other the sensor is bent angle to 90°, its resistance decreases. The resistance value decreases with further decrease in bend position. This phenomenon is validated with some numerical values (analogue values). Figure 3 indicates the line plot of bent position versus resistance value.

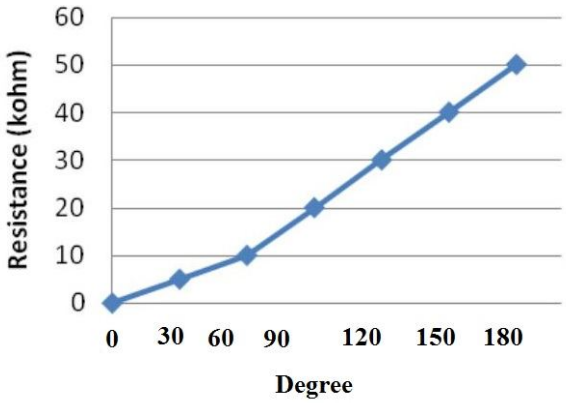

Figure 3. Line Plot Of Bent Position Versus Resistance Values.

It is clearly seen from Figure 3 that as the bending position decreases the corresponding resistance also decreases hence conductivity increases. Finally, development set up of the flex sensor as shown in figure4.

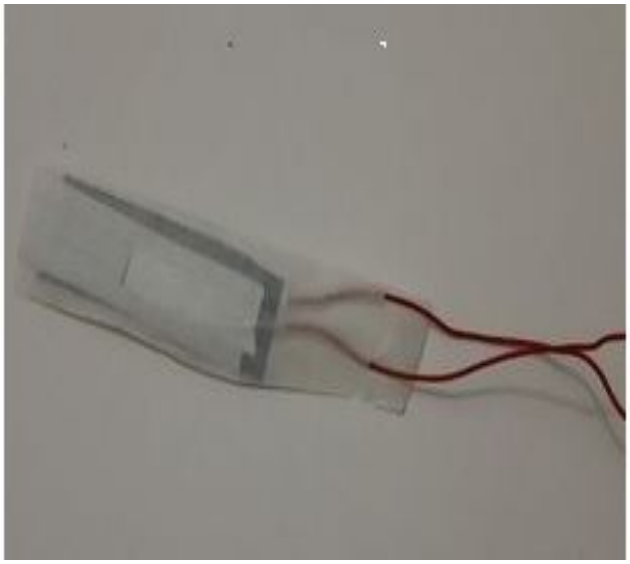

Figure 4 Development set up of the flex sensor.

V. MATHETICAL FORMULA

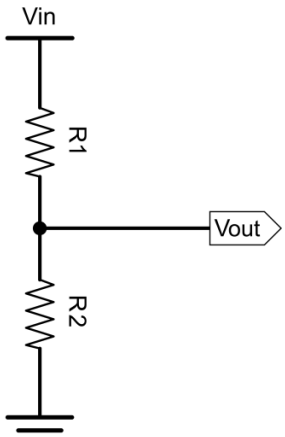

Figure 5. Voltage divider circuit.

$$V_{out} = \frac{V_{in} R_2}{R_1 + R_2}$$

Where,

V (out) =output voltage.
V (in) =input voltage.
R1=Resistance of flex sensor.
R2=Resistance value.

The very important things required for flex sensor is voltage divider circuit. The above figure 5 helps for supplying voltage according to the

VI. RESULTS

The changes of sensor resistance versus voltage are shown in Figure 6. As seen from Figure 6 the changes of sensor resistance and voltage are inversely proportional. That means higher the value of resistance lower is the voltage and vice versa. The maximum resistance of 40k ohm is observing i.e. when the voltage across the voltage divider circuit connected with flex sensor is 0 volt.

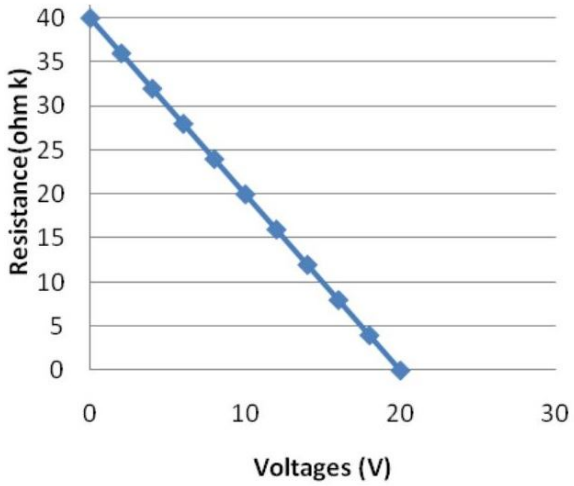

Figure 6. the changes of sensor resistance versus voltage.

VII. ADVANTAGES

- It is easy to make.
- It is simple.
- A very Low cost.

VIII. APPLICATIONS

- It is used in robotics field.
- It is used in medical field.
- It is useful in automobile field.
- It can use in ardunio.
- It is used in industrial field.

IX. CONCLUSION

Develop very low cost flex sensor using Aluminum (Al) foil paper is accurate sensing analog values. This system will help to reduce cost and time in future. This system can save the lives of many people. The develop sensor can also be used in industrial purpose gaming device and measuring device. The proposed sensor is much more cost effective and less complex in structure.

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