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EARLY STAGE BREAST TUMOR REPORTING WITH APPLICATION TO DIELECTRIC PROPERTIES OF THE MALIGNANCY

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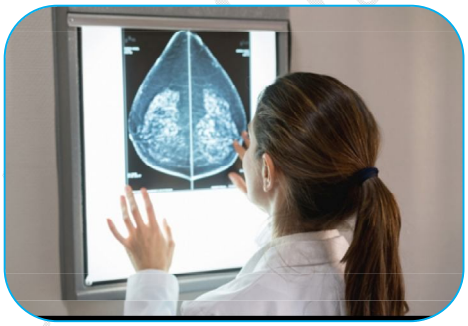
ABSTRACT:

One of the main causes of breast cancer is the beginning of abnormal growth of the breast cells. These cancerous breast cells divide very fast than that of the healthy cells. They continue to accumulate at a point in the body.There; they begin to form a lump or mass, which appears in the form of tumor at the point. Each breast contains 15to 20 glands called lobes, where milk is produced. These lobes are connected to the nipple by tubes. These tubes are called ducts. The structure of the lobes and ducts is similar to the branches of a tree. Breast cancer usually begins within the lobes.



KEYWORDS: *abnormal growth , breast cancer , accumulate.*

1.INTRODUCTION :

Breast cancer can sometimes spread to other areas of the body through this lymph system or they may also spread to the other parts of the body through the blood vessels. There is so much need to grow awareness among people regarding the breast tumor.The concerned people should always be concuss about any change in the shape or size of the breast or near its part. Any sign of appearance of abnormality near the breast portion may be the preliminary cause of the breast cancers. They may be checked for confirmation by family doctors.

2.INITIALIZATION OF BREAST TUMOR:

Our bodies are made up of a large number of cells. We have different types of cells for different parts of our body. The skin cells look differently from that of the liver cells. Similarly the skins cells work differently than that of the liver cells. Each cell contains DNA. The DNA instructs the cell on how to look and how to behave. Sometimes, our bodies need to make new cells to replace old cells or damaged cells. Therefore, the existing cell first makes an extra copy of all its DNA and then it splits into two. Each new cell receives a complete set of DNA instructions. This process can happen many times. So many cells can be doing this at any one time. Normally when a cell splits, a number of processes take place to make sure that the DNA has been copied correctly. The new cells have everything they need to work properly. If a mistake is found, then the cell would die. However, if these safety checks fail, the new cells may survive with mistakes in them. Often, a mistake in DNA may take place which is known as a mutation. Generally it is found that the mutation does not cause any problems. However, sometimes the mistake can make the new cells behave strangely. They may be splitting into abnormal cells at a fast rate. This is the main cause of forming a tumour. But it is to be noted that all the tumours so

formed are not cancerous. If the tumour cells don't have expansion properties and they are very unlikely to gain the ability to grow into neighbouring tissue, they are called benign tumours. Benign tumours often don't need treatment. They are not cancerous. However, if the tumour cells have the ability to invade neighbouring tissues, they are cancerous. Cancers can usually be treated in the early stage and they may be cured. Otherwise they may grow and spread and cause so many problems leading to the death of the patient in the long run.

3. GROWTH AND SPREAD OF BREAST CANCER:

If the cancerous breast cancers are not treated, they can grow bigger. They may invade over more surrounding breast tissues. The breast cancer that has not spread beyond the breast or armpit is known as primary, or early, breast cancer. Sometimes breast cancer cells break away from the original cancer and they enter the blood vessels. The can be travelling though these vessels In this way the cancer cells may settle in other areas of the breast. They may settle in the lymph nodes of the breast tissue. In this way a new tumour is formed. They may also spread to other areas of the body where they can form new tumours they are called secondary breast tumors.

4. BREAST CANCER TREATMENTS:

There are many treatments available for primary breast cancer and we often successfully get rid of this disease. There are also treatments for secondary breast cancer that can be cured. In this way we can help to control the disease and thus we can make slow its growth rate and spread rate[1-4].

Models of the human body may widely be used in several kinds of studies. These models may give information on human anatomy. The dielectric properties can be used for the evaluation of the electromagnetic field absorbed by the human body under several exposure conditions (Bernardi et al., 2004).However; the technique used to develop such kind of models is slow.

In the following, an automatic procedure will be illustrated to derive information on the dielectric properties of body tissues from a Magnetic Resonance Imaging (MRI) scanning. The procedure has been first proposed in 2003 (Mazzurana et al., 2003) and it aims at linking the voxel (a 3D pixel) intensities, recorded in the Nuclear Magnetic Resonance (NMR) scanner, to the relaxation time of the tissue filling the corresponding body area. Then, from the relaxation time, the tissue water content is derived; finally, from the water content, the tissue dielectric properties are obtained. Relationships between relaxation times, related to signal intensity, and water content of tissues have been reported in the literature (Fatouros and Marmarou, 1999; Whittall et al., 1997). The scope of this work is to present a possible way to implement the above mentioned tasks. Moreover, an optimization of the procedure previously proposed and alternatives to reach the same goal will be suggested. In fact, main limits of Mazzurana's approach can be found in the MRI sequence chosen and in the procedure used to evaluate dielectric properties from water content.

5. DIELECTRIC PROPERTY EVALUATION :

Schepps and Foster (1980) reported the dependence of tissue dielectric properties, as a function of frequency on water content. This equation, evaluated for each voxel, delivers the 3D dielectric human body model. The assumption behind the method of Schepps and Foster for the calculation of dielectric constants from the water content of a tissue is that, in the microwave range, cell membranes have very low impedance and tissues can be compared to suspensions of proteins in water5,6,7]. Eq. (1) shows these relationships:

$$\in = \in_w \left[\frac{1-P}{1+(K-1)P}\right] \left[1+\frac{KP\in P}{\in(1-P)}\right] \quad \text{.....1}$$

where

• $\in_w$ is the permittivity of water, it is given at a specific microwave frequency;

• P is the volume fraction of suspended solid,• ∈ P is the permittivity of the protein molecule;• K is a factor which depends on geometry and $\in_P$ Mazzurana and colleagues decided to proceed with the formulation of an empirical transfer function which relates directly the image signal with the relative permittivity and conductivity at a known frequency.

6. THE EXPERIMENTAL DATA COLLECTION:

The procedures to collect the data and to detect the tumor in 2D are similar to the procedures presented in [8]. However, in this study , the DCT of the signals are expressed in terms of feature vectors. The whole system for experimental data collection and detection process is shown in Figure [1]. Here, only the commercial UWB Tx-Rx with PC connectors has been utilized. The relative tumor formation and location detection can be studied by caliberating the the experimental datas. Tese results are in good agreement with the simulation results in [8]. The relative performance detection rate of tumor size also represents the stage of the tumor. Negative value for actual tumor size represents that there is no tumor. It has been found that sometimes the experimental results are better than that of the simulation results. This could be because of the use of actual UWB Tx-Rx, antennas, signals and DCT. Also, the number of signal value points obtained in the experimental work is set contains some signals correspond to tumor existence and some for tumor absence and approximately up to 100% tumor existence detection rate has been achieved.

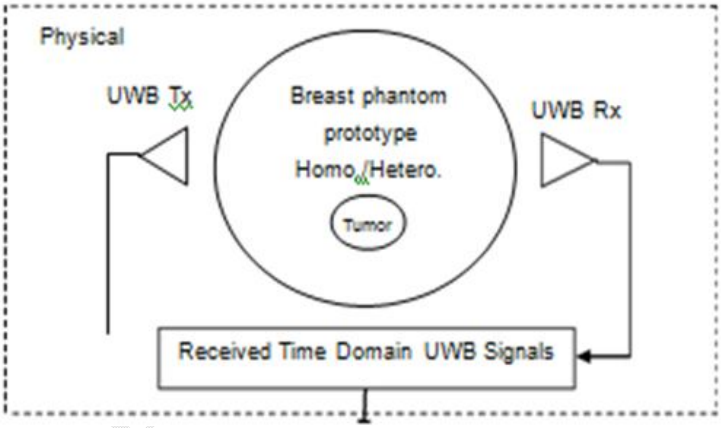


Figure [1] Data collection and detection set- up.

7. APPLICATION:

When the dielectric constant of the part of the breast can be determined, then there is need of preparing the calibration curve of variation of the dielectric constant of the slice of the breast with time for a particular people. As the abrupt variation in the water content or the dielectric properties of the slice of the breast appears, it must be reported to the concerned doctor. In this way the awareness of breast tumor can be induced to the people of the society. A time will come when the people of all section of the society will become free from this type of deadly diseases.[8-11].

8. CONCLUSION:

This article describes a semi automatic process to evaluate dielectric properties of a body part, starting from MRI images. The MRI images are manipulated in order to extrapolate information on the relaxation time. New fast and reliable strategies to quantitatively measure the absolute water content can be considered for its application to common people in future. Although this technique is easy to understand and to follow, but it is possible for only those persons who are educated and those who have medical conception of their bodies. In detection of the dielectric constant of the malignant part of

the breast be made easy and be available to every common people then this technique will be more beneficial for the people of the lower strata of the society.

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