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Prediction of Chronic Kidney Disease Using Adaptive Network

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ABSTRACT: Chronic kidney disease, also called chronic kidney failure, involves a gradual loss of kidney function. Your kidneys filter wastes and excess fluids from your blood, which are then removed in your urine. Advanced chronic kidney disease can cause dangerous levels of fluid, electrolytes and wastes to build up in your body.In the early stages of chronic kidney disease, you might have few signs or symptoms. You might not realize that you have kidney disease until the condition is advanced.Treatment for chronic kidney disease focuses on slowing the progression of kidney damage, usually by controlling the cause. But, even controlling the cause might not keep kidney damage from progressing. Chronic kidney disease can progress to end-stage kidney failure, which is fatal without artificial filtering (dialysis) or a kidney transplant. Kidney is consisted of four different structures with different functions. That is renal cortex, renal column, renal medulla and renal pelvis. Different kidney diseases affect different part of kidney. For example, kidney tumor usually occurs in renal cortex, renal column hypertrophy may exist in renal column, medullary cystic kidney disease usually exists in renal medulla, and transitional cell l cancer, renal pelvis and ureter cancer may attack renal pelvis. The proposed method consists of two main parts localization of renal cortex and segmentation of kidney components. In the localization phase, a fast localization method which effectively combines 3D GHT and 3D AAM is proposed, which utilizes the global shape and texture information. In the segmentation phase, a modified RF method and a cortex thickness model are proposed to efficiently accomplish the multi-structure segmentation task. Finally obtain the diseases in kidney.

I. INTRODUCTION

Medical imaging is the technique and procedure of creating visual demonstration of the internal of a body for experimental analysis and health intervention. Medical imaging seeks out to disclose internal structures hidden by the skin and bones, as well as to diagnose and treat disease. Medical imaging also establishes a database of normal anatomy and physiology to make it possible to identify abnormality. Although imaging of removed organs and tissues can be performed for medical reasons, such procedures are usually considered part of pathology instead of medical imaging. As a discipline and in its widest sense, it is part of biological imaging and incorporates radiology which uses the imaging technologies of X-ray radiography, magnetic resonance imaging, medical ultrasonography or ultrasound, endoscopy, elastography, tactile imaging, thermography, medical photography and medicine functional techniques as positron emission tomography.

In the clinical context, "imperceptible light" medical imaging is generally associate to radiology or "medical imaging" and the medical practitioner responsible for understanding (and sometimes acquiring) the images are a radiologist. "Visible light" medical imaging involves digital video or still pictures that can be seen without special equipment. Dermatology and wound care are two modalities that use visible light imagery. Diagnostic radiography designates the technical aspects of medical imaging and in particular the acquisition of medical images. The radiographer or radiologic technologist is usually responsible for acquiring medical images of diagnostic quality, although some radiological interventions are performed by radiologists. As a field of scientific investigation, medical imaging constitutes a sub-discipline of engineering, medical or medicine depending on the context:

Research and development in the area of instrumentation, image acquisition (e.g. radiography), modeling and quantification are usually the preserve of biomedical engineering, medical physics, and computer science; Research into the application and interpretation of medical images is usually the preserve of radiology and the medical sub-discipline relevant to medical condition or area of medical science (neuroscience, cardiology, psychiatry, psychology, etc.) under investigation. Many of the techniques developed for medical imaging also

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have scientific and industrial applications. Medical imaging is often perceived to designate the set of techniques that noninvasively produce images of the internal aspect of the body.

In this restricted sense, medical imaging can be seen as the solution of mathematical inverse. This means that cause (the properties of living tissue) is inferred from effect (the observed signal). In the case of medical ultrasonography, the probe consists of ultrasonic pressure waves and echoes that go inside the tissue to show the internal structure. In the case of projection radiography, the probe uses X-ray radiation, which is absorbed at different rates by different tissue types such as bone, muscle and fat. The term noninvasive is used to denote a procedure where no instrument is introduced into a patient's body which is the case for most imaging techniques used. The MIPAV (Medical Image Processing, Analysis, and Visualization) application enables quantitative analysis and visualization of medical images of numerous modalities such as PET, MRI, CT, or microscopy. Using MIPAV's standard user-interface and analysis tools, researchers at remote sites (via the internet) can easily share research data and analyses, thereby enhancing their ability to research, diagnose, monitor, and treat medical disorders. MIPAV is a Java application and can be run on any Java-enabled platform such as Windows, UNIX, or Macintosh OS X. Cardiovascular disease is the leading direct or contributing cause of non-accidental deaths in the world. As a consequence, the current research is particularly focused on its early diagnosis and therapy. An example of this effort is the delineation of the left ventricle (LV) of the heart, which turns out to be an important tool in the assessment of cardiac functional parameters such as ejection fraction, myocardium mass, or stroke volume. Fully automatic and reliable segmentation methods are desirable for the quantitative and massive analysis of these clinical parameters, because the traditional practice of manual delineation of the heart's ventricles is subjective, prone to errors, tedious, hardly reproducible, and very time-consuming - typically between 1and 2 h per cardiac study, thus exhausting the radiologist's capacity and resources.

Even though the most relevant medical information can be extracted from the left heart, a segmentation of the whole heart (and eventually also the great vessels) can be useful to extract a model of the organ before surgery or to facilitate diagnosis. Compared with other imaging modalities (such as ultrasound and magnetic resonance imaging), cardiac computed tomography (CT) can provide detailed anatomical information about the heart chambers, great vessels, and coronary arteries. Actually, CT is often preferred by diagnosticians since it provides more accurate anatomical information about the visualized structures, thanks to its higher signal-to-noise ratio and better spatial resolution. Although computed tomography was at one time almost absent in cardiovascular examinations, recent technological advances in X-ray tubes, detectors, and reconstruction algorithms, along with he use of retrospectively gated spiral scanning, have opened the doors to new diagnostic opportunities,
enabling the non-invasive derivation of the aforementioned functional parameters. Therefore, computed tomography becomes an important imaging modality for diagnosing cardiovascular diseases. In the recent literature, one can find many papers which tackle the (semi-)automated segmentation of the heart from CT or MRI scans. These works deal with different strategies for approaching the segmentation task, including image-driven algorithms, probabilistic atlases, fuzzy clustering, deformable models, neural networks, active appearance models, anatomical-based landmarks, or level set and its variations. A comprehensive review of techniques commonly used in cardiac image segmentation can be found. Nevertheless, many published methods have various disadvantages for routine clinical practice: they are either computationally demanding, potentially unstable for subjects with pathology, limited to the left ventricle, require additional images to be acquired, or need complex shape and/or gray-level appearance models constructed (or 'learned') from many manually segmented images -

II. LITERATURE SURVEY

A Fast and Robust Level Set Method for Image Segmentation Using Fuzzy Clustering and Lattice Boltzmann Method Author(s):Souleymane Balla: In the LSM, the movement of the zero level set is actually driven by the level set equation (LSE), which is a partial differential equation (PDE). For solving the LSE, most classical methods such as the upwind scheme are based on some finite difference, finite volume or finite element approximations and an explicit computation of the curvature. Unfortunately, these methods cost a lot of CPU time. Recently, the lattice Boltzmann method (LBM) has been used as an alternative approach for solving LSE. It can better handle the problem of time consuming because the curvature is implicitly computed and the algorithm is simple and highly parallelizeable. The LBM is used to solve the LSE. The proposed method is based on the approach of the LBM PDE solver defined. In the proposed method, using a modified FCM objective function, we designa new fuzzy external force (FEF). The method is fast, robust against noise, and efficient whatever the position or the shape of the initial contour and can detect efficiently objects with or without edges. It has, first, the advantage of the FCM which gives it the latitude to stop the evolving curve according to the membership degree of the current pixel, second, the advantages of the LSM which allow it to handle complex shapes, topological changes, and different constraints on the contour smoothness, speed,

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size, and shape which are easily specified, and, third, the advantages of the LBM which make it very suitable for parallel programming due to its local and explicit nature. Segmentation of medical images is a key step to gathering anatomical information for diagnosis or interventional planning. Renal volume and perfusion, which can be extracted from CT images, are typical examples for nephrologists. However, it is often long and tedious for clinicians to segment 3D images.

Automatic Detection and Segmentation of Kidneys in 3D CT Images Using Random Forests Author(s): Remi Cuingnet, Raphael Prevost1, David Lesage: Segmentation of medical images is a key step to gathering anatomical information for diagnosis or interventional planning. Renal volume and perfusion, which can be extracted from CT images, are typical examples for nephrologists. However, it is often long and tedious for clinicians to segment 3D images. Automatic and fast segmentation algorithms are thus needed for practical use. It is yet still challenging to design an algorithm robust enough to noise, acquisition artifacts or leakages in neighboring organs. Kidney segmentation in 3D CT images allows extracting useful information for nephrologists. For practical use in clinical routine, such an algorithm should be fast, automatic and robust to contrast agent enhancement and fields of view. By combining and refining state of- the-art techniques (random forests and template deformation), we demonstrate the possibility of building an algorithm that meets these requirements. Kidneys are localized with random forests following a coarse to- fine strategy. Their initial positions detected with global contextual information are refined with a cascade of local regression forests. A classification forest is then used to obtain a probabilistic segmentation of both kidneys.

Fully Automatic Segmentation of AP Pelvis X-rays via Random Forest Regression and Hierarchical Sparse Shape Composition Author(s): Cheng Chen and Guoyan Zheng: Segmenting anatomical regions such as the femur and the pelvis is an important task in the analysis of conventional 2D X-ray images, which benefits many applications such as disease diagnosis, operation planning/intervention, 3D reconstruction and so on. Traditionally, manual segmentation of X-ray images is both time-consuming and error-prone. Therefore, automatic methods are beneficial both in efficiency and accuracy. However, automatic segmentation of X-ray images Face many challenges. The poor and non- uniform image constrast, along with the noise, makes the segmentation very difficult. Occlusions such as the overlap between bones make it difficult to identify local features of bone contours. Furthermore, the existence of implants drastically interferes with the appearance.

Therefore, conventional segmentation techniques, which mainly depend on local image features such as the edge information, cannot provide satisfactory results, and model based segmentation techniques are often adopted. However, model based methods suffer from the requirement of proper initialization, which is typically done manually, and the limited converging region, leading to unsatisfactory results. This paper presents a novel texture and shape priors based method for kidney segmentation in ultrasound (US) images. Texture features are extracted by applying a bank of Gabor filters on test images through a two-sided convolution strategy. The texture model is constructed via estimating the parameters of a set of mixtures of half-planed Gaussians using the expectation-maximization method. Through this texture model, the texture similarities of areas around the segmenting curve are measured in the inside and outside regions, respectively. We also present an iterative segmentation framework to combine the texture measures into the parametric shape model proposed by Leventon and Fauger as. Segmentation is implemented by calculating the parameters of the shape model to minimize a novel energy function. The goal of this energy function is to partition the test image into two regions, the inside one with high texture similarity and low texture variance, and the outside one with high texture variance. The effectiveness of this method is demonstrated through experimental results on both natural images and US data compared with other image segmentation methodsand manual segmentation

Segmentation of Kidney From Ultrasound Images Based on Texture and Shape Priors Author(s): Jun Xie, Yifeng Jiang, and Hung-tat Tsui: This paper presents a novel texture and shape priors based method for kidney segmentation in ultrasound (US) images. Texture features are extracted by applying a bank of Gabor filters on test images through a two-sided convolution strategy. The texture model is constructed via estimating the parameters of a set of mixtures of half-planed Gaussians using the expectation-maximization method. Through this texture model, the texture similarities of areas around the segmenting Curve are measured in the inside and outside regions, respectively. We also present an iterative segmentation framework to combine the texture measures into the parametric shape model proposed by Leventon and Fauger as.

Segmentation is implemented by calculating the parameters of the shape model to minimize a novel energy function. The goal of this energy function is to partition the test image into two regions, the inside one with high texture similarity and low texture variance, and the outside one with high texture variance. The effectiveness of this method is

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demonstrated through experimental results on both natural images and US data compared with other image segmentation methods and manual segmentation.

III. PROPOSED SYSTEM

To propose a fast fully automatic kidney segmentation method, that can segment the kidney into four components: renal cortex, renal column, renal pelvis and renal medulla. Two datasets were used in this paper. Dataset 1 was acquired from subjects who donated their left kidney. By this method, the volume change of the four renal components of the remaining kidney before and after donation is analyzed. It is essential for kidney function evaluation. Dataset 2 was acquired from a completely different CT system for both normal subjects and abnormal subjects. Dataset 2was used to validate the robustness of the proposed method. To the best of our knowledge, this study is the first work that segments the kidney into four components. The proposed method consists of two parts: localization of renal cortex and segmentation of kidney components. In localization of renal cortex, the Active Appearance Model (AAM) method is used. The AAM is widely used in computer vision such as face recognition and organ localization. Extended the AAM to three dimensions and tested it on Cardiac MR and Ultrasound Images. However, conventional AAM searches the whole image which is inefficient especially for 23 large volume image. In this paper, we propose to combine the 3D Generalized Hough Transform (GHT) and 3DAAM. The 3D GHT can find the center of gravity of kidney efficiently. Then AAM searches around the center of gravity of kidney instead of the whole image. This combination improves the accuracy and efficiency of AAM. In segmentation of kidney components, the random forests method is used. The random forests method was first proposed by Breiman. Feature selection and weighted voting are applied to overcome these problems for kidney component segmentation. Furthermore, we apply the multithreading technology to speed up the segmentation process.

MODULE DESCRIPTION

IMAGE ACQUISITION

In this module, we capture the kidney image or upload the datasets. The uploaded datasets contains 3D kidney images. Then web camera images known as 2D images, then these face images are converted into 3D images. And also input the videos, then converted into frames after every 0.5 second

PRE PROCESSING

In this module we convert the RGB image into grayscale images. Then remove the noises from images by using filter techniques. The goal of the filter is to filter out noise that has corrupted image. Filtering is a nonlinear operation often used in image processing to reduce "salt and pepper" noise. A median filter is more effective than convolution when the goal is to simultaneously reduce noise and preserve edges.

IMAGE LOCALIZATION

Localization is the process of 3D fast automatic segmentation of kidney. Localization and segmentation is important task in this paper. This step can use one algorithm and one technique.

- Active Appearance Model
- Generalized Hough Transform

GENERALIZED HOUGH TRANSFORM(GHT)

The Hough transform was initially developed to detect analytically defined shapes such as line, circle, ellipse etc. the generalized Hough Transform, the problem of finding the model's position is transformed to a problem of finding the transformation's parameter that maps the model into the image. As long as we know the value of the transformation's parameter, the position of the model in the image can be determined. 3D GHT can find the center of gravity of kidney efficiently

Active Appearance Model

An active appearance model (AAM) is a computer vision algorithm for matching a statistical model of object shape and appearance to a new image. They are built during a training phase. A set of images, together with coordinates of landmarks that appear in all of the images, is provided to the training supervisor. The algorithm uses the difference between the current estimate of appearance and the target image to drive an optimization process. By taking advantage of the least squares techniques, it can match to new images very swiftly. Then AAM searches around the 33 center of gravity of kidney instead of the whole image. This combination improves the accuracy and efficiency of AAM.

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SEGMENTATION

Segmentation is the important process of image processing. In segmentation of kidney components, the random forests method is used. The random forests method was first proposed by Breiman. Because of its computational efficiency for handling a huge feature space, it has been widely used in computer vision domain argued that the traditional random forests method has two main disadvantages in medical image classification or segmentation: a huge feature pool with many poor features may affect the segmentation accuracy; equal voting by each tree is not the best way to produce classification result. In this paper, feature selection and weighted voting are applied to overcome these problems for kidney component segmentation. Furthermore, apply the multithreading technology to speed up the segmentation process. An improved random forests method is used to segment kidney components accurately and efficiently, where both 2D and 3D features are utilized; the proposed method is highly efficient which can segment kidney into four components within 20 seconds

IV. CONCLUSION

The proposed methodology relies on image processing and analysis techniques (such as multi-thresholding based on statistical local and global parameters, mathematical morphology, and image filtering) and also on prior knowledge about the cardiac structures involved . In the localization phase, a fast localization method which effectively combines 3D GHT and 3D AAM is proposed, which utilizes the global shape and texture information. In the segmentation phase modified RF methods are proposed to efficiently accomplish the multi-structure segmentation task. Finally the segmentation of kidney image is perfectly segment using random forest and active appearance model technique

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