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DESIGN OF ELECTRIC SENSOR USING MEMS USED FOR PURIFYING ANY LIQUID CONTENTS

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ABSTRACT

Electric sensor examines the change in electric or magnetic signals based on a environmental input. A sensor is a device that measures a particular characteristic of an object or system. Some sensors are purely mechanical, but most sensors are electronic, returning a voltage signal that can be converted into a useful engineering unit. Sensors take advantage of the mechanical or electrical response of its component to relate the response to a relevant quantity. Engineers use sensors in test and monitoring applications, but home owners interact with sensors every day. Automobiles are filled with sensors, from the engine to the airbag. We are interested in the development of mems technologies, where the emphasis is on minimizing cost, and the ratio of performanceof minimizing cost rather then maximizing performance. As the materials serve as the basis for this exploratory progress, a conceptually selected effort to reduce the cost of diagnostic systems by developing electric sensor.

Keywords: RADAR, AIRBAG, SENSORS, WATER PURIFIER

1. INTRODUCTION

In the broadest definition, a sensor is a device, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics, whether as simple as a light or as complex as a computer.

Sensors are used in everyday objects such as touch-sensitive elevator buttons (tactile sensor) and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. With advances in micromachinery and easy-to-use microcontroller platforms, the uses of sensors have expanded beyond the traditional fields of temperature, pressure or flow measurement, for example into MARG sensors. Moreover, analog sensors suchas potentiometers and force-sensing resistors are still widely used. Applications include manufacturing and machinery, airplanes and aerospace, cars, medicine, robotics and many other aspects of our day-to-day life.
A sensor's sensitivity indicates how much the sensor's output changes when the input quantity being measured changes. For instance, if the mercury in a thermometer moves 1 cm when the temperature changes by 1 °C, the sensitivity is 1 cm/°C (it is basically the slope Dy/Dx assuming a linear characteristic). Some sensors can also affect what they measure; for instance, a room temperature thermometer inserted into a hot cup of liquid cools the liquid while the liquid heats the thermometer. Sensors are usually designed to have a small effect on what is measured; making the sensor smaller often improves this and may introduce other advantages. Technological progress allows more and more sensors to be manufactured on a microscopic scale as microsensors using MEMS technology. In most cases, a microsensor reaches a significantly higher speed and sensitivity compared with macroscopic approaches.

1.1 Electric Sensor

This is a model from electric impedance tomography, a method of imaging the interior permittivity distribution of a body by measuring current and voltage at the surface.

This model demonstrates how the shape and placement of figures with different material properties inside a closed box can be determined with this non-invasive technique. Applying a potential difference on the boundaries of the box gives rise to a surface charge density that varies depending on the permittivity distribution inside the box.

The technique can be used in, amongst other applications, medical diagnosis. Different organs have different properties so that you can “see” the organs and their movement from the permittivity "image" that they create.

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2. MOTIVATION

Micro size sensors and actuators: integration with electronics on single chip (system or lab on chip).Decrease cost of production with bulk processing. Many new features and products previously unthought-of can be possible using MEMS. Combination of MEMS with other branches (examples optical MEMS, bio MEMS, etc) leads the technology to use the Micro size sensors in various fields. The usage of MEMS structures with various physics leads the study and analysis of Sensors with all required variables and functions. The simulation results may be considered for manufacturing the sensors which can be a life saving sensors and actuators to the mankind.

3. DESIGNINGMETHODOLOGY

1. MODEL WIZARD

This model solves Gauss' law with ρ = 0:

$$-\nabla \cdot (\varepsilon_0 \varepsilon_r \nabla V) = \rho$$

The box contains air with εr equal to 1. The different objects are made of materials with different values of the relative permittivity, εr: 1, 2, and 3. To get a voltage difference, a ground condition (V = 0) is set on the bottom while the condition V = 1 is applied on the top of the box. On the side, the boundary condition used is electric insulation: n · D = 0.

Selection of 2D, physical parameters and mode analysis

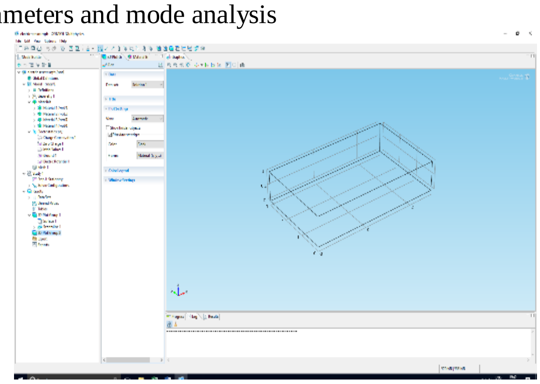

Fig1: Selection of model

2. GLOBAL DEFINATION

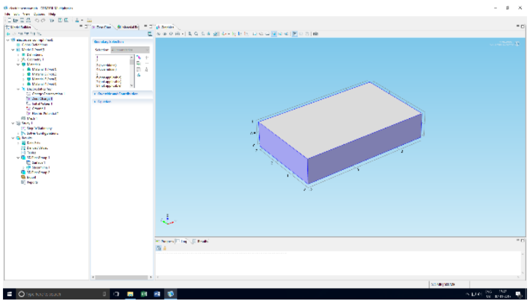

Fig2: Creation of the blocks

In the material section choose the material requiredDefine the variables required in the model couplings and thus click on the boundaries required

3. MESH

Triangular meshing is selected for the entire space

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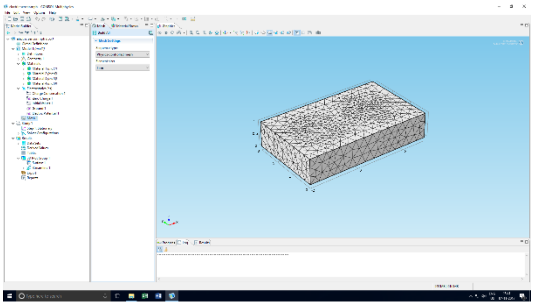

Fig3: Meshing image of electric sensor

4. WORKING OF ELECTRIC SENSOR

Sensors react to changing physical conditions by altering their electrical properties. Thus, most artificial sensors rely on electronic systems to capture, analyse and relay information about the environment. These electronic systems rely on the same principles as electrical circuits to work, so the ability to control the flow of electrical energy is very important.Put simply, a sensor converts stimuli such as heat, light, sound and motion into electrical signals. These signals are passed through an interface that converts them into a binary code and passes this on to a computer to be processed.Many sensors act as a switch, controlling the flow of electric charges through the circuit. Switches are an important part of electronics as they change the state of the circuit. Components of sensors such as integrated circuits (chips), transistors and diodes all contain semiconducting material and are included in the sensor circuits so that they act as switches. For example, a transistor works by using a small electrical current in one part of the circuit to switch on a large electrical current in another part of the circuit.

5. RESULT AND ANALYSIS

Once the simulation is done, the selection of electric sensor based on different conductivity is obtained and it is as shown in the below table

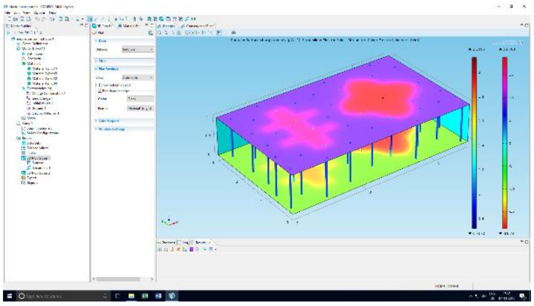

Fig4: Surface charge density (boundary), electric field (streamline density), and electric potential (streamline color).

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Table1: relative permittivity V/s Conductivity

Materials	Relative permittivity	Conductivity
Salts	3-15	(-8.36*10^-22) to (-1.255*10^-22)
Sulphite	84-100	(-7.43*10^-21)to (-8.854*10^-21)
Carbon	2.6	-2.302*10^-22
Silicon oxides	11.68	-1.0341*10^-21

By the selection of different relative permittivity of salt material for designing the electric sensor conductivity is calculated.

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