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Recognition of Spatially Significant Zone Using Morphological Dilation With Advanced Watershed Segmentation Algorithm

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Abstract- In several domains of image analysis, mathematical morphology plays a very vital role. It was a concept that evolved in France in sixties. This premise has received little attention since then but anyhow, is now object of research in many laboratories. The Significant attention has been paid to obtain spatially significant zones within a cluster of zones. Advanced watershed algorithm helps to reduce over segmentation process it decreases the iteration of dilation distance technique. The spatial significance of zones within a cluster of zones has been identified by using morphological dilation distance technique . This paper focuses on the calamity of identifying zones that they are the most important based on their proximity to other zones.

1.INTRODUCTION

The mathematical morphology is the study of shapes. The main aim is the geometrical properties of a natural feature represented as a binary image through the microstructures by means of structuring templates. It objective is to extort information about the geometrical structure of an point by mathematical morphological concepts. In this, a spatial fractal is subjected to transformations of another object called the structuring element. The main characteristics of the structuring element are, shape, size, origin and orientation[1-5].The topological distinctiveness of fractal (e.g. spatial distribution, morphology, connectivity, convexity, smoothness and orientation) can be characterized by structuring element. According to Matheron's approach, each image object is considered to have its boundary, and thus can be represented by a closed subset of Euclidean space(E)[5]. Many structuring element can be identified by subset of E, so that constraints which correspond to the four principles of mathematical morphology (such as invariance under translation, compatibility with change of scale, local knowledge and upper semi continuty) will be forced on set transformations (dilation, erosion, opening and closing) for specific extraction of topological data from the structures. Dilation, erosion, opening and closing are the basic morphological set transformations. These transformations are based on Minkowski set addition and subtraction[3].

A significant zone within a cluster of zones having a geometric characteristic, 1)greater proximity to other zones prominence implication of location. Identifying the spatial significance of a zone from a geometric point of outlook based on qualitative spatial logic is nontrivial, when a spatial system includes a large number of zones, and such an recognition process varies from person to person according to their own individual spatial perceptions [13].Recognizing spatially significant zones within such a spatial system serene of various zones could be quantitatively proficient. To evaluate the spatial significance of a zone. Spatial significance of a zone follows the property of a zone being central with respect to distance spatial relationship with other zones in the cluster[8]. In a cluster of closest, nonempty solid, and nonoverlapping zones, it is possible to balance spatial significance on the basis of dilation distances. This includes the degree of proximity to other sets with minimum expenditure of energy [5].

Each image object is assumed to contain its boundary, and thus can be represented by a closed subset of Euclidean space. In addition many kernels are represented by a compact subset of E, so that constraints which correspond to the four principles of the theory of mathematical morphology such as invariance under translation, compatibility with change of level, local knowledge and upper semi-continuity will be imposed on morphological set transformations [7] . Mathematical morphology based on set theoretic concepts is a meticulous approach to the analysis of geometric properties of different structures. The geometrical properties of a natural characteristic represented as a binary image by investigating its microstructures by means of "kernels", following Serra's concept. It aims to extract information about the geometrical structure of an object by mathematical morphological concepts. In this, specific object detection features are subjected to transformations by means of another object called kernel. The main characteristics of kernels are, shape, size, origin and orientation. Different kernels can distinguish the topological characteristics spatial distribution [9-10].

II.RELATED WORKS

The mathematical morphological transformations are useful for the estimation of basic measures of any type of surface water body, and avoid the constraints of manual methods[11]. Hydrologists may desire to accept these mathematical morphological concepts to compute basic measures, rather than the use of algorithms that rely on real arithmatic. The most important measures are used to study irrigation tanks in a temporal domain. The areal extent can be computed, facilitating hydrologists to carry out temporal analysis at a faster rate. In particular, sequential changes in binary images can be studied. This aids analysis of directions and changes in the areal extent of the water bodies[15]. These primary measures can be used to calculate various shape ratios empirically. The absolute to any unit of spatial shape. This computationally simple algorithm also works well on complicated shapes[16].

Objects are detected by background differencing. Low contrast levels can present problems, leading to poor object segmentation and fragmentation, particularly on older analogue tracking system[18]. The object detection can be done through the kernel, which is interacting with the given image by morphology and result will be identified. The model-free tracking algorithm described to addresses object fragmentation and the masking induces spatially-smooth similarity. The morphological operators are applied with kernel for detecting the definite objects[16].

Morphological based object detection with in image is difficult task. One way to simplify the problem is to modify the grayscale image into a binary image, in which each pixel is restricted to a value of either 0 or 1. The techniques used on these binary images go by such names as: blob analysis, connectivity analysis, and morphological image processing. The foundation of morphological processing is in the mathematically rigorous field of *set theory*; however, this level of sophistication is seldom need.(KERNAL).It is beneficial in dealing with many image-related problems, through various cited examples was brought forth in a logical manner. We saw the strength and versatility of this technique through the review of previous research works in this domain[17-20].

It has been rightly remarked by a famous researcher "though mathematical morphology is a powerful tool for many image analysis, it is not that famous because it is not useful or it is not used so it is not famous, may be because it involves too many mathematical theory!" but we saw the aspect in which it can be dealt with several image queries.

Hence, we conclude on this note of discussion that in spite of not gaining ample recognition, Geographic Information Sciences and image processing evidenced the efficiency of morphology and the time has come to prove its enduringness to the critics. The root of the matter is that we can wait for some more accurate results in the world of images in the near future where the differences between the morphological and non-morphological operations will be well known to us[20-25].Topologically, water bodies are the first-level topographic regions that get flooded and as the flood level gets higher, adjoining water bodies merge.

The looplike network that forms along all these merging points represents zones of influence of each water body. These two topologically mutually supporting phenomena follow the universal scaling laws similar to certain other environmental and biological phenomena. Despite morphological variations, water bodies and their influence zones of varied sizes and shapes have different sets of scaling exponents, thereby decisive that they belong to different universality classes. The automated extraction of drainage networks includes generation and processing of digital elevation models (DEMs) obtained

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from the remotely sensed data having stereo viewing capability[25-27]. The latter aspect usually aims to extract terrain features such as elevation contours and channel networks.

In this technical note, the application of morphological operators to extract channel networks from the digital elevation model is described. The methodology is illustrated using a transcendentally generated DEM that bears the spatially distributed regions in grey levels, assumed as the regions of topographic reliefs and the V-shaped crenulations in successive elevation contours. The authors conclude that the adaptation of this approach to extract channel networks from DEM data is straightforward and is simple both algorithmically and computationally.

III.METHODOLOGIES

The dilation distances among zones of a cluster is to measure the significance index (SI) for each zone.

A .Advanced Watershed Algorithm

Watershed algorithm is applied widely to image segmentation for its fast computing and high accuracy in locating the weak edges of adjacent regions. But classical watershed segmentation is sensitive to noise and can leads to serious over-segmentation. Aiming at the limitation of watershed segmentation, this paper presented an algorithm of watershed transformation based on opening-closing operation and distance transform. It improved the classical watershed segmentation algorithm based on distance transform, overcoming over-segmentation.The experiment result demonstrated that this method for segmentation inherits the advantage of watershed algorithm based on distance transform that it successfully segment out each dowel in the image bringing convenience to computer vision and auto-counting of dowels. It also overcame over-segmentation existed in traditional watershed segmentation preserving the original edges.

B .Dilation Distance

Binary dilation is a basic morphological operation that can be performed on any set on a 2-D Euclidean space. The Boolean OR transformation of set X by set B is also called the dilation of X by B. first, dilates input image objects. Dilation of X by B by $(X \oplus B)$. Multiscale dilation can be measured by number of *structuring element nB*, where $n = 0, 1, 2, \ldots, N$. Dilation can be also iteratively performed as follows:

$$(X \oplus nB) = (X \oplus B) \oplus B \oplus \cdot \quad \cdot \quad \cdot \oplus B.$$

Determining distances between spatial objects based on Euclidean metric is a challenge. If all the zones in a cluster considered are identical such that the shapes and sizes of zones are similar, then the simple Euclidean distances between all the possible pairs of centroids of such zones would suffice to
detect the spatially significant centroid corresponding to a zone.

$$d\max(Xji) = \max \forall j \ (\min (n : (Xi \subseteq (Xj \oplus nB))))$$

C. SI (Significant Index)

A zone Xi is designated as spatially most significant to establish a facility if it is located in a place closer to all Xjs and reaching Ai from all Xjs required a shorter distance. No other zone from a cluster of Xjs matches with Xi with respect to these two characteristic relationships, and hence, Xi is chosen as the best zone and is termed as the most spatially important zone. Keeping these characteristics involving dilation distances between origin zone Xi and destination zones Xj .Thus,

$$\mathrm{SI} = \min \forall i \ (d\max(Xij))$$

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The minimum of all the maximum values of the corresponding origin zones would clarify about the zone from which it is easier to attain out all other zones with minimum energy expenditure.

IV. CONCLUSION

The technique proposed here is advanced watershed algorithm reduces noise, over segmentation and it reduces the iteration of dilation. The SI for zones of a cluster of zones is measured to identify the significant zone. Identifying a significant zone is a scale-invariant process. This equation is sensitive to variations in rotations and translations and to geometric distortions but insensitive to variations in the scale of the considered zones. typically, a larger interior zone that could be reached by other destination zones of a cluster would stand as a spatially significant zone.

REFERENCES

[1] B. S. D. Sagar, G. Gandhi, and B. S. P. Rao, "Applications of mathematical morphology on water body studies," *Int. J. Remote Sens.*, vol. 16, no. 8,pp. 1495–1502, 1995.
[2] B. S. D. Sagar, "Universal scaling laws in surface water bodies and their zones of influence," *Water Resour. Res.*, vol. 43, no. 2, pp. W02416-1–W02416-10, 2007.
[3] H. M. Rajashekara, P. Vardhan, and B. S. D. Sagar, "Generation of zonal map from point data via weighted skeletonization by influence zone," *IEEE Geosci. Remote Sens. Lett.*, vol. 9, no. 3, pp. 403–407, May 2012.
[4] L. T. Tay, B. S. D. Sagar, and H. T. Chuah, "Analysis of geophysical networks derived from multiscale digital elevation models: A morphological approach," *IEEE Geosci. Remote Sens. Lett.*, vol. 2, no. 4, pp. 399–403, Oct. 2005.
[5] L. T. Tay, B. S. D. Sagar, and H. T. Chuah, "Granulometric analysis of basin-wise DEMs: A comparative study," *Int. J. Remote Sens.*, vol. 28, no. 15, pp. 3363–3378, Jul. 2007.
[6] M. Pesaresi and J. A. Benediktsson, "A new approach for the morphological segmentation of high-resolution satellite imagery," *IEEE Trans. Geosci. Remote Sens.*, vol. 39, no. 2, pp. 309–320, Feb. 2001.
[7] J. A. Benediktsson, M. Pesaresi, and K. Arnason, "Classification and feature extraction for remote sensing images from urban areas based on morphological transformations," *IEEE Trans. Geosci. Remote Sens.*,vol. 41, no. 9, pp. 1940–1949, Sep. 2003.
[8] T. Barata and P. Pina, "A morphological approach for feature space partitioning,"*IEEE Geosci. Remote Sens. Lett.*, vol. 3, no. 1, pp. 173–177,Jan. 2006.
[9] H. Taubenbock, M. Habermeyer, A. Roth, and S. Dech, "Automated allocation of highly structured urban areas in homogeneous zones from remote sensing data by Savitzky–Golay filtering and curve sketching,"*IEEE Geosci. Remote Sens. Lett.*, vol. 3, no. 4, pp. 532–536,Oct. 2006.
[10] J. Chanussot, J. A. Benediktsson, andM. Fauvel, "Classification of remote sensing images from urban areas using a fuzzy possibilistic model," *IEEE Geosci. Remote Sens. Lett.*, vol. 3, no. 1, pp. 40–44, Jan. 2006.
[11] M. Dalla Mura, A. Villa, J. A. Benediktsson, J. Chanussot, and L. Bruzzone, "Classification of hyperspectral images by using extended morphological attribute profiles and independent component analysis," *IEEE Geosci. Remote Sens. Lett.*, vol. 8, no. 3, pp. 542–546, May 2011.
[12] C. Mering, J. Baro, and E. Upegui, "Retrieving urban areas on Google Earth images: Application to towns of West Africa," *Int. J. Remote Sens.*, vol. 31, no. 22, pp. 5867–5877, Nov. 2010.
[13] A. Wilson, "Remote sensing as the 'X-ray crystallography' for urban 'DNA'," *Int. J. Remote Sens.*, vol. 31, no. 22, pp. 5993–6003, Nov. 2010.
[14] G. Trianni, F. Dell'Acqua, and P. Gamba, "Geographic information system (GIS)-aided per-segment scene analysis of multi-temporal spaceborne synthetic aperture radar (SAR) series with application to urban area," *Int. J. Remote Sens.*, vol. 31, no. 22, pp. 6005–6014, Nov. 2010.
[15] J. Serra, *Image Analysis and Mathematical Morphology*. London, U.K.:Academic, 1982.
[16] J. Serra, "Hausdorff distances and interpolations," in *Mathematical Morphology and Its Applications to Images and Signal Processing*, H. J. A. M. Heijmans and J. B. T. M. Roerdink, Eds. Dordrecht, TheNetherlands: Kluwer, 1998.
[17] B. S. D. Sagar, "Visualization of spatiotemporal behavior of discrete maps via generation of recursive median elements," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 32, no. 2, pp. 378–384, Feb.
[18]XM Chen, GQ Guo, and MQ Liu, "On infrared image segmentation algorithm based on watershed," *Journal of Optoelectronics.laser*, vol. 12, no. 10, pp. 1072-1075, 2001.
[19] SH Liu, LB Zeng, B Liu, and Y Fang, "Separating algorithm for overlapping granule images," *Computer Engineering*, vol. 28, no. 2, pp. 198-199, 2002.
[20] XH Tang, "Modified watershed based on recursive merging," *Computer Engineering and Applications*, vol. 41, no. 1, pp. 84-86, 2005.
[21] Ratael C.Gonzalez, Richard E. Woods, and Steven L.Eddins, Digital Image Processing Using Matlab. Prentice Hall, Upper Saddle River,Version 1.0, 2004.
[22] L Vincent, and P Soille, "Watersheds in digital spaces: an efficient algorithm based on immersion simulations," *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 13, no. 6, pp. 583-589,1991.
[23]FY Xie, ZG Jiang, and FG Zhou, "Immune cell image segmentation based on mathematical morphology," *Journal of Image and Graphics*, vol.7, no. 11, pp. 1119-1122, 2002.

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[24] ZM Ma, and CK Tao, "Artificial object detection in natural background," *Chinese Journal of Lasers*, vol.27, no.3, pp. 237-242, 2000.
[25] L. Najman, and M. Schmitt, "Geodesic saliency of watershed contours and hierarchical segmentation," *IEEE Transaction on Pattern Analysis and Machine Intelligence*, vol. 18, no. 12, pp. 1163-1173, 1998.
[26] A. Bleau, L J Leon, "Watershed-based segmentation and region merging," *Computer Vision and Image Understanding*, vol. 77, no. 3, pp. 317-370, 2000.
[27] J.B. Roerdink, A. Meijster, "The watershed transform: definition, algorithms and parallelization strategies," *Fundamental Information*, vol. 41,no.1, pp. 187-228, 2001.
[28] GIARDINA, CR., and DOUGHERTY, E. T., 1988, *Morphological me/hods in image processing and siqnal analysis* (New York: Prentice Hall).