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A Gallbladder Segmentation Method of A CTC - MSPCNN in Ultrasound Image

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ABSTRACT: The paper presents a method for extracting the gallbladder from abdominal CT images. This method utilizes a customized fast-marching level set approach to generate an optimal initial region for gallstones, followed by a modified distance regularized level set method to accurately extract the gallbladder. By combining these level set techniques, our method achieves improved segmentation results. Additionally, we introduce an energy-decrement algorithm and an energy-tune algorithm to mitigate the negative impact of bonding forces caused by connected tissues with similar intensities to the gallbladder. Comparative analysis with two other medical image segmentation methods demonstrates the effectiveness of our proposed approach.

KEYWORDS: Gallbladder extraction, ultrasound images, MATLAB implementation, level set techniques, comparative analysis.

I. INTRODUCTION

Gallbladder extraction plays a crucial role in computer-aided diagnosis, meeting the high demand for accurate diagnostic tools. Segmentation of the gallbladder in computer tomography (CT) images is essential to support various medical workflows, including diagnosis, treatment planning, and treatment delivery. Medical image processing, such as gallstone analysis and detection of gallbladder regions, is critical given the high mortality rate associated with gallbladder diseases like gallstones, which can be challenging to detect and treat promptly. Extracting the gallbladder from CT images can significantly enhance numerous clinical applications. Utilizing a hybrid level set method offers a promising approach for identifying both the gallbladder region and gallstones effectively.

II. RELATED WORK

The novelty of our method lies in the meticulous selection and fusion of level set techniques. Additionally, we introduce an energy-decrement algorithm and an energy-tune algorithm to mitigate the adverse effects of bonding forces induced by connected tissues with intensities akin to gallstones. Our approach effectively addresses the limitations associated with over-segmentation at weak boundaries, ensuring the precise extraction of gallstones from CT images.

III. EXISTING METHOD

Gallbladder segmentation typically rely on traditional techniques such as thresholding or region growing. These methods often struggle with accurately delineating the gallbladder boundary, especially in cases with low contrast or noise in the image. While some approaches incorporate level set methods, they may not fully address the challenges posed by connected tissues with similar intensities to the gallbladder. Additionally, prior methods may lack robustness and efficiency in handling variations in gallbladder shape and size across different patient images.

IV. PROPOSED METHOD

The proposed method consists of a customized fast-marching level set method which generates an optimal initial gallstone region to solve the problem that the level set method is sensitive to the initial contour location and a modified distance regularized level set method which extracts accurate gallstone. In addition to the customized fast-marching level set method and modified distance regularized level set method, the proposed approach introduces novel algorithms to enhance the segmentation process. These include an energy-decrement algorithm and an energy-tune algorithm, specifically designed to mitigate the impact of bonding forces from connected tissues with similar intensities to gallstones. Furthermore, the method integrates advanced image processing techniques to improve the accuracy and robustness of gallstone extraction.

V. LEVEL SET METHODS

Main idea:

- Evolve the embedding function $f(x,y)$
- Keep track of its **zero level set**

This can thought as the diffusion of a 2-D surface.

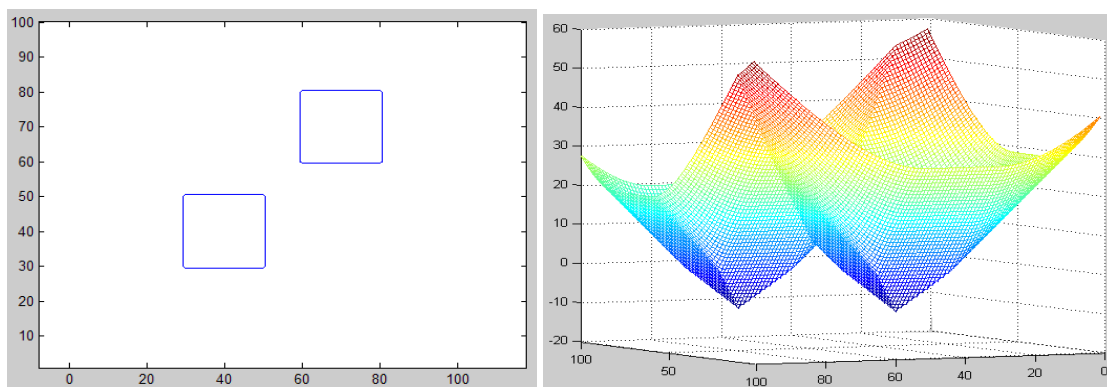


FIGURE 1(a): Multi -part curves

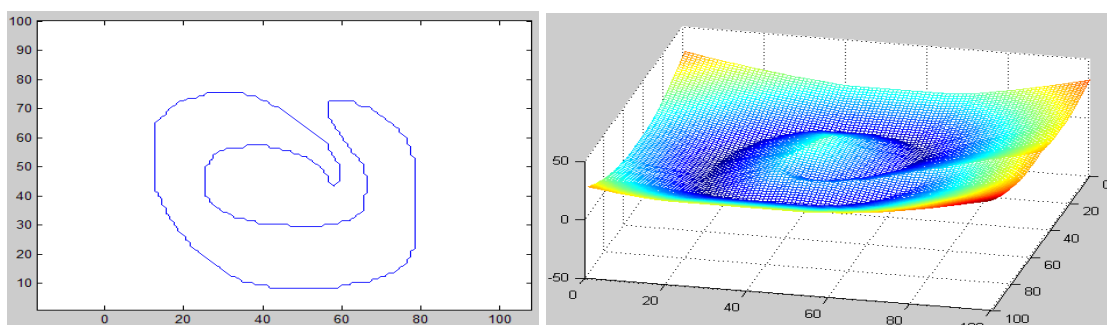


FIGURE 1(b): Curvature - based force

VI. MODEL AND IMPLEMENT

In modeling the physical process and interface motion, partial derivative equations (PDE) are employed to describe the dynamics accurately. Level Set Methods play a pivotal role in implementing curve and interface evolution driven by diverse forces. However, several challenges arise during implementation. Numerical errors stemming from discretization need careful consideration to maintain accuracy. Additionally, accurately estimating derivatives around discontinuities is crucial for preserving the integrity of the model. Ensuring numerical stability throughout the implementation process is paramount, requiring meticulous attention to algorithm design and parameter selection. Addressing these challenges is essential to ensure the reliability and effectiveness of the implemented Level Set Methods for modeling physical processes and interface motion.

VII. IMAGE SEGMENT

The following CT images is feed to Level set algorithms to Analysis the Gall stone, Its content less amount of Gallstone issues

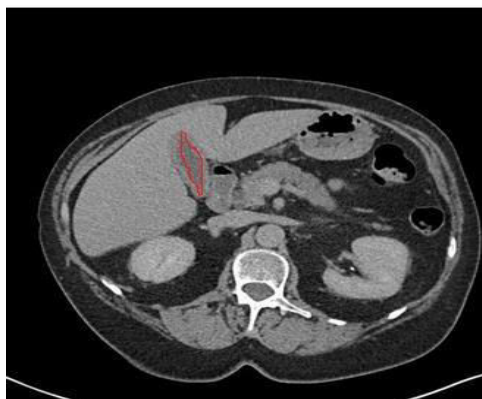
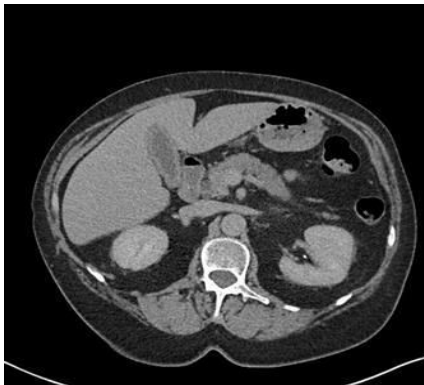


FIGURE 2 (a) : CT Images of abdomen ct scan (Sample-1) and level set result (red mark)

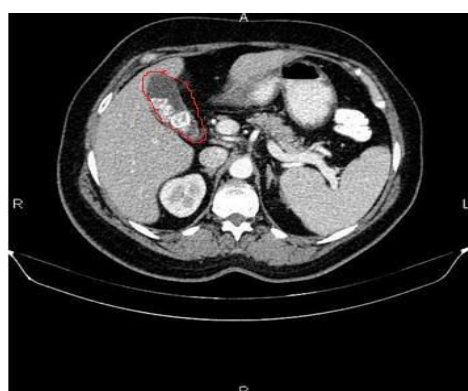


FIGURE 2 (b) : CT Images of abdomen ct scan (Sample-2) and level set result (red mark)

VIII. CONCLUSION

Gallstones belong to the high incidence of gallbladder disease in northwestern India. To dates, there are only few works

studying on gallstone from CT image segmentation. This project presents a variational level set framework for gallstone ultrasound image segmentation. Additionally, the ultrasound images come from the local hospital with pertinence to residents. We make a comparison between level set method and PCNN based segmentation method, the comparison results show that the method is excellent, and it is efficient to overcome the drawback of ultrasound image segmentation. Additionally, according to the characters of ultrasound images, we consider if it is better to obtain negative images for lately segmentation. the extracted gallstone can be beneficial to analyze for taking decision about the treatment procedures. Two different gallbladder CT images are considered for validation. The result is observed as good.

REFERENCES

1. [I. Ying-bin Hou and Y. Xiao, "Active snake algorithm on the edge detection for gallstone ultrasound images," 2008 9th International Conference on Signal Processing, 2008, pp. 474-477, doi: 10.1109/ICOSP.2008.4697173.
2. S. Sari, N. Zainuddin, M. N. Mohd, N. S. Afifi Mohd Taujuddin and H. Roslan, "BiT C Detector: Gallstones Detection for Ultrasound Images," 2019 IEEE International Conference on Signal and Image Processing Applications (ICSIPA), 2019, pp. 89-94, doi: 10.1109/ICSIPA45851.2019.8977753.
3. S. S. Agnihotri, H. Loomba, A. Gupta and V. Khandelwal, "Automated segmentation of gallstones in ultrasound images," 2009 2nd IEEE International Conference on Computer Science and Information Technology, 2009, pp. 56-59, doi: 10.1109/ICCSIT.2009.5234996.
4. N. T. Sanghvi et al., "A low frequency (220 kHz) ultrasound system for enhancement of gallstone dissolution," IEEE Symposium on Ultrasonics, 1990, pp. 1635-1639 vol.3, doi: 10.1109/ULTSYM.1990.171646.
5. W. Hong-yan and L. Ji-xing, "A lore-based FCM algorithm for gallstone CT images segmentation," 2015 10th International Conference on Computer Science & Education (ICCSE), 2015, pp. 749-753, doi: 10.1109/ICCSE.2015.7250345.
6. T. Song, F. Meng, A. Rodríguez-Patón, P. Li, P. Zheng and X. Wang, "U-Next: A Novel Convolution Neural Network with an Aggregation U-Net Architecture for Gallstone Segmentation in CT Images," in IEEE Access, vol. 7, pp. 166823-166832, 2019, doi: 10.1109/ACCESS.2019.2953934.
7. P. S. Duth, V. P. Saikrishnan and V. P. Vipuldas, "Variational level set and level set method for mri brain image segmentation: A review," 2017 International Conference on Communication and Signal Processing (ICCSP), 2017, pp. 1555-1558, doi: 10.1109/ICCSP.2017.8286649.
8. Y. Zheng and L. Zhang, "A Novel Image Segmentation Algorithm Based on Hesitant Neutrosophic and Level Set," 2021 International Conference on Electronic Information Technology and Smart Agriculture (ICEITSA), 2021, pp. 370-373, doi: 10.1109/ICEITSA54226.2021.00077

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