The Mechanism of Remote Sensing Models Integration and Sharing

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1. Introduction

Remote sensing quantitative retrieval, focusing on modelling, has accumulated plenty of models in recent decades. On the other hand, due to multiple data resources and study requirements, there springs up a great deal of new algorithms**.** It is noticed that some of them are just the repeat of existing work (especially pre-processing models), bringing out resources redundancy which goes against the original intention of sharing. Therefore, algorithms sharing problem should be solved.

It is necessary to share models for remote sensing quantitative retrieval, which pursues the following aims(Yue 2003):

- Avoid misuse of models.
- Reduce resource-wasting for rebuilding pre-existing models.
- Provide a reference for researchers to study models have not been developed yet in the field.
- Help to choose a better one among models with different mathematics expression for the identical application.

In this paper, we put forward the importance of model sharing in remote sensing, and then indicate inadequacieson it after analyze the research status in this field. At the end, we present a mechanism of remote sensing models integration and sharing on a grid workflow platform.

2. Related work

Distributed Computing Infrastructure (DCI) provides many benefits for remote sensing applications. One of the advantages is the interoperability achieved through the use of architectural and implementation standards for protocols and interfaces, such as those provided by a SOA.This technique provides the possibility for sharing massive data and models of remote sensing. GENESI-DR, GENESI-DEC, G-POD are distributed data services, and GEO Grid SDK enables users to create their own services that can be registered and shared with other users and sites(Lee et al. 2011).

Geospatial Data Cloud (http://www.gscloud.cn/), developed by Computer Network Information Centre Chinese Academy of Sciences, enables users to custom model

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services for individual computing demand on its platform. Currently, the system provides only a few models of data processing, terrain information extraction, data application.

Up to now, researchers have been made progress on remote sensing models sharing. They put emphasis on single model application, or independent package service on web, but lack of integration between models.

With respect to remote sensing model base, researcher propose the architecture concentrating on remote sensing application (Xiao et al. 2001, Tang et al. 2003, Tang et al. 2006, Xue et al. 2007, Zheng et al. 2008), but lack of sufficient consideration on the access efficiency of the model base.

A grid workflow is a type of high-level grid middleware to support modelling, redesign and execution of large-scale intricate scientific and business processes in many complex e-science applications. Using it in remote sensing quantitative retrieval, to divide tightly coupled process into a series of sub-tasks, aims to share algorithms in the grid environment and process some steps parallelly (Dong et al. 2012).

At present, they realize functions of model query and workflow customization on a grid workflow platform. Therefore, it would be a meaningful work tointegrate models on this platform, build correct connections between them through the interface and establish an efficient search mode. Furthermore, Argent(2004) concluded the development of model integration into 4 levels.The integration realized in this paper only indicates offering interface rather than rewriting the model

3. Model integration on workflow platform

For the purpose of sharing, the workflow should be not only a customized implement, but also an interface for integrating model in grid environment. Figure 1 shows the mechanism of model sharing on a grid workflow platform.

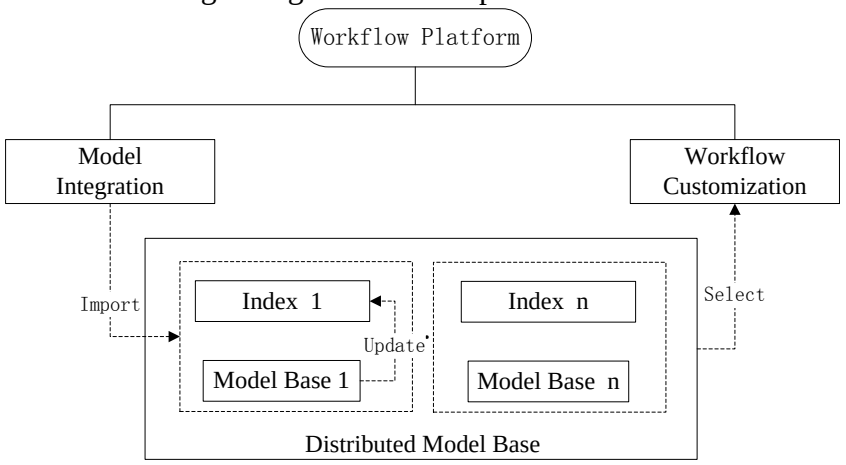

Figure 1. The mechanism of model sharing on a grid workflow platform

Sharing models in the form of grid workflow, enables users to choose desired models from distributed model base to customize applications and import new models to extend model base resources.Nonetheless, the properties of the model are stored in the form of individual fields in distributed base.If users submit a model-search request, the server should traverse entire model base for the proper one. That procedure would be time-consuming and resource-consuming. On the other hand, it is also a huge load for the

server. Therefore, it is particularly important to establish an efficient model search engine. We construct a keyword index for each model base, containing basic information of model application. As shown in Figure 1, when users search for model resourcesto customize an application, instead of visiting the model base directly as a traditional way, the system traverses the keyword index according to the request. Then, the model search engine extracts entire information of the matching ones or else skips the base to find other bases. In this way, the frequent request of distributed resources is avoided, which helps to reduce the waste of network resources and improve efficiency. If a new model isimported into the model base, the keyword index would be updated automatically.

Furthermore, to ensure the correct model connections, it is necessary to import input and output parameters of each model when we integrate them into the base. It is also the basis for workflow validation in the near future.

4. Conclusion

In this paper, we propose a mechanism to integrate and share remote sensing models on a grid workflow platform. Although it is an advisable means to share remote sensing models, we only practice on several aerosol optical depth retrieval algorithms. It is still a long way for sharing in its true sense. How to express model information accurately by keyword index and how to validate the customized workflow before executionin order to avoid illegal process both need further study.

5. Acknowledgements

This work was partly supported by the Ministry of Science and Technology (MOST) of China under Grant No. 2013CB733403 and by NSFC, China under Grant Nos. 41271371 and 41120114001.

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