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SURVEY OF REGION OF INTEREST AND ITS APPLICATIVE UTILITY IN VARIOUS AREAS OF MEDICAL FIELD

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ABSTRACT

Recently the medical field has started using images and storing them for future reference also for most of the disease. So there is an increase in taking number of images for different disease. Also for a single person more number of images are taken from different angles. So there are different issues related with taking images and storing them for later viewing or analysis. Also in that images there would be only certain region which will be of importance and the other region will be of no interest. So the concept of finding region of interest from the images and storing images such that the region of interest in images would not be compressed and other part in the image would be compressed. Due to this there will be saving in the storage space also. So in this paper we try to survey different medical field where this type of concept will be used and then try to compare from different paper how useful the above mentioned concept is.

Keywords: Image Processing, Medical field, Region of Interest (ROI), Video Processing

I INTRODUCTION

Medical field is nowadays using computer operated software / hardware for diagnosis of various disease or to analyse various parts of body. For that they are taking various images of the body parts in terms of X-rays or Ultra sonic etc. So image processing is gaining much importance in the field of medical. Doctors rely on the images captured by various devices and then view the image and according to the image taken give the diagnosis. Often after giving the diagnosis they store such images for either near future use or for records purpose. Now if they are going to store images of each and every patient that they are going to diagnose then at the end of the day it would result into bulkier storage and after certain months even GBs of hard disk would be full. Then they are left with either going for new storage option or otherwise store the images in such a way that they occupy less space or gaining freedom of storing more numbers then. Now if the images are stored in compressed form then there is chance of loss of vital information in the image which may lead to wrong diagnosis. So Region of interest is an important concept where the doctor can save space and at the same time store image without losing the vital information. So in this paper we will be analysing the areas where region of interest can be applied in the medical domain. The outcomes of this survey can be an aid to researchers in this field.

1.1 Different Areas where ROI technique can be applied in medical domain

a. Respiration rate (RR) is one of the important vital signs used for clinical monitoring of neonates in intensive care units. Detection of the chest-and-abdomen region of the neonate is crucial to determining the respiration rate accurately [1]. As the skin of neonates is very fragile, it is preferred to have monitoring systems with minimal contact. Hence, recently several methods of contact free monitoring of vital signs using video cameras have been proposed. Monitoring of vital signs aids in proper diagnosis and provides early indications of hidden clinical abnormalities. Neonatal Intensive Care Units (NICU) commonly monitors the respiration rate (RR), the heart-rate (HR), and the blood oxygen saturation (SPO2) of neonates [4]. Most monitoring systems acquire vital signs using electrodes or contact sensors positioned suitably at various points on the body. It is desirable to have monitoring systems for neonates that have minimal or no contact with the neonate since the electrodes/sensors may often cause discomfort to the neonate in the form of shearing of the skin, scars, irritation, and etc. [5]. Due to this reason, contact free monitoring of vital signs has recently been achieved by means of a video camera positioned suitably in the vicinity of the baby [6], [7]. Here we can identify the ROI, which for this purpose can be Chest-and-abdomen region.

This region must be demarcated from the remaining body parts of the neonate (e.g., head, hands, legs) and constantly monitor only this ROI region in order to compute the RR from the video stream.

Fig 1 Neonatal Intensive Care Unit

Image URL: http://3.bp.blogspot.com/hUxQKflTkLM/TY9Kys4ewDI/AAAAAAAAAG8/nzgYjOO8s_8/s320/R_sun1.jpg

b. Human spine is a multifunctional structure of human body consisting of bones, joints, ligaments, and muscles which all undergo a process of change with the age. A sudden change in these features either naturally or through injury can lead to some serious medical conditions which puts huge burden on health services and economy. While aging is inevitable, the effect of aging on different areas of spine is of clinical significance. So any image taken of spine can be of importance in finding ROI from the image according to need.

c. Dry eye is a symptomatic disease that affects the activities of daily living, adversely impacting important task such as computer use, driving and others. For automatic image processing methodology to be applied to this, there are two clinical test : analysis of lipid pattern and tear film breakup time test. In tear film breakup time test experts usually analyze the bottom part of the iris ignoring certain areas such as sclera, eyelids etc and focusing on the area where the tear has higher contrast. This will lead to the fist step which consist of preprocessing the images to extract the region of interest.[8]

d. For the diagnosis in the gynecology field different diagnostic capabilities have brought certain advancement. Different methodology includes 3D ultrasound, Ultrasound Contrast Media and Harmonic imaging in its various forms and its derivatives have been there. Image segmentation is commonly used to define tissue and fluid boundaries, either by manual or semi automated methods. Segmentation and classification process separate region of interest from surrounding tissue or acoustic noise that prevents visualization of anatomic structures. Several different methods are there defined for detection of surface boundaries by image segmentation. Once the boundaries are defined a particular region of interest can be analyzed for quantitative volume measurements. [9]

e. This concept of Region of interest can be evaluated for the tumor tracking accuracy also. Although conventional wisdom states that the ROI reconstruction requires a priori information of a small region inside the ROI and 180° scanning without angular truncation for accurate image reconstruction, the computer simulation showed that the ROI reconstruction method without any a priori information had equivalent accuracy in terms of tumor tracking compared with the case reconstructing the entire region. [3]

1.2 Algorithm how one can proceed for selecting ROI

By seeing the above applications the need for selecting ROI is getting more prominent and for that the proposed algorithm would be as follow.

a. Firstly some data set is need for training purpose to train computer with some images of similar types.
b. Second step would be to generate some feature vector based on region of interest part of the training images.
c. Some test images are to be provided based on the training set of images and the applications should be able to automatically identify the region of interest part from the images.
d. Then after selecting the ROI automatically the system should be trained to segment that ROI part and compress the rest of the image.
e. After that ROI part should be merged with the compressed image and then it should be stored in the system.

By following the above steps our applications would be able to select ROI and then store the images in such a manner that the size of the image is reduced.

II CONCLUSION

So we have here surveyed different medical field be it orthopaedic field, genecology field, paediatric field etc where Region of Interest concept can be applied and can be helpful to the Doctors / practitioners to give the analysis and can help them to save more data then they were able to save previously. Future work can be to select different field and show the comparisons how the space reduction can actually happen by our proposed technique.

REFERENCES

[1] Venkitaraman, A., & Makkapati, V. V. (2015, January). Motion-based segmentation of chest and abdomen region of neonates from videos. In*Advances in Pattern Recognition (ICAPR), 2015 Eighth International Conference on* (pp. 1-5). IEEE.

[2] Halter, R., Hartov, A., Poplack, S., diFlorio-Alexander, R., Wells, W., Rosenkranz, K., ... & Paulsen, K. (2015). Real-time electrical impedance variations in women with and without breast cancer.

[3] Tashima, H., Yoshida, E., Shinaji, T., Haneishi, H., Ito, H., & Yamaya, T. (2013, October). Monte Carlo simulation of region-of-interest reconstruction for real-time tumor tracking by OpenPET. In *Nuclear Science Symposium and Medical Imaging Conference (NSS/MIC), 2013 IEEE* (pp. 1-3). IEEE.

[4] M. R. Neuman, Neonatal Monitoring. John Wiley and Sons, Inc., 2006.

[5] D. Teichmann, C. Bruser, B. Eilebrecht, A. Abbas, N. Blanik, and S. Leonhardt, "Non-contact monitoring techniques - principles and applications," in Engineering in Medicine and Biology Society (EMBC), Annual Intl. Conf. IEEE, 2012., 2012, pp. 1302–1305.

[6] M.-Z. Poh, D. J. McDuff, and R. W. Picard, "Advancements in non contact, multiparameter. physiological measurements using a webcam," IEEE Trans. Biomedical. Eng., vol. 58, no. 1, pp. 7–114, Jan. 2011.

[7] ——, "Non-contact, automated cardiac pulse measurements using video imaging and blind source separation," Opt. Expr., vol. 18, pp. 10 762– 10 774, May 2010.

[8] Image Analysis and Modeling in Opthamology By Eddie Y. K. Ng, U. Rajendra Acharya, Jasjit S. Suri, Aurelio Campilho February 11, 2014 by CRC Press ISBN 9781466559301

[9] Ultrasound and Color Doppler in Obstetrics, Gynecology and Infertility by Prof. R Rajan , Indian Academy of human reproduction, Kerala, India