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The Design and Implementation of Remote Sensing Algorithms Visual Workflow Editing and Processing Platform

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Abstract

The visual workflow operate-mode can greatly improve the programming efficiency. Visual workflow technology which is brought into the design of remote sensing algorithms can not only control the processing of remote sensing algorithms flexibly, but also greatly improve the reusability of remote sensing algorithms. The principle of remote sensing algorithms visualization lies in the decomposition of remote sensing algorithms. By means of packaging the decomposed algorithms and showing them visually, the algorithm can be processing more efficient. In addition, through the visual platform, the decomposed algorithms can be restructured into new algorithm flow which is composed by a certain number of refined algorithms. Therefore, the composed algorithm can be accelerated through the parallel processing method. Currently, multi-core processors programming is popular. Multi-core processing has been becoming an emerging and high efficient computer technology. The platform will accelerate the processing of the algorithm flow further by using multi-core processing technology.

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Key words: Visual Programming, Multi-Core Processing, Parallel Processing, Schedule monitoring

1. Introduction

As the field of remote sensing image processing is becoming more widespread, number of remote sensing processing algorithms are also increasing rapidly. Many remote sensing image processing algorithms include public modules which have same functions, but when the public modules are needed in

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a new kind of algorithm, they are always written again. This work mode greatly reduces the programming efficiency.

The remote sensing image processing algorithms' main characteristic is image processing, almost every algorithm is a series of image processing to generate a new image. According to this feature, we can encapsulate the image processing into a public module by designing the interface of input and output parameters, reconstructing the algorithms by workflow and providing the interfaces of workflow restructuring in the form of visualization.

There will be the following advantages[1,2,3]:

- Increased code reusability, and with the increasing of public modules, a written function can be directly used in the future
- Visual workflow technology enables the algorithms to be shown in a clear way. Visual operation like dragging will also replace the bring code-editing work mode into the front, and greatly improve work efficiency
- As the algorithm is refined, there will be a lot of parallel computing. The use of parallel computing technology will accelerate the overall speed of the algorithm and reduce computing time

The platform analysis the remote sensing image processing thoroughly. According to which features packaged the atoms processing involved in algorithms, the platform abstracted the algorithms and developed a series of specifications describing the algorithms, making the platform analysis the I/O and running format and other related information of the encapsulated algorithms based on the specification. The platform allows users to customize algorithm flows in form of visual workflow, which implements the scheduling and computing of algorithms in parallel multi-core processing technology.

2. Visual editing of algorithm flows

To achieving visual editing through programming language, we usually use graphic controls. Graphic controls is the encapsulated algorithm's carrier, the information of algorithms is displayed graphically. In the workflow system, model-driven engine applied into this platform is based on model, meta-model and system three concepts[4,5], shown in Figure-1. Algorithms are abstracted according to the characteristics of the algorithms and ultimately displayed in workflow system. Mainly related questions are: firstly, how to abstract algorithm; secondly, how to show the abstract algorithms in system.

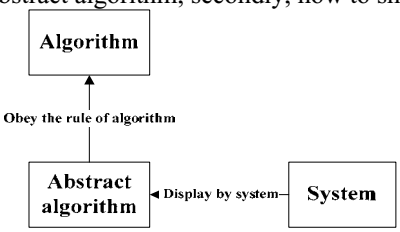

Figure 1 The relationship between algorithms and systems

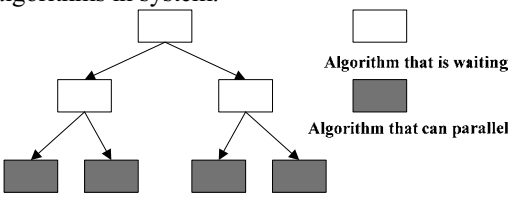

Figure 2 Schematic diagram of parallel algorithms

A. Abstract algorithm

To abstract workflow algorithms require at least two steps[6,7]: firstly, to extract common features of algorithms, to describe and save abstract algorithms in a certain structure; secondly, to save the overall algorithm flow, which is to encapsulate each relationship between algorithms. Moreover, to take into account the special nature of the overall workflow's outermost input and output which is packaged, users can easily specify algorithm processes' input and output.

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