Building Recognition in Earthquake-stricken Areas Using Post-earthquake SAR Images

Wei Zhai[1,2], Yaxin Bi[2], Guiyu Zhu[1], Jianqing Du[1]
zhaiw@gsdzj.gov.cn, zwxzzzdsyhq@163.com
[1]Gansu Earthquake Agency, Lanzhou, 730000, P.R. China; [2]Ulster University, Belfast, BT15 1ED, UK.

Ridgeline extraction from a single SAR image: In SAR images, the buildings always produce incorrect judgements due to the existence of ridgelines . A novel method of ridgeline recognition based on the principle of the Chan-Vese model was proposed.

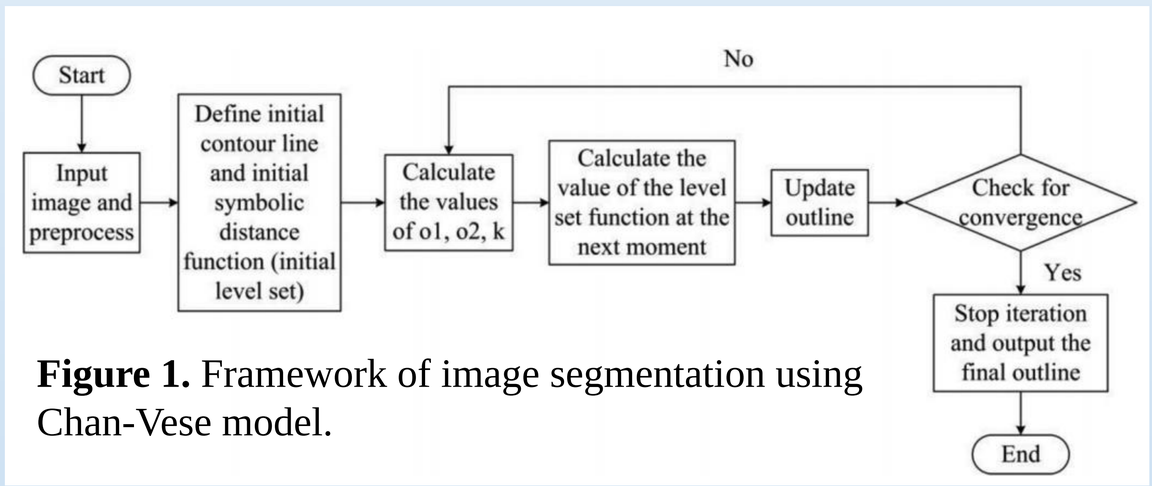

Figure 1. Framework of image segmentation using Chan-Vese model.

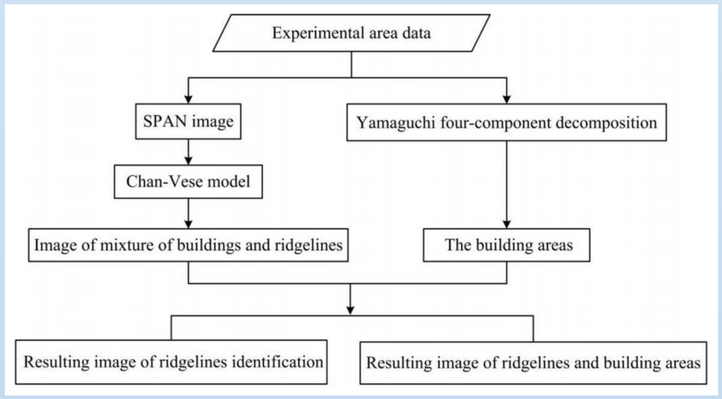

Figure 2. Diagram of the process of overall research

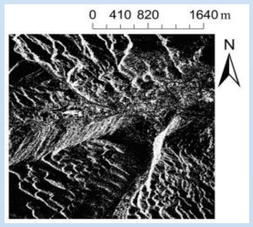

Figure 3. SAR data

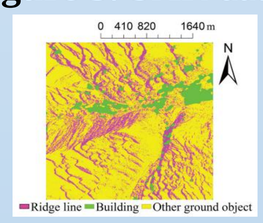

Figure 4. Result image

Damaged building extraction from post-earthquake SAR data based on the Fourier transform: The number of collapsed buildings is usually overestimated, which is because the scattering mechanism is similar to that of intact oriented buildings. In view of this, the variable coefficient of angle domains based on the Fourier amplitude spectrum parameter (CV_AFI) is proposed to ameliorate the damaged building overestimation.

$$CV\_AFI = \frac{\mathrm{std}(AFI_1, AFI_2, \cdots, AFI_n)}{\mathrm{mean}(AFI_1, AFI_2, \cdots, AFI_n)}$$

$\mathbf{AFI} = \sqrt{[\mathrm{real}(\mathbf{FI})]^2 + [\mathrm{imag}(\mathbf{FI})]^2}$, $\mathbf{FI} = FFT(\mathbf{I})$, $\mathbf{I} \subset$ SAR image

The recognition of structures in SAR imagery by the use of a spatial reasoning method: The identification of buildings in SAR imagery is mostly influenced by structures because of the similar scattering intensity effects. A new spatial reasoning method is proposed based on spatial and morphological feature parameters to identify large-scale structures in SAR imagery.

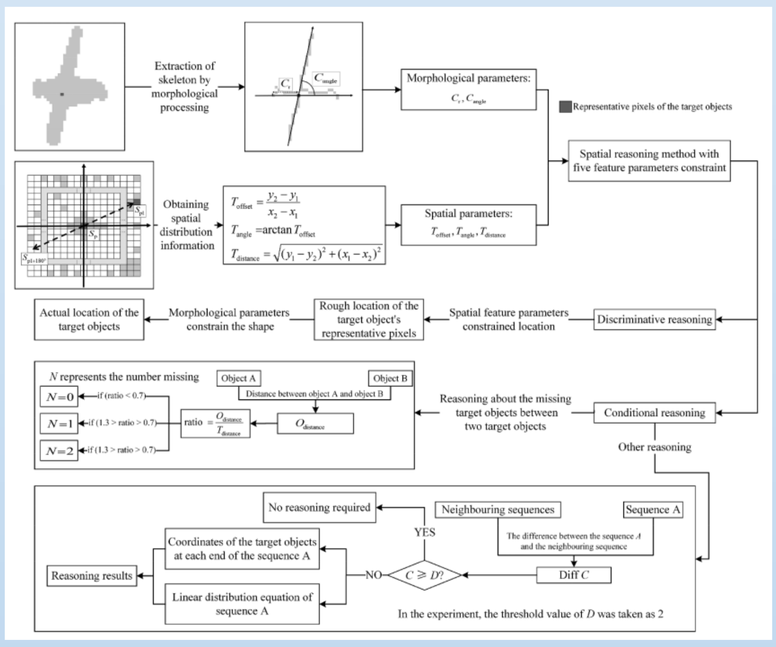

Figure 5. Diagram of the spatial reasoning method.

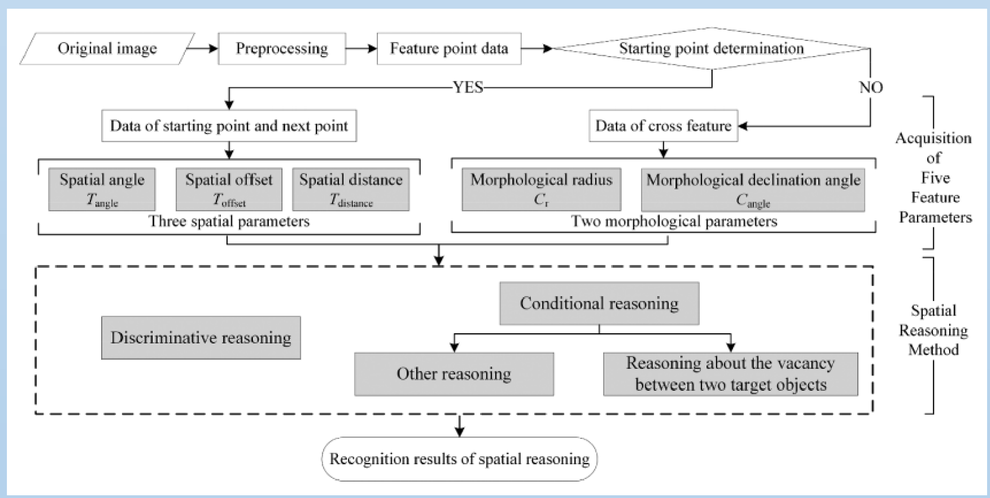

Figure 6. Diagram of the process of overall research

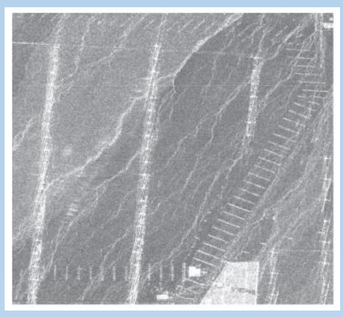

Figure 7. SAR data

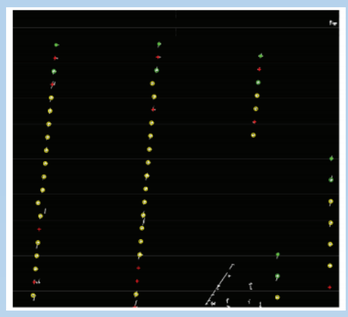

Figure 8. Result image

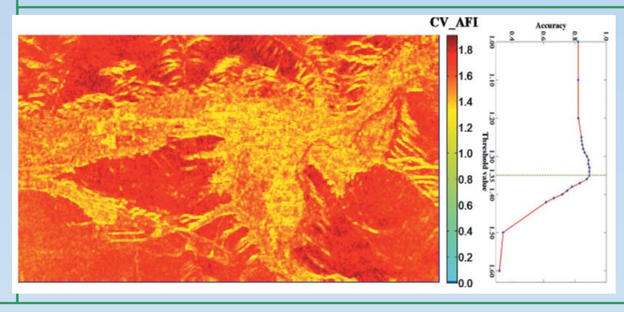

Figure 9. The map of CV_AFI values and its threshold value selection.