# Contour Detection of Human Knee

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**Abstract -Medical images (X-ray, CT, MR or PET) of human organs are widely used in the everyday clinical praxis. The paper presents methods which allows the user to analyze, model and adjust the total knee contour detection procedure during a preoperative planning which eliminating the need of using expensive and sophisticated commercial software tools, which procedures are not familiar to the natural user, the surgeon. It has based on a observation which is affects the global saliency of the contour from the local context of a edges. Here we have propose the scheme consists of first find the edge in which response all points in an image using gradient computation and in the second one adapted the edge response at a point by the response in its border. Here we also apply the canny edge detection technique to present the results of implementing the scheme followed by a mask operation for the border manipulation. We have examined on a large set of images which is tested successfully. This scheme is computationally and qualitatively favorably in comparison with another human knee contour detector technique which is also based several influence. The proposed scheme can provides a little expenditure preprocessing step for high level tasks such shape based human knee contour detection.**

***Keywords:*** **Biological models, image analysis, reconstruction, Contour detection, Surround suppression, Human visual system.**

## 1. INTRODUCTION

The human knee is a delicate and complex articulated structure that plays a vital role in the human motion system. Knee motion is coupled with the motions of four rigid bones including the femur, tibia, fibula and patella, as well as the deformations of muscles and ligaments surrounding the knee. Contour detection in human knee images is a fundamental crisis in many computer visualization tasks. Contours must be distinguishable from edges as follows. Edges are change in intensity level which is determine by gradient in a gray level image whereas contours are most important loutish edges that belong to the object and constituency boundaries in the image. The contour representation drawn by human knee observers consist of these edges as they are considered to be prominent. Different human produce contours for a given image are not indistinguishable when the images are of complex, multifarious, natural scenes. In such images, multiple indications are available for the human visual system - low quality indications such as inconsistency of brightness, texture or continuity of edges, intermediate middle level indications such as regularity and convexity, as well as high quality indication based on recognition of familiar objects. In case of the human knee, however, this can be extremely difficult due to the similar gray-scale representation of the synovial fluid between the opposite cartilage surfaces of femur and tibia, and the partly covering surfaces. Efficient and sensitive computer methods for contour detection and segmentation can improve the quality of evaluation. Accurate computation of distances, directions, angles within the joint provide solid basis for orthopedic handling and surgery.

## 2. REVIEW WORKS

Graphic and geometric tools for analyzing morphology of the human knee[1] methods that were specifically developed to investigate the morphology and functionality of the human knee joint. Anterior knee pain (AKP) [2-4], also called patella-femoral pain, is a common pathological disease. Patients feel pain if they apply pressure to the 22 Vol. 17 No. 1 February 2005 patella, walk down stairs or keep the knee bent for a long period. The generic AKP syndrome can be further categorized to different conditions [5] like patella dislocation, chondromalacia patellae [6-7] and retropatellar pain. The reason for occurrence of AKP is still not fully understood. However, the most obvious problem is the abnormal patellar tracking mechanism. The abnormality may result from either muscular or structural imbalance. Patella movement is dominated by the quadriceps. Once a muscle imbalance occurs, the patella tends to stray from its normal path and results in pain. As to structural imbalance, the malalignment of the patella is the major cause. Both muscular and structural imbalances are stimulated sport and tear to the cartilage and bring about pain. However knee bone segmentation can serve as a basis for more advanced representation of other essential structures [8]. MRI image is a flexible and non enveloping modality. But bone segmentation can have demanding aspect from clinical MRI images that experience from poor image quality also imposed by time and clinical restrictions. Furthermore, we also know that bone intensity is not homoge- neous in MRI image due to differences in cortical and trabecular bones which can affect some segmentation approaches. Edge detection technique used canny algorithms which are based upon some gradients, hysteresis [9-10]. Osteoarthritis results from a breakdown of cells within the joint to preserve the balance between fusion and degradation of the extracellular matrix. Osteoarthritis is the major cause of pain and disability in the mature so far there is at present no effective treatment for loss of joint function. This is because the condition obscures pathogenesis but also because there are no specific laboratory tests or screening procedures that make available a unambiguous diagnosis of early osteoarthritis. There is clearly needed to be able to define creation of characteristic pathological changes when intervention would be timely manner and monitor the usual history up to the stage of Radiological detected damage [11].

## 3. PROPOSED WORK

First of all some image enhancement and noise reduction techniques are used to enhance the image quality this is done by the original image pass into high pass filter and combine this image and original input image to enhanced the image and grayscale conversion due to removal of noise . It is the best method to segment an image to separate a Knee but it suffers from over and under segmentation, due to which we have used it as a check to our output. The process of identifying and locating sharp discontinuities in an image the edge detection the edge detection technique is proceeds. These discontinuities may be some abrupt changes in pixel intensity which may be boundaries of objects in a image or scene. Some methods of edge detection involve convolving the image with an operator, which is constructed to large gradients in the image returning values of zero while in uniform regions in the image. There are an exceptionally large number of edge detection operators available, such as canny, sobel , laplacian , Robert's cross operator , Prewitt's operator each designed to be sensitive to certain types of edges. Then to detect edge of the knee a canny edge detection technique is applied here [10]. Then to detect contour of the knee we use some operations they are removals from the binary image that are have fewer than some certain values pixels, producing another binary image. Determine the connected components, compute the area of each component, and remove small objects

### 3.1 Algorithms:-

Step1:- Converts input color images to grayscale which is done by eliminating the hue and saturation information while retaining the luminance and the image returns a grayscale color map.

Step2:- Filters the multidimensional array with the multidimensional filter. Each element of the output an integer or in array, then output elements that exceed the certain range of the integer type is shortened, and fractional values are rounded.

Step3:-Add step2 and step3 image get the resultant enhanced image.

Step4:- Computes a global threshold that can be used to convert an intensity image (step3) to a binary image with a normalized intensity value which lies in between range 0 and 1.

Step5:- Takes a grayscale or a binary image (from step3) as its input, and returns a binary image of the same size as binary image, with 1's where the function finds edges and 0's elsewhere to find edges of local maxima of the gradient.

Step6:- Removes from a binary image (step5) all connected components (objects) that have fewer than certain values pixels and producing another binary image. This are done by the determination of connected components, computation the area of each components, removal small objects then get the ultimate output image.

The advantage of smearing edge information is that it allows quick detection of features and their location within an image, thus enabling fast segmentation of the image. Image regions that lie nearby, but on opposite sides of a prominent edge are quickly distinguished. Grayscale conversion removes noise. It converts the true color RGB image to the grayscale image by eliminating the hue and saturation information while retaining the luminance. The output is shown in figure2.

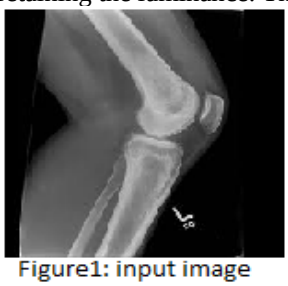

Figure1: input image

Figure2 : RGB to Gray image

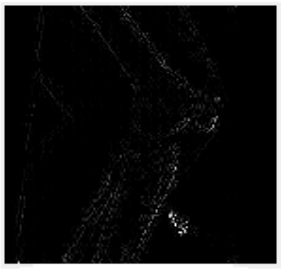

Figure3: HPF image

Figure4: enhanced image

A high-pass filter is a device that passes igh amplitude and attenuates reduces the amplitude of lower than its amplitude, this amplitude may frequencies. A high-pass filter is usual modeled as a linear time-invariant system. It is sometimes called a low-cut filter or bass-cut filter. High-pass filters have many uses, such as jamming direct component from circuitry responsive to non-zero average voltages. They can also be used in combination with a low-pass filter to make a band pass filter. The actual amount of attenuation for each amplitude/frequency is a design parameter of the filter and combing this high pass filter image and gray scale image we get enhanced image. This is shown in figure3 and figure4. Due to the most obvious low error rate and as the optimal edge detector the canny edge detection algorithm is applied here to detect edges. It is important that edges occurring in images must not be missed and also there are no responses to non-edges. The second one is that the edge points are well confined to a small area. In other words, the distance between the edge pixels as found by the detector and the actual edge is to be at a minimum and the third one is to have only one response to a single edge. From this output we eliminate smallest area and also connect the component ultimately get the desire results in Figure7 and other operation are shown in Figure3,Figure4, Figure5, Figure6.A brief block diagram are shown in Figure 8. Images are very important parts of medicine which are frequently used by physicians and doctors to investigate and diagnose of the structure and function of the body. In this paper, an automatic edge detection method is proposed for medical images. It is similar to region growing algorithm where the seed points are automatically selected and grown. In the proposed algorithm, similarity percents of the pixels were calculated by using the amount of shift while the occurred light through a transparent

sheet and re-enters the same environment. The newly developed fully automated MRI of human knee-based system provided precise detection of knee joint with excellent association with data from phantoms, a manual system, and joint objective. Such an automated system will be instrumental in improving the reproducibility/reliability of the evaluation of this marker in clinical application.

Figure5: threshold image

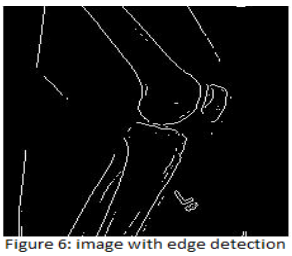

Figure 6: image with edge detection

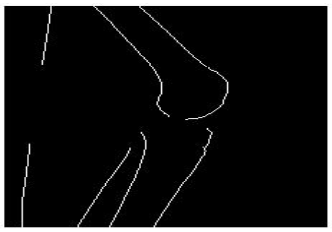

Figure7:human knee contour image

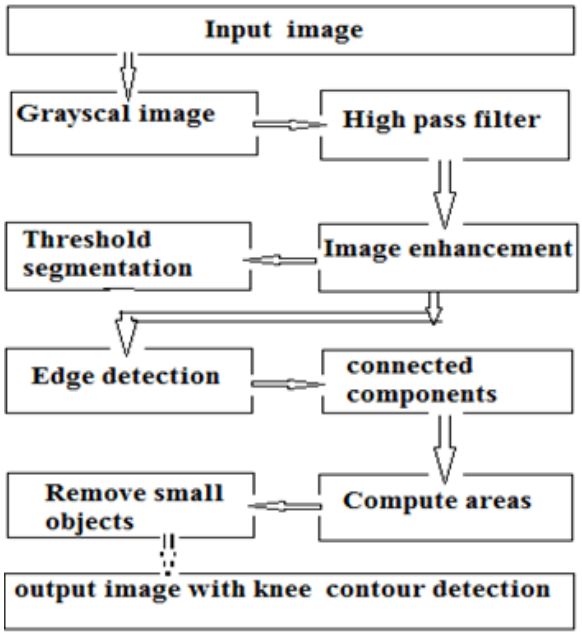


Figure8: a simple block diagram

## 4. OTHER RESULTS

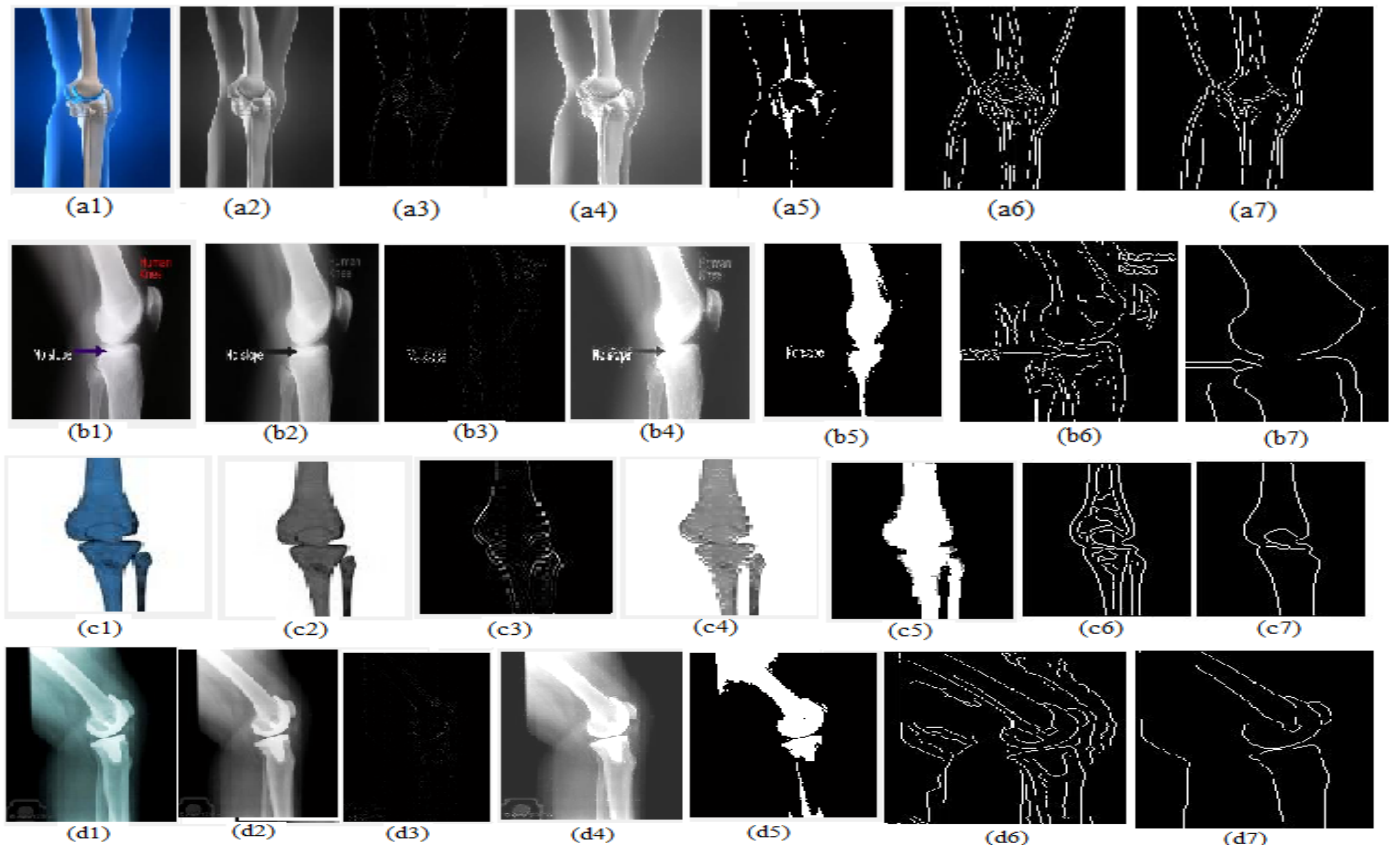


Figure : (a1,b1,c1,d1) input knee image,(a2,b2,c2,d2) Grayscale image,(a3,b3,c3,d3) high pass filter image,(a4,b4,c4,d4) enhanced image,(a5,b5,c5,d5) threshold image,(a6,b6,c6,d6) canny edge, (a7,b7,c7,d7) output with contour of human knee image.

## 5. FUTURE WORK

Several improvements are possible such as fully automated system for the quantification of human knee joint effusion 3D volume using magnetic resonance imaging, the time consumed by the automatic volume generation module can be reduced, using more advanced techniques. For example, instead of detecting every contour, still does not take into account that the human bone and the implant are heterogeneous and they are comprised by several materials. Our aim in the future is to develop a complete computer aided knee surgery and navigational system based on the graphic and geometric components discussed above.

## 6. CONCLUSION

We have presented several examples where current algorithms for system identification can be successfully employed to detect human knee contour. Analysis of the geometrical properties of the knee is important from many points of view. Based on shape information clinical can draw conclusions on the healthy and pathological state of the knee. Surgeons can design surgical intervention using geometrical data of the knee. Better understanding of the morphology and functionality of the knee may lead to better than existing prostheses. Accurate geometrical information facilitates preoperative design of knee surgery and computer control during surgery, the methods and programs were developed to satisfy specific aims and requirements of knee studies, many elements can be efficiently used to investigate similar biological structures.

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