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# BREAST CANCER DETECTING TECHNIQUE USING NII (NEAR INFRARED IMAGING)

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**ABSTRACT**

*Breast cancer is one of the most life-threatening diseases and hence its detection should be fast and accurate. A breast tumor is a collection (or mass) of abnormal cells in the breast. Breast tumors can be cancerous (malignant) or non-cancerous (benign). The detection can be achieved by the execution of automated tumour detection techniques on medical images. Some the presently using medical imaging techniques are MRI, CT, microwave which cannot detect below 3mm size can be detected using Near Infrared imaging technique (NII). The objective of this paper is to detect the breast tumor using the near infrared imaging technology for tumor size below 3mm which could not be detected using CT and MRI images. It is an non-invasive method of detecting tumors. NIR imaging uses the 780nm frequency NIR LED as transmitter and photo detector led is used for receiving. And for accurate result LSVM signal processing techniques is used.*

## 1. NTRODUCTION

Breast phantoms with optical characteristics comparable to those of normal breast tissue were used to simulate breast conserving surgery. Tumor-simulating inclusions containing the fluorescent dye Indo Cyanine Green (ICG) were incorporated in the phantoms at predefined locations and imaged for pre and Intra Operative tumor localization, real-time NIRF-guided tumor resection, NIRF-guided evaluation on the extent of surgery, and postoperative assessment of surgical margins. A customized NIRF camera was used as a clinical prototype for imaging purposes.

Breast phantoms containing tumor-simulating inclusions offer a simple, inexpensive, and versatile tool to simulate and evaluate intra operative tumor imaging. The gelatinous phantoms have elastic properties similar to human tissue and can be cut using conventional surgical instruments. Moreover, the phantoms contain hemoglobin and intra lipid for mimicking absorption and scattering of photons, respectively, creating uniform optical properties similar to human breast tissue. The main drawback of NIRF imaging is the limited penetration depth of photons when propagating through tissue, which hinders (noninvasive) imaging of deep-seated tumors with epi-illumination strategies. The existing system are Magnetic Resonance Imaging (MRI) depends on magnetic activity in the breast and does not use X-rays, so it is considered more safe than imaging techniques that do use X-rays. SPECT uses gamma rays, which are characteristically safer than other imaging systems using alpha or beta rays. Both PET and SPECT scans require the injection of radioactive materials, but the half-lives of isotopes used in SPECT can be more easily managed. The existing system of the project uses the RADAR technology. Use the micro wave imaging to detect the breast tumor The drawback of the existing system is micro wave may damage the breast cell if the level of the micro wave increased little bit.

The proposed system use Near Infrared Imaging for the tumor detection in breast. This NIR imaging uses the 780nm frequency IR LED for imaging. The 780nm wavelength led transmitter and photo detector led (Receiver) is used for the imaging .Which act like an radar system and for accurate result, LSVM signal processing techniques is used.

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## 2. PROPOSED SYSTEM

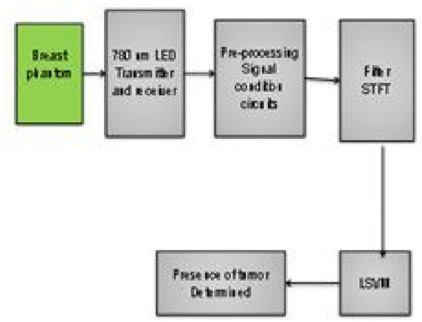


Fig .1 Block Diagram of proposed system

### 2.1. Near Infrared Sensor

It is a spectroscopic method that uses the near-infrared region of the electromagnetic spectrum (from about 700 nm to 2500 nm). Typical applications include pharmaceutical, medical diagnostics (including blood sugar and pulse oximetry), food and agrochemical quality control, and combustion research, as well as research in functional neuro imaging, sports medicine & science, elite sports training, ergonomics, rehabilitation, neonatal research, brain computer interface, urology (bladder contraction), and neurology (neurovascular coupling).

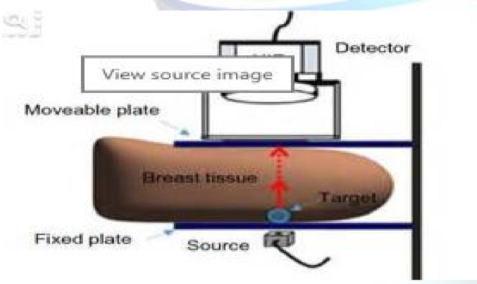


Fig2. NIR sensor

Common incandescent or quartz halogen light bulbs are most often used as broadband sources of near-infrared radiation for analytical applications. Light-emitting diodes (LEDs) are also used; they offer greater lifetime and spectral stability and reduced power requirements. The type of detector used depends primarily on the range of wavelengths to be measured. Silicon-based CCDs are suitable for the shorter end of the NIR range, but are not sufficiently sensitive over most of the range (over 1000 nm). In GaAs and PbS devices are more suitable though less sensitive than CCDs. In certain diode array (DA) NIRS instruments, both silicon-based and In GaAs detectors are employed in the same instrument. Such instruments can record both UV-visible and NIR spectra 'simultaneously'. Many commercial instruments for UV/vis spectroscopy are capable of recording spectra in the NIR range (to perhaps ~900 nm). In the same way, the range of some mid-IR instruments may extend into the NIR. In these instruments, the detector used for the NIR wavelengths is often the same detector used for the instrument's "main" range of interest. [6] discussed about an eye blinking sensor. Nowadays heart attack patients are increasing day by day."Though it is tough to save the heart attack patients, we can increase the statistics of saving the life of patients & the life of others whom they are responsible for.

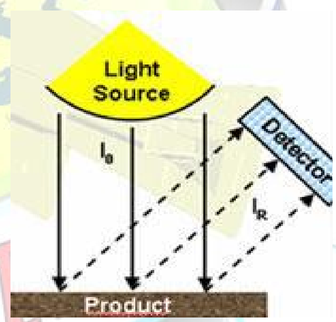


Fig3.wave from of NIR sensor

### 2.2. Signal Pre-processing

It is an analog to digital converter which includes filtering process. The STFT filter in this proposed system uses a capacitor. It is used to filter the unwanted noise signal.

#### 2.2.1. STFT Filter

Segment the signal into narrow time intervals (i.e., narrow enough to be considered stationary) and take the FT of each segment. Each FT provides the spectral information of a separate time-slice of the signal, providing simultaneous time and frequency information. Choose a window function of finite length. Place the window on top of the signal at t=0 Truncate the signal using this window. Compute the FT of the truncated signal, save results. Incrementally slide the window to the right. window reaches the end of the signal

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### 2.3. LSVM

LSVM is Lagrangian Support Vector Machine. It is used for further accurate results.

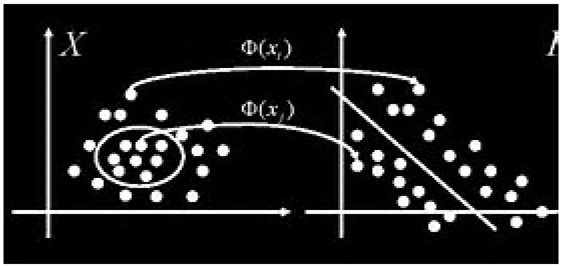


Fig.4 Hyper plane build by LSVM

Before stating our algorithm we define two matrices to simplify notation as follows:

$$H = D[A \quad -e], \qquad Q = \frac{I}{\nu} + HH'.$$

With these definitions the dual problem becomes

$$\min_{0 \le u \in R^m} f(u) := \frac{1}{2}u'Qu - e'u.$$

It will be understood that within the LSVM Algorithm, the single time $Q^{-1}$ that is computed at the outset of the algorithm, the SMW identity will be used. Hence only an matrix is inverted. The LSVM Algorithm is based directly on the Karush KuhnTucker
necessary and sufficient optimality
conditions KTP for the dual problem

$$0 \le u \perp Qu - e \ge 0.$$

By using the easily established identity between any two real numbers (or vectors) a and b :

$$0 \le a \perp b \ge 0 \iff a = (a - \alpha b)_+, \; \alpha > 0,$$

the optimality condition can be written in the following equivalent form for any positive α :

$$Qu - e = ((Qu - e) - \alpha u)_+.$$

These optimality conditions lead to the following very simple iterative scheme which constitutes our LSVM Algorithm:

$$u^{i+1} = Q^{-1}(e + ((Qu^i - e) - \alpha u^i)_+), \; i = 0,$$

for which we will establish global linear convergence from any starting point under the easily satisfiable condition:
Setting the gradient with respect to u of this convex and differentiable Lagrangian to zero gives

$$(Qu - e) + \frac{1}{\alpha}(Q - \alpha I)((Q - \alpha I)u - e)_+ - \frac{1}{\alpha}Q(Qu - e) = 0,$$

or equivalently:

$$(\alpha I - Q)((Qu - e) - ((Q - \alpha I)u - e)_+) = 0$$

which is equivalent to the optimality condition under the assumption that α is positive an not an eigen value.

## 3.RESULTS AND DISCUSSION

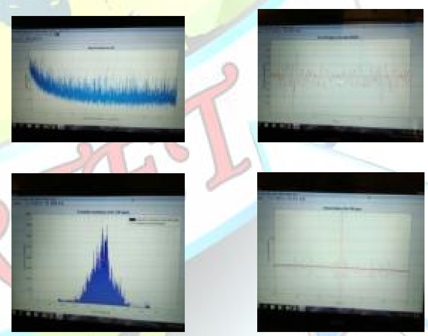

Fig.5 Sensor input and output signal for breast phantom

Near-Infrared Imaging and Tumor Compared with CT, and MRI, targeted NIR imaging, intraoperative x-ray fluoroscopy, affords the combination of tumor specificity, low cost, safety, and simplicity without exposing patients and personnel to ionizing.

The NIR sensor placed on the breast phantom. The sensor reading is preprocessed and amplified. The amplified signal in the output shows the trace of tumor in the breast phantom. The filter (STFT) is applied to reduce the noise. The LSVM is used separate the unwanted signals and to detect the tumor size.

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## 4. CONCLUSION

A low powered, high accurate, high speed technique has been presented for detecting the breast tumor less than 3mm. The performance of the NIR imaging has been verified in a head imaging system where a breast tumour was successfully detected in an artificial breast phantom.

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