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Retina Resistivity Analyzer

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Abstract ***Retina play a vital role in nervous system being directly connected to the brain .Depending on the person & his mental and physical health the character of retina ought to change .To study such changes and possibly diagnose clients of the human body, retina needs to be examining .The purpose of the invention is to collect data of resistivity values of retina by a simple economical method. The conventional techniques involved light ray based study using coherent light such studies could be dangerous in the long run .The proposed method is the non invasion process of applying four electrodes to the eyelid at specify distances so that the retina resistivity can be easily determined .The data collected by such a device can be useful for a finding out the health of the body and even predict future affections. Analogous to resistivity probe in geological exploration studies and resistivity measurements of semi - conductor our invention uses Schlumberger method. Two outer electrodes carry the current from a constant current source; the inner electrodes pick up the voltages with reflected from inside. All the electrodes are filled like a set of lenses and the spectacles. A simple circuit concealing of a battery few resistors and an ammeters and voltmeter combination gives the apparent resistance associated with 2/3 of the distance of any outer electrodes from the centre .The resistivity calculated from the apparent resistance is related to the retina. The initial study on the device has been quite encouraging and is able to distinguish resistivity of old persons to that of young person's .So in future more data needs to be collected from various persons show us to have a knowledge base further analysis.***

Index Terms: Resistivity, electrodes, ammeters, voltmeter, four probe methods.

I. INTRODUCTION

It is known that resistivity is a characteristic property of materials which shows the extent to which the material blocks flow of electricity. This proper proposes a technique for determining resistivity of retina reflecting the contribution of blood vessels present in retina [1]. The values are studied using the phenomenon of soil resistivity which is used to determine various characteristics of soil. By calculating retina resistivity values, a person's health can be judged. This study takes into consideration properties of tissue in multiscale determinations based on interaction of electromagnetic fields with neural tissues having relevance to dosimetry as well as neuroprosthetics.

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Conventionally, models at bulk tissue on cellular levels are determined using resultant voltage of existing tissue-scale models used as extracellular source. Taking Schlumberger four electrode probes circuit has been designed by placing specific resistor in series with ammeter for maintaining constant current. In comparison with Wenner method, Schlumberger method is more economical because of the centre remaining constant. In the design of instrumentation, need to be eliminated [3,4]. Reciprocity theorem can be applied to inverse Schlumberger array [5]. The self potential factor is automatically made negligible in this technique. The placement of electrodes has to be non-invariance considering the effect of electrodes has toe non-invasive considering the effect of probes on probes neural tissues and required spatial cells.

II. METHODOLOGY FOUR PROBE RESISTIVITY

For the study at steady temperature the relationship between Resistance R and resistivity is given by

$$R = \rho \frac{L}{A} \quad (1)$$

Where
L = Length
A = Area of cross section
For measurement of resistivity of semiconductors it must be noted that their resistivity is less than metals and more than non conductors such that semiconductors differ from metals in having the property of decreasing resistivity with increasing temperature [6].
It is known that energy band structure for semiconductors consists of valence band and conduction band. When an external electrification applied, electrons in valence band tend to have free movement resulting in flow of electric current. For intrinsic semi conductor, the Fermi level is in between the conduction band minimum and valence band maximum.In the case of intrinsic semiconductors, the Fermi level [7] lies in between the conduction band minimum and valence band maximum. The conduction band remains unoccupied at 0 k as no thermal excitation takes place with Fermi level than this band. Such a situation results in infinite resistance. As the temperature goes up occupancy in conduction band increases lowering the electrical resistivity [7].

For semiconductors, four probe measurements can be done by the following:-

1. It is assumed that resistivity is uniform in the measurement space
2. In case of minority carrier injection by the electrodes, the effect is minimised by recombination.
3. The surface of measurement is considered to be flat with negligible leakage of the surface.
4. Four probes are kept on a line.

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5. The diameter of contact area for probes and semiconductor is assumed to be negligible in comparison to inter electrode distance.
6. The boundary between electrodes carrying current and bulk material is considered to be hemispherical with small diameter.
7. The surface could be conducting or non conducting. Conducting boundary has low resistivity where as non conducting boundary is produced when surface of semi conductor has constant with insulator [8]

Figure 1 explains the pattern of resistivity keeping the side boundaries at sufficient far from probes, such that the die could be treated as equivalent to a slice. For a slice of thickness the sensitivity is

$$\rho = \frac{\rho_0}{f\,(w/s)} \tag{2}$$

Here the function f (w/s) gives the factor of division for determining the resistivity. This depends on w and s. Considering the size of metal tip to be infinitesimal and thickness to be greater than the inter electrode distance

$$\rho = \frac{V}{I} \times 2\pi S \tag{3}$$

Here
V = Voltage difference between inner probe
I = Current in outer probes.
S = gap between probes in m.

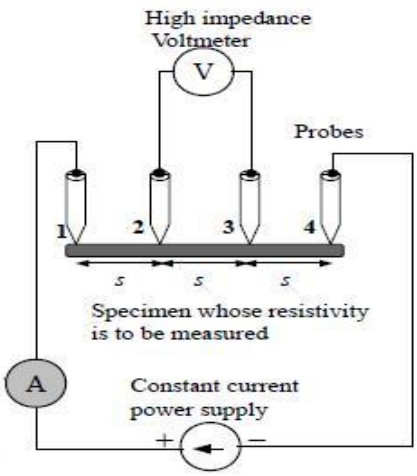

Figure 1: Measurement of resistivity using four probes

For geological measurements, the resistivity depends on the potential difference between the inner electrodes and the current earned by the outer electrode depending on the distribution of surrounding soils and rocks. Their pattern is followed in resulting electrical resistivity by DC method. Location of electrodes, in principle, need not be in line. However, in practice to have perfect geometry, the electrodes are placed in line. Direct current or commutated direct current on square wave alternating current can be applied. AC frequency should be low around 20 Hz. The direct current theory is applied in all these cases. The case of horizontally stratified ground and case of unvaried lots represented by vertical planes line a vertical fault with large throw and vertical like are also taken into consideration. The interpretation is done by qualitative comparison of observed response with that of idealized hypothetical models on the empirical methods. Many cases of mineral grains having soils and rocks are basically non conductive except in some exotic materials like metallic ones. Hence, the resistivity of rocks and soils is governed by quantity of pore water, resistivity and the pattern of pores. Variations of lithology are related to variation of electrical resistivity. So resistivity is useful in estimating the depth of bed rock and detecting bodies of anomalous materials. For granules soils, the ground water surface is normally marked by a sudden change in water saturation represented by change in resistivity [10]. IN case of fine grained soils, such clear demarcation may not happen as resistivity is linked to pore water condition.

However, zones of distinctive resistivity can be associated with specific soil or rock units on the ground of local field on drill hole information. Resistivity surveys can be gainfully extended to areas with very limited on nonexistent data. Anomalies can be also detected by intelligence operation methodology which detects and investigates such cases by complementary geophysical methods and/or drill holes.

Figure 2 shows the electric field around electrodes as the pattern of equipotential represent imaging shells on bowls covering the current electrodes assuming that electrical potential is uniform. The current lines represent 2 sampling of the infinitely multiple path follow by the condition that these must be normal to the equipotential surface. Data from these surveys is used to generate apparent values of resistance resulting in determination of resistivity. In the phenomenon of associate in Nursing electrical coverage is homogenous and isotropic half space which yields the measured relationship of voltage generated and the current applied. The exact value of associate in nursing conductor combine on other combination will be determined by superposition. Taking a single point electrode located on the boundary of a semi-infinite electrically homogeneous medium like earth, the Figure 2 current I and the potential at any purpose with in the medium or on the boundary are the important parameters.

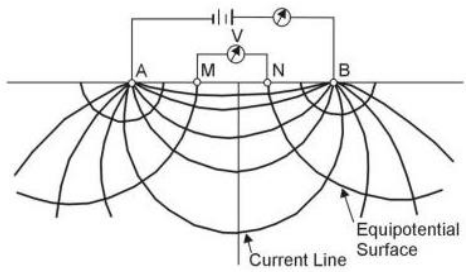

Figure 2: Equipotentials and current lines for a pair of current electrodes.

The current electrodes are A and B. The pair of electrodes M and N is for voltage measurement assuming that no current flows in this Schlumberger Array.

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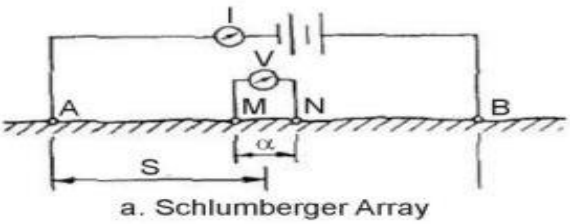

Figure 3: operation of schlumberger array

In Figure 3 this array is shown with L approaching zero in limit condition. V/α approaches the value of the potential gradient at the mid part of the array. Actually, sensitivity of instrument limits the ration of S and α to 30. It is recommended using a finite electrode spacing and equation.

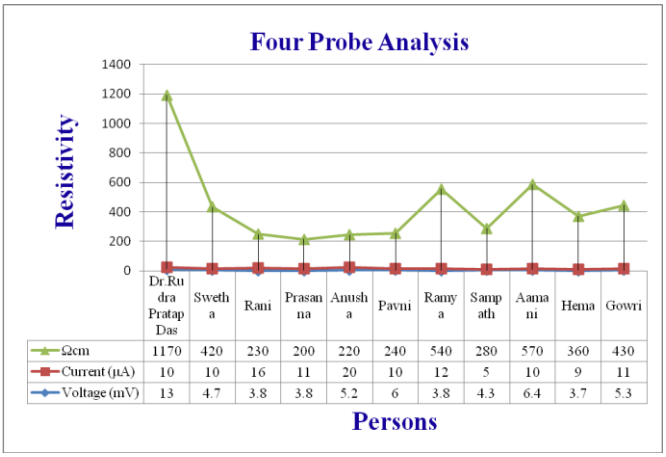

Figure 6 representing the four probe analysis

III. Retina Resistivity Analyzer Equipment

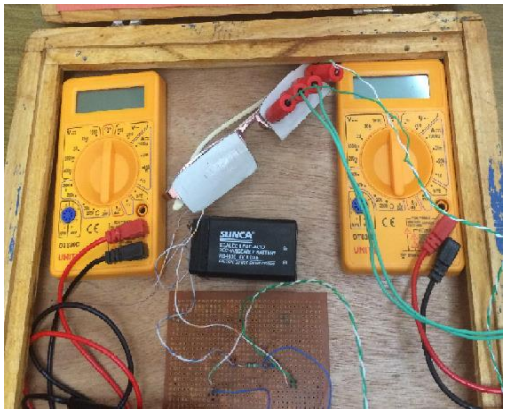

Figure 4 Retina resistivity analyzer Equipment

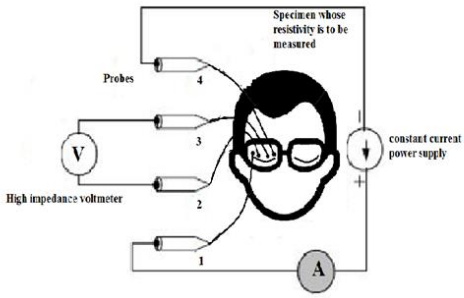

Figure 5 Instrument of human eyelid

Figure 4 and figure 5 explains the final set of the instrument on the human eyelid. Four smooth surface probes (1, 2, 3,4) are inserted into the spectacles from outside of the frame so when a person wears it, probes would touch the eyelid gently and values of voltage and current are taken using the 4 probe method. This complete arrangement is economical, simple in construction and understanding.

IV .Simulation Results

Resistivity measurements obtain from simulations conform that these are link to different conditions of retina. The classification of condition can be link with age clarity of eye site and general health.

Sno	Persons	Voltage (mV)	Current (μA)	Ωcm
1.	Dr.Rudra Pratap Das	13	10	1170
2.	Swetha	4.7	10	420
3.	Rani	3.8	16	230
4.	Prasanna	3.8	11	200
5.	Anusha	5.2	20	220
6.	Pavni	6	10	240
7.	Ramya	3.8	12	540
8.	Sampath	4.3	5	280
9.	Aamani	6.4	10	570
10	Hema	3.7	9	360
11	Gowri	5.3	11	430

Table 1 Representing values of different age group persons

It is found that for girls and boys in the range of 21-23 the case of clear eye sight can be related to lower values of resistivity for the same range of age but poor eye sight can be expected to have higher resistivity. It is known from medical science the liquid contain around retain dry up giving hardened conditions .This stage associated with resistivity bellowing 10kΩ cm in table 1and figure 6.

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V.CONCLUSION

Each and every individual has their own different resistivity value but between same ranges which vary between $2-5*10^3\Omega\ cm$ .It also differs with time. The value of resistivity increases with increase in age. From the above calculations, we can justify that a person whose age is 64 years has his resistivity value as $11.7*10^3\Omega\ cm$ whereas all the remaining people has resistivity values of range in between $2-5*10^3\Omega\ cm$.The people whose range is in between $2-5*10^3\Omega\ cm$ are in between the age group of 20 to 21 years who have the resistivity values at constant range. By this project we can justify that the resistivity values of retina varies in between person to person, age of as person and also varies from time to time.

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