# To Realize the Ideas of the Earth : With Super Capacitance Sensors on Carbon Fibers Paper

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**Abstract:- The study on to feel Ideas of the EARTH is a technology which a super acreage capacitance sensors on carbon fibers paper place on or between the surface of the object under test, the movement information of each land can be converted into electrical signals. Through Machine Learning, such as take natural disaster data as the learning set, then we can realize the purpose of perceiving every inch of land and realize the dialogue between human and nature.**

*Keywords:- dialogue between human and nature, carbon fibers paper, super acreage capacitance sensors.*

## I. INTRODUCTION

According to BBC NEWS: 'Laos dam collapse: Many feared dead as floods hit villages', **Error! Reference source not found.**[1] At least 20 people have been killed and more than 100 are missing in flooding following the collapse of an under-construction dam in south-east Laos. Fig. 1



Fig 1:- Laos dam collapse: many feared dead as floods hit village

Indonesia earthquake is short for Indonesia earthquake, it is also the general name of all earthquakes in Indonesia. Because Indonesia lies at the junction of the Pacific seismic belt and the Eurasian seismic belt, where tectonic plates meet, earthquakes and volcanoes are frequent, and earthquakes of any size occur thousands of times a year.

It was this report that inspired this study, if there is a technology that can anticipate every inch of land change, It will save countless lives. With the 'To feel Ideas of the EARTH: super capacitance sensors on carbon fibers paper'

entitled, our main objective is developing a technology used as feel the thoughts of the Earth.[4]

Indonesia's official antara news agency said Saturday night, The magnitude-6.4 earthquake hit lombok island in the Indonesian province of sinushatengala at 6:47 a.m. local time, with the epicenter at 8.26 degrees south latitude and 116.55 degrees east longitude, with a depth of 24 kilometers. At least 14 people were killed, 162 injured and thousands of homes damaged on lombok island and the nearby songbawa islands.[4]

Philosophically speaking, the idea of the earth is represented as an omnipresent movement.

In 132 AD in China, zhang heng invented the earliest geodynamic instrument, which is called Pentecostal seismograph.[1]
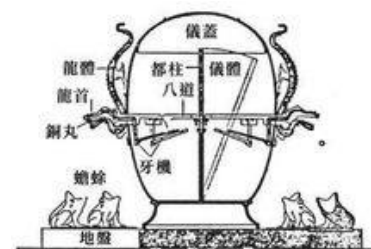


Fig 2:- The earliest geodynamic instrument by Zhang Heng, China

According to the later book, the geodynamic instrument was made of fine copper, with a round diameter of eight feet and a raised top cover, shaped like a wine bottle. There is a big pillar in the middle, along the eight lanes, to shut down the engine. It has eight directions, each with a copper-beaded dragon in its mouth and a toad below it. If there is an earthquake on either side, the copper beads contained in the dragon mouth in this direction will fall into the mouth of toad, and the direction of the earthquake can be measured. Since then in China, the court has ordered historians to record where the earth movement took place.

*This is the first time in history that man has observed the motion of the earth.*

Earthquake, also known as ground motion, ground vibration, is the rapid release of energy from the earth's crust in the process of vibration, during which will produce seismic waves a natural phenomenon. According to statistics, more than 5 million earthquakes occur on earth every year, that is, thousands of earthquakes occur every day. Most of them are too small or too far away to be felt. There are about a dozen or twenty earthquakes that can really do serious harm to human beings. Earthquakes can cause especially serious disasters about once or twice. Earthquakes that are not felt must be recorded by seismograph. Different types of seismographs can record earthquakes of different intensity and distance. Thousands of earthquake instruments are running around the world to monitor the movement of earthquakes day and night.[3]

Natural variation on the earth, including natural variation induced by human activities, is conceived in the earth's surface environment composed of the atmosphere, lithosphere, hydrosphere and biosphere. It happens all the time and everywhere. When this mutation brings harm to human society, it constitutes a natural disaster. Because it has brought different degrees of damage to human production and life, including the relationship between man and nature as a medium of labor and the relationship between man and nature as well as the people related to it. Disasters are negative or destructive. Therefore, as a manifestation of the contradiction between man and nature, natural disasters, with the dual nature of nature and society, are one of the most severe challenges facing mankind in the past, present and future.[6]

*To predict the movement of every inch of land is the expectation of all mankind!*

The study on To feel Ideas of the EARTH is a technology which a super acreage capacitance sensors on carbon fibers paper place on or between the surface of the object under test, the movement information of each land can be converted into electrical signals. Through Machine Learning, such as take natural disaster data as the learning set, then we can realize the purpose of perceiving every inch of land and realize the dialogue between human and nature.

All the study includes four sections:

- Section 1: Capacitance Sensors on Carbon Fibers Paper (CS-CFP),
- Section 2: To realize the purpose of the EARTH: super capacitance sensors on carbon fibers      paper
- Section3: Web on Lands: by used super capacitance sensors on carbon fibers paper
- Section3: Web in Seas: by used super capacitance sensors on carbon fibers paper

## II. MATERIALS AND METHODS

*A. The Block resistance is main performance of sensor.*

Block resistance is characterization of thin film conductivity quantities, usually using a four-point probe to determine, the method is simple in principle and data processing is convenient, non-destructive measurement, so widely used.[6]

Fig. 3 shows the parallel flow of the current through the ITO film, where: d is the thickness of the film, I is the current,

L1 is the length of the film in the direction of current, and L2 is the length of the film perpendicular to the direction of current.
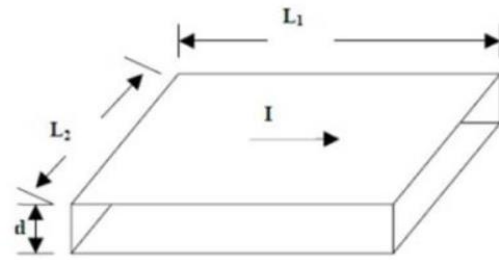


Fig 3:- Block resistance diagram From: Touch screen (TP) tetrahedral probe resistance test,

When the current flows through the square conductive film layer as shown in the figure, the resistance of the layer is:

$$R = \frac{\rho L_1}{d L_2} \qquad (1)$$

Where:

$\rho$ - The resistivity of a vacuum membrane is a steady value for a given membrane layer.

When $L_1 = L_2$, that is the square membrane layer, whose resistance values are set by the static $\rho/d$.

So that's the definition of the square resistance:

$$R = \frac{\rho}{d} \qquad (2)$$

In (2), R and $\rho$ are Units: $\Omega$ , d is in meters (m).

It can be seen from this that the characteristics of the resistance of the cube: for a given film layer, the resistance value R varies with the size of the square used is related to the thickness of the film material. In the case of infinite thinness of the sample, it can be regarded as a two-dimensional plane.

*B. Block resistance experiment about carbon fiber paper*
- *Experiment: Model 1*

First three by the experimental data (table 1) and the CF content is 23% estimate the resistance for 40 $\Omega$, using G (1, 1) grey model, according to carbon content 6% of the step length, concluded after three lines of side resistance, change trend diagram and the linear regression model is given Fig 4.
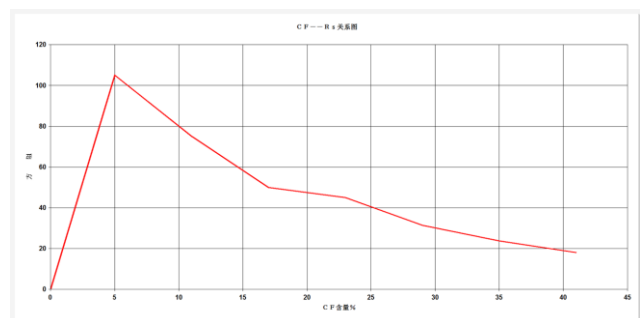


Fig 4:- The experimental 2 Model 2 CF—BR relation

| CF (%) | 5 | 11 | 17 | 23 | 29 | 35 | 41 |
|---|---|---|---|---|---|---|---|
| BR( Ω/cm²) | 105 | 75 | 50 | 40 | 27.2265 | 19.56917 | 14.06542 |

Table 1. The experimental Model 1 data

- *Experiment Model 2*

First three by the experimental data (table 2) and the CF content is 23% estimate the resistance for 45 Ω, using G (1, 1) grey model, according to carbon content 6% of the step length, concluded after three lines of side resistance, change trend diagram and the linear regression model is given Fig. 5.
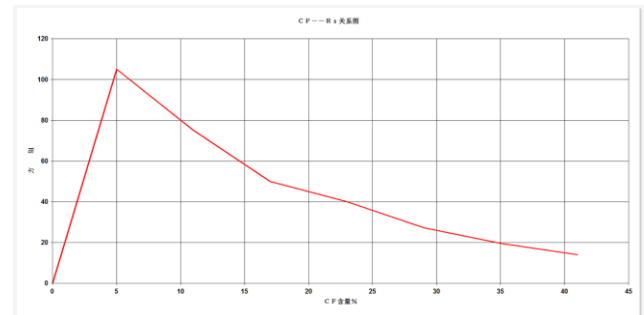


Fig 5:- The experimental Model 1 CF—BR relation

| CF (%) | 5 | 11 | 17 | 23 | 29 | 35 | 41 |
|---|---|---|---|---|---|---|---|
| BR( Ω/cm²) | 105 | 75 | 50 | 45 | 31.40726 | 23.75465 | 17.96666 |

Table 2. The experimental Model 2 data

*C. One dimensional linear regression analysis*

Nonlinear analysis was performed on the above two groups of data. The curve graph of linear regression fitting was Fig 6.
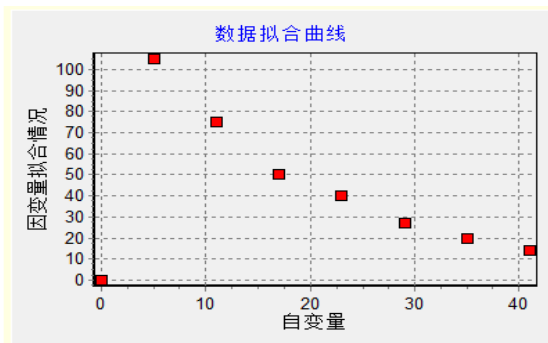


Fig 6:- The curve graph of linear regression fitting

According to the figure above, the calculation is simplified and segmented according to linear change.

CF contents are 5%——22%，The inferred linear equation is: (3)

$$Y=130 - 5 * X \qquad （3）$$

CF contents are 23%——41%，The inferred linear equation is: (4)

$$Y=73.2 – 1.44 * X \qquad （4）$$

Where：
Y—— Block Resistance (Ω)
X—— CF contents (%)

The square resistance values of different CF contents were calculated respectively according to the two formulas (3) and (4), as shown in the following table 3.

| Y=130-5*X | | Y=73.2-1.44*X | |
|---|---|---|---|
| X | Y | X | Y |
| 5 | 105 | 23 | 40.08 |
| 6 | 100 | 24 | 36.64 |
| 7 | 95 | 25 | 37.2 |
| 8 | 90 | 26 | 37.56 |
| 9 | 85 | 27 | 34.32 |
| 10 | 80 | 28 | 32.89 |
| 11 | 75 | 29 | 31.44 |
| 12 | 70 | 30 | 30.00 |
| 13 | 65 | 31 | 28.56 |
| 14 | 60 | 32 | 27.12 |
| 15 | 55 | 33 | 25.68 |
| 16 | 50 | 34 | 24.24 |
| 17 | 45 | 35 | 22.80 |
| 18 | 40 | 36 | 21.36 |
| 19 | 35 | 37 | 19.92 |
| 20 | 30 | 38 | 18.48 |
| 21 | 25 | 39 | 17.04 |
| 22 | 20 | 40 | 15.6 |

Table 3. CF content vs Block Resistance

According to the first formula (3), the sheet resistance is 40 Ω when CF content is 18%; Fig. 6

According to the second formula (4), the sheet resistance is 40 Ω when CF content is 23% Fig. 7
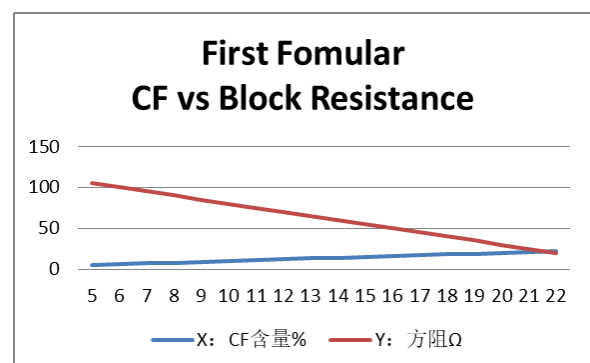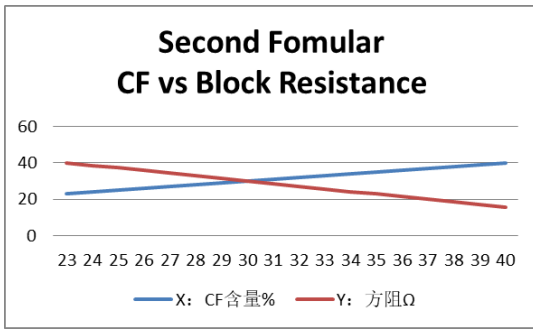


Fig 7:- The first CF—BR relation

Fig 8:- The second CF—BR relation

Therefore, 40 Ω request sheet resistance, it is advisable to CF content 18% - 23%.

## III. RESULTS

*A. Desgin on super capacitance sensore on carbon fibers paper*

- *Get data*

A carbon fibers paper, size S= 200x300mm, block resistance BR= 0.187 $\Omega/cm^2$, given it 6V, Frequency F= from 100Hz to 10,00Hz, the data of capacitance as table 4.

| F (Hz) | 100 | 200 | 300 | 400 | 500 | 600 | 700 | 800 | 900 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|
| Capacitance (Nf) | 13.66 | 21.20 | 13.67 | 9.89 | 7.62 | 6.11 | 5.04 | 4.23 | 3.60 | 3.10 |
| Capacitance (Nf/cm$^2$) | 0.028 | 0.035 | 0.0227 | 0.0165 | 0.0127 | 0.0102 | 0.0083 | 0.00705 | 0.006 | 0.005 |
| Capacitance (Nf/m$^2$) | 280.00 | 350.00 | 227.00 | 165.00 | 127.00 | 102.00 | 83.00 | 70.50 | 60.00 | 50.00 |
| Capacitance (F/km$^2$) | 0.28 | 0.35 | 0.227 | 0.165 | 0.127 | 0.102 | 0.083 | 0.0705 | 0.06 | 0.005 |

Table 4. The data of capacitance

Three forms of capacitance sensors on carbon fibers paper
- ✓ *Epoxy resin adhesive form*

The form, a carbon fibers paper, resin adhesive the surface of the object under test, if F=200Hz, C=0.35 F/km$^2$.

- ✓ *Silicone coating form*

The form , a carbon fibers paper by silicone coating, and then resin adhesive the surface of the object under test, if F=200Hz, C=0.35 F/km$^2$.



- ✓ *Concrete - silicone coating form*

The form , a carbon fibers paper by concrete-silicone coating, and make concrete blocks of a certain area resin, then adhesive the surface of the object under test, if F=200Hz, C=0.35 F/km$^2$.



*B. Example of the Three-Gorges Dam (TGD) in China*

The Three Gorges hydropower station is the largest hydropower station in the world and the largest project ever built in China. Fig. 9


Fig 1:- Three gorges water conservancy project

| Length (m) | Height (m) | Width (m) |
|---|---|---|
| 2,335 | 101 | (dam bottom) 115 |

Table 1. The data of Three gorges water conservancy project

From table 5 the Length * Height = 2,335 * 101=235,835m$^2$, used Silicone coating form, make 1m$^2$ capacitance sensors on carbon fiber paper, so a capacitor = 350.00 Nf, if F=200Hz, the super capacitance sensors C=235,835 * 350.00=82,542,250 Nf.

*C. Example of the Pan American Highway*

The pan American highway is a road that runs from the edge of the United States through much of central and South America, the system is 47515 kilometers long. Fig 10.

Fig 10:- The pan American highway

| Length (m) | Width (m) |
|---|---|
| 47,515,000 | 23.4 |

Table 2. the data of the pan American highway

*The average two-way 6 lanes, American highway width standard

From table 6 Length * Width=47,515,000 * 23.4=$1.1*10^9$ $m^2$, about 1000km$^2$, used Epoxy resin adhesive form, F=200Hz, C=0.35 F/km$^2$. The super capacitance sensors = 350 F, what huge!

### D. Examples of the African coast

Africania, Africa for short. Located in the southwest of the eastern hemisphere, the earth spans north and south of the equator, and parts of the northwest extend into the western hemisphere. It covers an area of about 3.02 million square kilometers. It accounts for 20.2% of the total land area of the world, second only to Asia and second only to the rest of the world. The coastline is 30,500 kilometers long.

Used Concrete - silicone coating form, to sink 30,500,000 blocks into the sea floor, the super capacitance sensors=30,500,000 * 350=$1.0 * 10^{10}$ Nf = 10 F.

## IV. DISCUSSION

The study no actual engineering practice has been carried out, it is only A simulation experiment in a laboratory and A imagine about super capacitance sensors on carbon fibers paper. But it has proved to be feasible, carbon fibers paper use as make super capacitance sensors, and realize the purpose of the EARTH by a super capacitance sensors on carbon fibers paper.

## V. CONCLUSIONS

To realize the purpose of the EARTH is the Human expectations and goals. The study, super capacitance sensors on carbon fibers paper, preformed a method to realize the purpose of the EARTH. We hope being a road on the researching realized the purpose of the EARTH.

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