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Detection of Geo-Spatial Targets in High Resolution Remote Sensing Images

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***Abstract*— In this document, we propose a detection of Geo-spatial target in high resolution remote sensing images are one of the most challenging task in image analysis. With the development of remote sensing imaging, the high spatial resolution can provide abundant spatial and contextual information for target detection. The use of such information offers the opportunity to detect geospatial targets with complex structures accurately, such as aircraft. Target detection has been achieved using, for example, constellation models and the deformable shape model. However, the target detection results by these methods are not precise enough. Using a contour-based spatial model we can detect geo-spatial target more accurately. By multiple segmentations each image are partitioned into pieces as target candidate regions. Then the target is identified by the similarity of the contour information with the target template .Spatial relationship functions are utilized to represent spatial context of different image pieces which can help in achieving accurate detection results**

***Keywords*— Contour-based spatial, Accurate detection, Target detection and Detect geospatial targets.**

I. INTRODUCTION

A contour-based spatial model which can detect geospatial targets accurately in high resolution remote sensing images. to detect the geospatial targets with complex structures, each image was partitioned into pieces as target candidate regions using multiple segmentations at first. Then the automatic identification of target seed regions is achieved by computing the similarity of the contour information with the target template using dynamic programming. Finally, the contour-based similarity was further updated and combined with spatial relationships to figure out the missing parts. in this way a more accurate target detection result can be achieved. The precision, robustness and effectiveness of the proposed method were demonstrated by the experimental results**.**

II. EXISTING SYSTEM

Some research studies which combined object detection and segmentation have been achieved, such as visual category filter and implicit shape model. Due to the lack of spatial and structure information, some methods can only get successful applications with limited data. Moreover, it is difficult to find a good partition method that works well for all objects in a complex scene, such as the high-resolution remote sensing image.

III. PROPOSED SYSTEM

Detection of geo spatial targets presents in high-resolution remote sensing images and delineate the target boundaries precisely. The contribution is threefold. First, a contour-based spatial model is proposed for segmenting and detecting target instances simultaneously. Second, the contours of segments instead of the extracted edges are combined with the similarity calculation for identifying the meaningful target regions. This is a natural and simple way after the segmentations and can avoid clutter and help in extracting good edges. Third in this model, spatial relationship functions are utilized to represent spatial context of different image pieces which can help in achieving accurate detection results. In this proposed system, the target can be extracted more accurately than existing system.

IV. SEQUENCE OF MODULES

A. Multiple segmentation

Image segmentation is the process of partitioning a digital image into multiple segments (sets of pixels also known as super pixels). The goal of segmentation is to simplify and change the representation of an image into something that is more meaningful and easier to analyse. Image segmentation is typically used to locate objects and boundaries (lines, curves, etc.) in images. More precisely, image segmentation is the process of assigning a label to every pixel in an image such that pixels with the same label share certain visual characteristics. The result of image segmentation is a set of segments that collectively cover the entire image or a set of contours extracted from the image (see edge detection). Each of the pixels in a region is similar with respect to some characteristic or computed property such as color, intensity or texture. Adjacent regions are significantly different with respect to the same characteristics. When applied to a stack of images, typical in medical imaging the resulting contours after image segmentation can be used to create 3D reconstructions with the help of interpolation algorithms like marching cubes.

B. Modelling Spatial Relationships

Edge detection is the name for a set of mathematical methods which aim at identifying points in a digital image at which the image brightness changes sharply or more formally has discontinuities. Spatial information is a crucial aspect of image processing, computer vision and structural

recognition for modelling context as well as resolving the uncertainties caused by the ambiguities in low-level features. This calls for the framework which exhibits nice features to represent spatial imprecision, and which provides powerful tools for fusion, decision-making, reasoning and suggest some potential applications in structural object recognition and image retrieval based on spatial relationships.

C. Extraction Algorithm

In image processing which involves using algorithms to detect and isolate various desired portions, shapes or features of a digitized image or video stream. It is particularly important in the area of optical character recognition. Search step: Fix the threshold τ, and search the image pieces R according to the criterion function. For every image piece, calculate its response value of the criterion function. Extract the image pieces whose response is positive. This routine can be implemented efficiently using dynamic programming. The algorithm ends when no missing piece is obtained at the search step. This target piece selection procedure can be shown to converge to a local maximum of contour similarity.

V. DESIGN PHASE

The purpose of the design phase is to plan out a system that meets the requirements defined in the analysis phase. It defines the means of implementing the project solution. In the design phase the architecture is established. This phase starts with the requirement document delivered by the requirement phase and maps the requirements into architecture. The architecture defines the components, their interfaces and behaviours. The deliverable design document is the architecture. Following section deals about both high-level design as well as detail design of the project. In this section we use rational rose software tool to design the project elements. UML is a standard language for specifying, visualizing, and documenting of software systems and created by Object Management Group in 1997.There are three important type of UML modelling are Structural model, Behavioural model, and Architecture model. To model a system the most important aspect is to capture the dynamic behaviour which has some internal or external factors for making the interaction, as shown in Fig. 1.

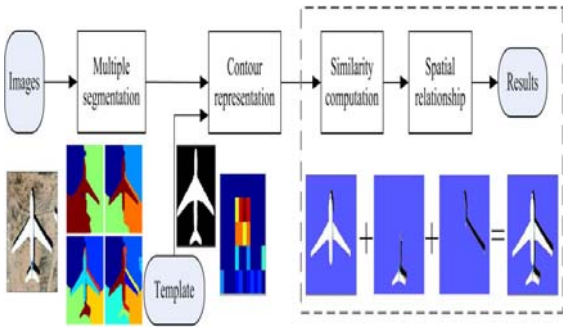

Fig.1 Architecture Diagram

D. Data Flow

Dataflow is a software architecture based on the idea that changing the value of a variable should automatically force recalculation of the values of variables which depend on its value. A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modelling its process aspects. Often they are a preliminary step used to create an overview of the system which can later be elaborated. DFDs can also be used for the visualization of data processing (structured design).A DFD shows what kinds of information will be input to and output from the system, where the data will come from and go to, and where the data will be stored. It does not show information about the timing of processes or information about whether processes will operate in sequence or in parallel it is common practice to draw the context-level data flow diagram first, which shows the interaction between the system and external agents which act as data sources and data sinks. On the context diagram the system's interactions with the outside world are modelled purely in terms of data flows across the system boundary. The context diagram shows the entire system as a single process, and gives no clues as to its internal organization. DFD of the project shows the detailed diagram of the project in terms of data flow from the initial stage to the output delivery.

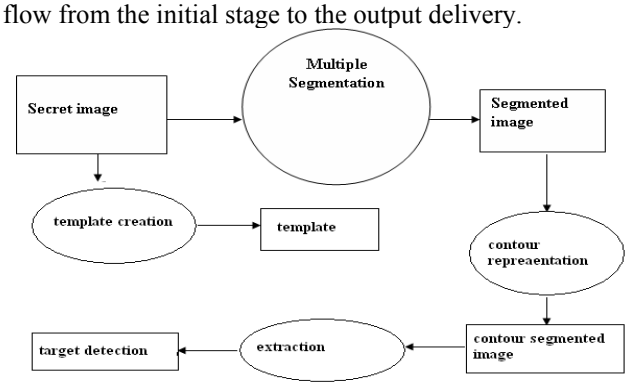

Fig.2 Data Flow Diagram

The template for the input image is created then input image is segmented to a multiple segmented image. The input image is processed through contour representation and a contour segmented image is created. Information from contour segmented image and multiple segmented image is used to extract the target accurately.

E. Image Processing

An image is an array, or a matrix, of square pixels (picture elements) arranged in columns and rows.

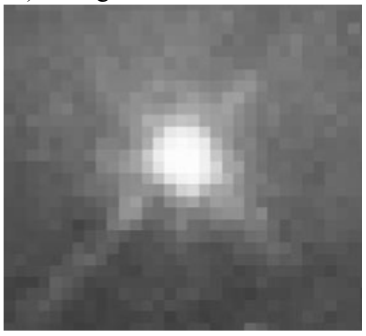

Fig. *3 Black And White Image*

In a (8-bit) grey scale image each picture element has an assigned intensity that ranges from 0 to 255. A grey scale image is what people normally call a black and white image, but the name emphasizes that such an image will also include many shades of grey.

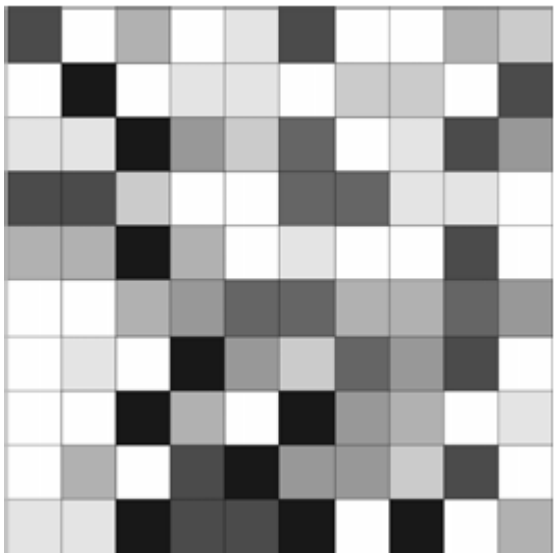

Fig. *4 Normal Grey Scale Image*

Each pixel has a value from 0 (black) to 255 (white). The possible range of the pixel values depend on the colour depth of the image, here 8 bit = 256 tonnes or greyscales. A normal greyscale image has 8 bit colour depth = 256 greyscales. A "true colour" image has 24 bit colour depth = 8 x 8 x 8 bits = 256 x 256 x 256 colours=16 million colours.

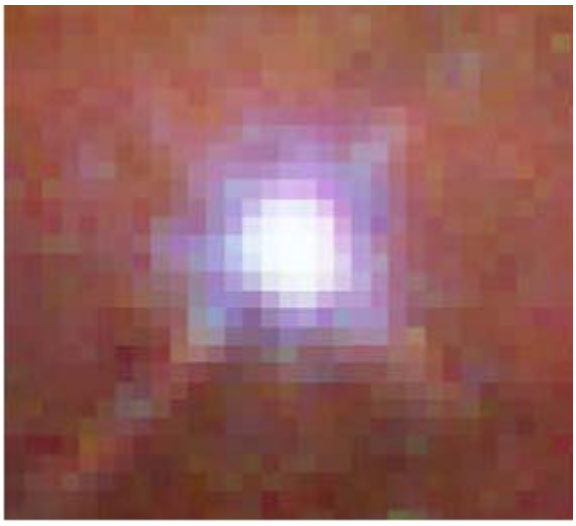

Fig. *5 Coloured Image (RGB)*

A true-colour image assembled from three greyscale images coloured red, green and blue. Such an image may contain up to 16 million different colours. Some greyscale images have more greyscales, for instance 16 bit = 65536 greyscales. In principle three greyscale images can be combined to form an image with 281,474,976,710,656 greyscales. There are two general groups of images Vector graphics (or line art) and Bitmaps (pixel-based or 'images'). Some of the most common file formats are:

i *GIF***:**

An 8-bit (256 colour), non-destructively compressed bitmap format. Mostly used for web. Have several sub-standards one of which is the animated GIF.

ii JPEG:

A very efficient (i.e. much information per byte) destructively compressed 24 bit (16 million colours) bitmap format. Widely used, especially for web and Internet (bandwidth-limited).

iii TIFF:

The standard 24 bit publication bitmap format. Compresses non destructively with, for instance, Lempel-Ziv-Welch (LZW) compression.

iv PS:

Postscript a standard vector format has numerous sub-standards and can be difficult to transport across platforms and operating systems.

v PSD:

A dedicated Photoshop format that keeps all the information in an image including all the layers. Image Processing is a technique to enhance raw images received from cameras/sensors placed on satellites, space probes and aircrafts or pictures taken in normal day-to-day life for various applications. Various techniques have been developed in Image Processing during the last four to five decades. Most of the techniques are developed for enhancing images obtained from unmanned spacecrafts, space probes and military reconnaissance flights. Image Processing systems are becoming popular due to easy availability of powerful personnel computers, large size memory devices, graphics software's etc. Image Processing is used in various applications such as:

- Remote Sensing
- Medical Imaging
- Non-destructive Evaluation
- Forensic Studies

The common steps in image processing are image scanning, storing and enhancing

- Interpretation
- Material Science
- Military
- Film industry
- Document processing
- Graphic arts
- Printing Industry

VI. CONCLUSIONS

CBS model has been proposed to solve the problem of detecting geospatial targets present in high resolution remote sensing images accurately and automatically. Multiple segmentations are employed to produce candidate target regions. According to their contour similarities, the seed regions are identified. Spatial relationship is utilized to obtain missing parts of the target instances. We use dynamic programming to calculate shape similarities efficiently since it utilizes the ordering information between contour points. Experiments with aircraft as example target

demonstrate the precision, robustness and effectiveness of the proposed method.

The main limitation of the proposed method is that it cannot deal with extreme viewpoint changes although it has some robustness. This is a common difficulty in shape-based recognition methods and can be overcome by modelling a target class by a collection of target models for different viewpoints. The CBS model is a global shape model, which captures the global characteristic of targets. Therefore, the proposed method can perform well on targets with relatively fixed shape.

REFERENCES

[1] D. Tuia, F. Pacifici, M. Kanevski, and W. J. Emery, "Classification of very high spatial resolution imagery using mathematical morphology and support vector machines," *IEEE Geosci. Remote Sens.*, vol. 47, no. 11, pp. 3866–3879, Nov. 2009.

[2] R. Fergus, P. Perona, and A. Zisserman, "Object class recognition by unsupervised scale-invariant learning," in *Proc. CVPR*, Jun. 2003, vol. 2, pp. II-164–II-271.

[3] A. C. Berg, T. L. Berg, and J. Malik, "Shape matching and object recognition using low distortion correspondences," in *Proc. CVPR*, Jun. 2005, vol. 1, pp. 26–33.

[4] R. Fergus, P. Perona, and A. Zisserman, "A visual category filter for google images," in *Proc. ECCV*, 2004, vol. 3021, pp. 242–256.

[5] B. Leibe, A. Leonardis, and B. Schiele, "Combined object categorization and segmentation with an implicit shape model," in *Proc. ECCV*, 2004, pp. 17–32.

[6] H. Akcay and S. Aksoy, "Automatic detection of geospatial objects using multiple segmentations," *IEEE Geosci. Remote Sens.*, vol. 46, no. 7, pp. 2097–2111, Jul. 2008.

[7] X. Sun, H. Wang, and K. Fu, "Automatic detection of geospatial objects using taxonomic semantics," *IEEE Geosci. Remote Sens. Lett.*, vol. 7, no. 1, pp. 23–27, Jan. 2010.

[8] V. Ferrari, L. Fevier, F. Jurie, and C. Schmid, "Groups of adjacent contour segments for object detection," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 30, no. 1, pp. 36–51, Jan. 2008.

[9] J. Shotton, A. Blake, and R. Cipolla, "Multiscale categorical object recognition using contour fragments," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 30, no. 7, pp. 1270–1281, Jul. 2008.

[10] A. Opelt, A. Pinz, and A. Zisserman, "A boundary-fragment-model for object detection," in *Proc. ECCV*, 2006, vol. 2, pp. 575–588.

[11] D. M. Gavrila, "A Bayesian, exemplar-based approach to hierarchical shape matching," *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 29, no. 8, pp. 1408–1421, Aug. 2007.

[12] X. Bai, Q. Li, L. J. Latecki,W. Liu, and Z. Tu, "Shape band: A deformable object detection approach," in *Proc. CVPR*, 2009, pp. 1335–1342.