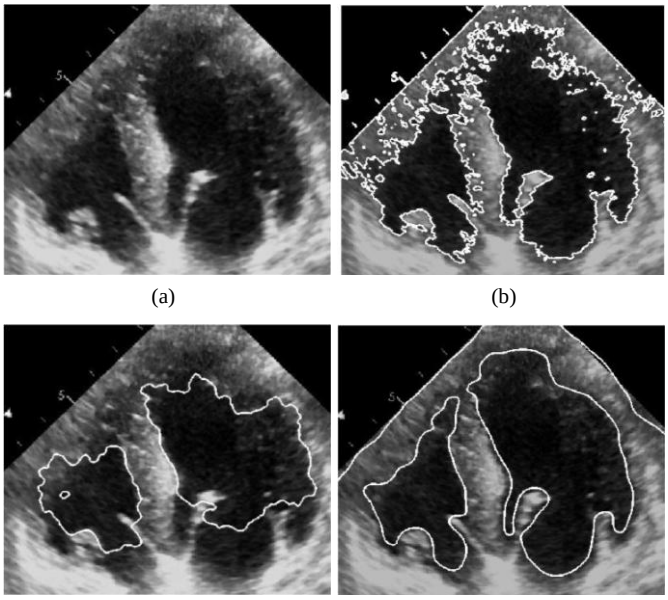
IV . Experiment Results

The data of this paper is three cardiac cycle UCG from a healthy person including 78 images collected by GE Vivid E9, The size of the image is 434×636 pixels. In the experiment, the traditional C-V model , Li's [6]method and our method were compared. One of the 78 UCG images was chosen as the example to describe the effect of our method. we set $\lambda_1=\lambda_2=1, v=0.001\times255\times255$ and $\Delta t=1, \mu$=0,a=-0.004,ε=1 for our method. The experiment results are illustrated in the Fig 3.

Fig3.(b) shows that C-V model[4] can detect the interior contour of heart. However, the speckle can be also segmented so that the results affects the accuracy of segmentation. Fig3.(c) shows the result which uses Li's method[6] to segment the UCG image. Obviously, the segmentation cannot finish successfully, and the reason is that the Li's model uses gradient information to evolute contour curve. Not only the interior contour of heart can be accurately segmented, but the speckle can be filtered by using our improved model. Besides, the contour curve is much smoother, as shown in Fig3.(d).



(a) (b)

(c) (d)

Fig. 3 (a) the original UCG image, (b)the segmentation result of C-V model, (c) the segmentation result of Li's method, (d) the segmentation result of our method

V . Discussion and Conclusion

In the experiment, our method was compared with Li's method and C-V model. Because of the big noise and considerable number of speckles, there are gradients everywhere in UCG image. Li's method with gradient information as the curve driving force cannot segment the heart contour successfully. It is global information that is used in our method. Global information uses every gray in image and the curve driving force cannot be limited by boundary gradient, therefore our method has a significant effect on the fuzzy and discrete boundary caused by noise and speckle in UCG image. Besides, the initial contour in Li's method must be inside or outside the boundary, but the initial contour in our method can be everywhere in image. Therefore, our method meets the need of auto-segmentation without initializing contour by handwork. By taking place $\delta(x)$ with $q(x)$, our method has a better effect on filtering speckle comparing to C-V model. Obviously, the contour of our method is much smoother because we add a signed distance penalizing energy function $P(\phi)$ which not only avoids re-initialization, but also has a function of smoothing curve.

In summary, the proposed method in this paper is appropriate for UCG image segmentation.

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