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Removing Water Droplets In Medical Images Using Textured Spectral Analysis

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Abstract

Some disease in human body is caused by accumulation of water molecules at particular place in an organ or entering of unwanted toxic foreign bodies. This may be in large or in negligible amounts. Many methods like CT, MRI can detect these abnormalities if present in appreciable amount. But if present in small amount, human vision on these scanned images cannot detect them. The visual appearance of moving water droplet is very complex. Each water droplet refracts and reflects both scene radiance and atmospheric illumination toward an observer. Water droplets are randomly distributed in space and move at high velocities. Thus, water droplets produce spatial and temporal intensity fluctuations in videos. Modelling, analysing and detecting these unwanted water molecules may benefit avoiding the negligence of presence of disease. In this paper, the proposed system that detect water molecules in the images of affected organ like lungs automatically .The crux idea is to exploit textural properties of droplets or fluid. To perpetrate this idea, we are aiming to model these droplets by laws of physical science and reveal this through block processing of image pixels. For partially occluded image portions, information of the image may be used to be applied in transform like DCT, blending functions and retrieve it. For fully occluded image, image completion techniques can be used. By using this we can detect the droplets even if they are in micron size.

Keywords: *Water droplet, textural property , DCT*

INTRODUCTION

Medical imaging is the technique and process of creating visual representation of interior of body for clinical analysis and medical intervention through various techniques like X-ray, CT, MRI, PET, MEG, the detection process of these images may be quite challenging if the affecting foreign molecules are present in trivial amounts. These water molecules clog and disfigure some image areas which disturb the performance of various algorithms in medical imaging systems. Due to the high velocity of the water droplets, their perspective projection forms water streaks. Detection of these water streaks becomes more difficult if there are moving objects in the continuous imaging system. To address this problem we analyse the textural appearance of these droplets and reckoning them. We present a pixel based detection method which can be applied to the droplets in variant of their size, even if in microns. For removing water droplet during acquisition of images being proposed a method by adjusting the camera parameters. Here, image coverage time is increased, or the intensity of the image field is reduced.

MEDICAL IMAGING TECHNIQUES

CT

Computerized Tomography combines a series of x-ray images taken from different angles and uses computer processing to

create cross sectional images, slices of bones, blood vessels ,soft tissues inside the body .It diagnose disease/injury as well as to plan medical, surgical, radiation treatment

MRI

Magnetic Resonance Imaging is a type of scan that uses strong magnetic field and radio waves to produce detailed images of the inside of the body .It can examine different parts like brain, spinal cord ,breast, blood vessels ,liver ,womb, prostate gland.

Table1: *Comparison of different imaging techniques*

Parameters	**CT**	**MRI**	**MEG**	**PET**
Commonly used for	Brain	Spinal cord and brain	Neural images of brain	Lungs, breasts, heart
Imaging source	Electrical energy	Magnetic and radio frequency pulses	Magnetometers	Radioactive tracers
Pros and cons	High doses of radiation (100 times than x-rays)	Contrast dye causes allergic reaction	No side effects	Low dose exposure(bleeding, soreness)
Cost effectiveness	More	Moderate	Less	High

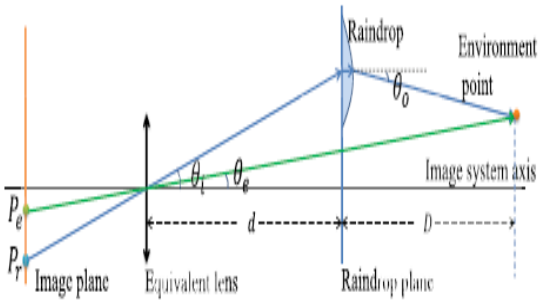

Fig 1. *Light path model in water droplet*

MEG

Magneto Encephalography is a functional neuro imaging for mapping braining activity by recording magnetic fields produced by electrical currents occurring naturally. This can be applied in a clinical sitting to find locations of abnormalities as well as in experiments to simply measure brain activity.

PET

Positron Emission Tomography is an imaging test that allows your doctor to check for diseases in your body .The scan uses a special dye that has radio- active tracers. These tracers are injected into a vein in your arm.

EXISTING METHODS FOR IMAGE COMPLETION:

Motion field transfer

They take samples of motions data into a high dimensional generalization [1] of a vector field which we called a motion field. By using the continuity (continuous locomotion) a single frame is taken and replicate from character's resulting state.

Sparse Tracking

They concentrate the local representations and do not make full use of intrinsic structure and inside target candidates .So the representation is less effective when similar objects appear or under occlusion.

Trajectory Linking:

By locating the colloidal particles in a sequence of video images, they match up locations in each image with corresponding locations in later images to produce trajectory. They require O(N!) computations.

Space Time Completion

These technique samples spatio-temporal patches [21] from other video portions. This can be applied static and dynamic

objects and background information this method is useful for complex dynamic scenes. They require consistency between all patches .So they use large image patches for finding hidden portions which results in large memory and high access time.

PROPOSED SYSTEM

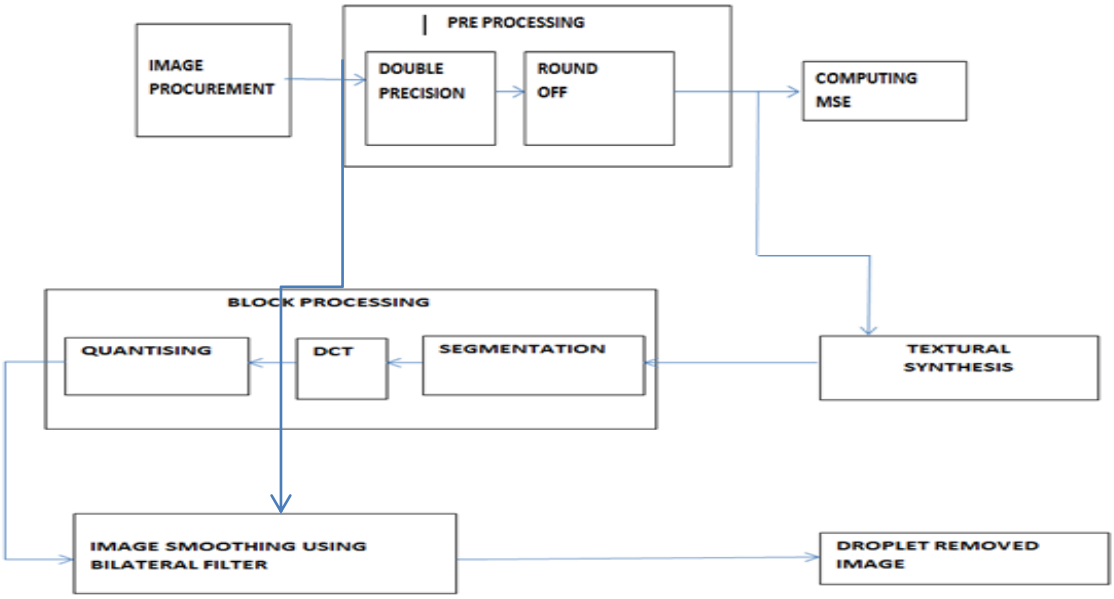

Fig.2 *Block diagram for proposed system*

Textured Structural Analysis

Texture in image processing means variation in intensity ranges in images. Images with smoother portions have small range of intensity values and those with coarse portions have larger ranges. We propose a new technique of detecting the droplets and recover the occluded portions through textured structural analysis we assume the texture as a combinations of homogeneous regions (texture primitives)..Thus through these textural syntheses we get the decomposed texture layer .

Block Processing

Through block processing, the large complex image is segmented into smaller blocks of size as specified .Thus rather applying transform directly to the larger image which consumes much time and provides less accurate image ,we apply the transform to the region spitted blocks

Discrete Cosine Transform

It converts a finite sequence of data samples into a sum of cosine terms oscillating at different frequencies. In particular DCT2 is used for image compression. It is fast algorithm for computation of data points in image blocks.

Bilateral Filter

We use bilateral filter for smoothing image portions occluded by droplets. Here we use the advantage of bilateral filter of preserving the edge points in the image, thus providing more accurate smoothing results. In this filter, the pixels are replaced by weighted average of other pixels.

RESULTS

Fig.3 *Image affected with water droplet*

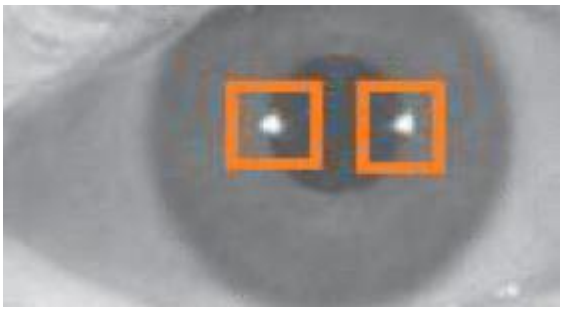

Fig.4 *Edge detected image*

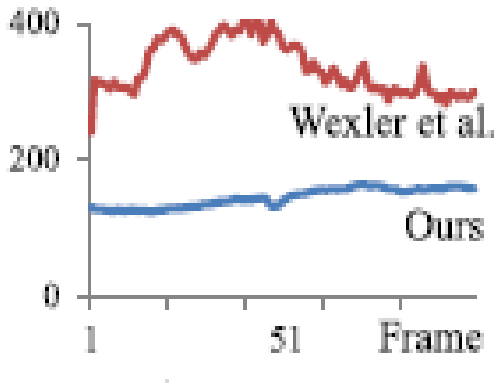

Fig.5 *Mean Square Error*

CONCLUSION

We have developed a method to detect and remove the effects of water droplets that cause glare using optical shutter array. Thus our method can detect and restore droplets irrespective of their size that is even if they are in microns. This method finds a great usage in detection of the micro droplets in scanning displays of imaging units. The detection of droplets using textural analysis can be used in any sophisticated images. We have introduced a novel method to detect and remove adherent water droplet in medical images. The key idea of detecting water droplet is based on our theoretical findings that the motion of water droplet pixels is slower than that of non- water droplet pixels, and the temporal change of intensity of water droplet pixels is smaller than that of non-water droplet pixels. The key idea on water droplet removal is to solve the blending function with the clues from detection. We believe our method is useful for continuous surveillance of the ICU patients.

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