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DETECTION OF BRAIN TUMOR BELOW 3MM USING NIR SENSOR

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Abstract - *: Brain tumor is one of the most life-threatening diseases and hence its detection should be fast and accurate. This can be achieved by the execution of automated tumour detection techniques on medical images. Some the presently using medical imaging techniques are MRI, CT, micro wave which cannot detect below 3mm size can be detected using Near Infrared imaging techniques*

Key Words: *Near infrared, medical imaging*

I. INTRODUCTION.

The aim objective of this project to detect the brain 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 methods of detecting tumors. A brain tumor is a collection (or mass) of abnormal cells in the brain. The skull is very rigid and the brain is enclosed, so any growth inside such a restricted space can cause problems. Brain tumors can be cancerous (malignant) or non-cancerous (benign). The existing system are Magnetic Resonance Imaging (MRI) depends on magnetic activity in the brain 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 more safe 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 exiting system of the project uses the RADAR technology .Use the micro wave imaging to detect the brain tumor .The draw back of the exiting system is micro wave may damage the brain cell if the level of the micro wave increased little bit.

II.PROPOUSED SYSTEM

Here instead of using radar technologies, a new Near infrared imaging is proposed for the tumor detection in brain .This NIR imaging uses the 780nm frequency IR LED for imaging. The 780nm 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

III- 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 neuroimaging, sports medicine & science, elite sports training, ergonomics, rehabilitation, neonatal research, brain computer interface, urology (bladder contraction), and neurology (neurovascular coupling).

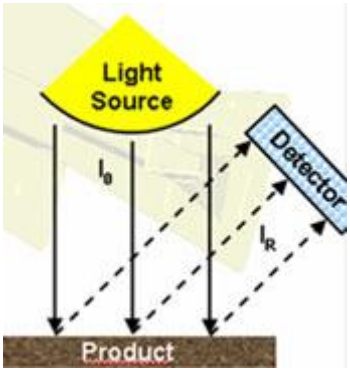

Fig1: proceses of NIR sensor

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.[2]

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.

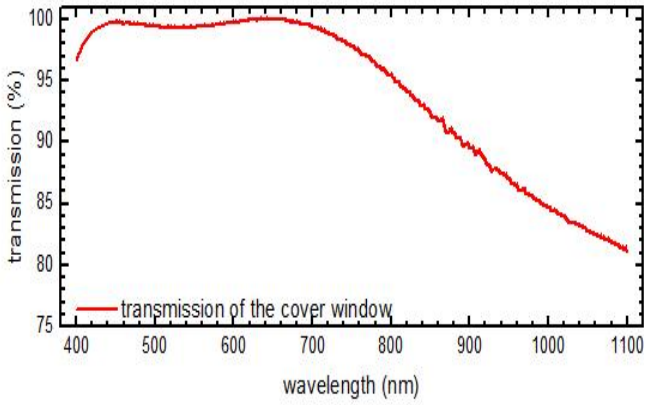

Fig2:wave from of NIR sensor

IV. 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

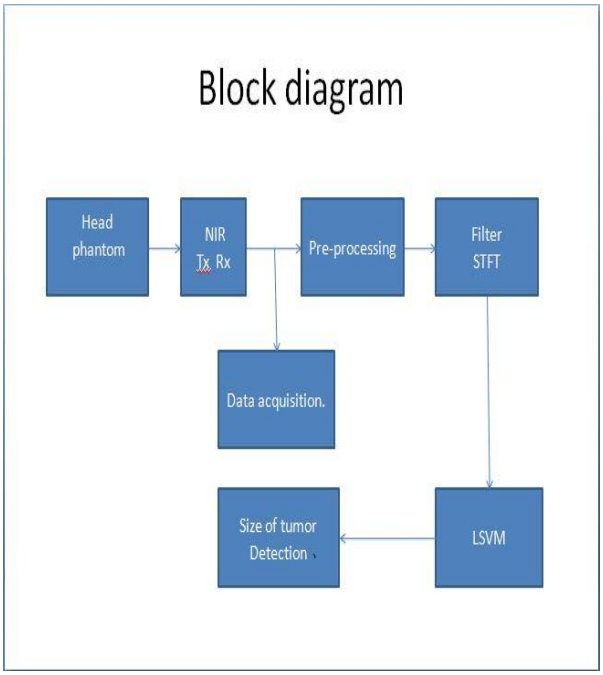

FIG3: Block diagram of proposed system

V. LSVM (Lagrangian Support Vector Machine) Algorithm

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 Q^{-1} single time 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-Kuhn-Tucker necessary and sufficient optimality conditions KTP for the dual problem

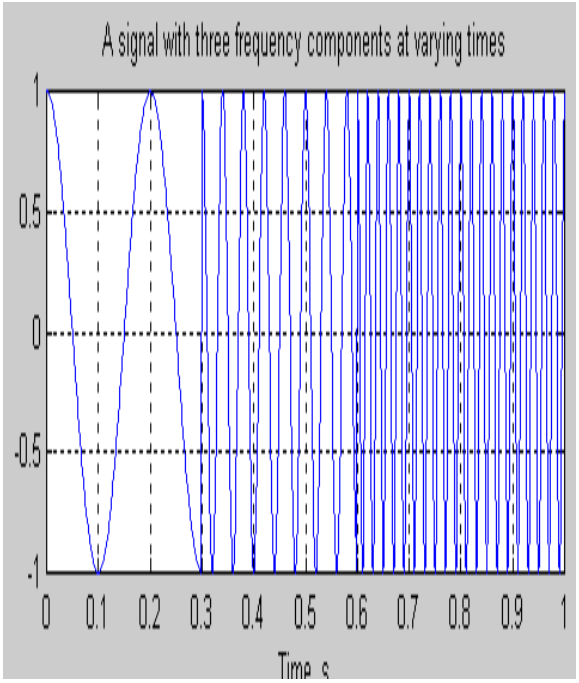

Fig4:signals from stft filter

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

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 eigenvalue

VI-DISCUSSION

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

FUNCTION

The NIR sensor placed on the head phantom. the sensor reading is preprocess (amplifying the signal)The filter(STFT) is applied to reduce the noise. The LSVM is used separete the siganls Then tumour size is detecte

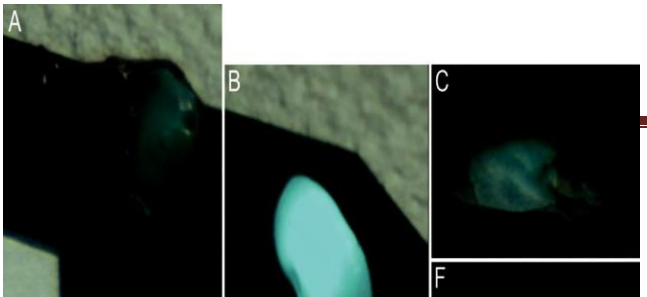

fig:5:result image of brain tumor

VII-CONCLUTION

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

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