Paper Number: 570

The Architecture on Geological Survey Intelligent Space

Li,C., Lv, X., Li,J. ,Li,F. ,Liu,C.

Development & Research Center of China Geological Survey, Beijing 10037,China,LICHAOLING@126.COM

To establish the framework of digital geological survey with new generation of information technology and raise the current digital geological survey to a more intelligent level, authors investigate the characteristics of procedures in digital geological survey 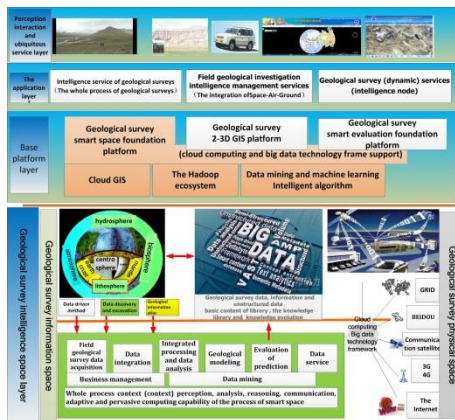(e.g., data acquisition, data processing, data communication, 3-D modeling, and information service) based on tools such as cloud computing, cloud GIS, and Hadoop Ecosystem. It is the author's opinion that the construction of intelligent space is the core of intelligent geological survey (IGS). Intelligent space is a composition of information space and physical space, as depicted in Fig.1. It has ubiquitous computing ability of perception, analysis, reasoning, communication, and self-adaptation in order to serve the user intelligently. The information space consists of context awareness, comprehensive analysis and modeling, knowledge discovery (data mining), etc. On the other hand, the physical space is a new generation technology portfolio of Internet, Internet of Things, communication network, Cloud Computing, and big data solutions.

Fig. 1: The intelligent space architecture for IGS

To build a working pattern for big data in an intelligently cognitive perception way, integration of cloud and in the cloud, ground-air-space, 2-D and 3-D, information space and physical space, geological survey procedure and GIS technology has been highlighted during the construction of basic software system platform. Particularly, it can support intelligent functions like knowledge service of current location, dynamic data acquisition, and fast modeling during field geological survey. To deal with key issues of resources sharing and interconnecting between information space and physical space, multiple technologies (e.g., Cloud Computing, Cloud GIS, Grid Computing, and Hadoop) are integrated, especially at resources layer and resources aggregation layer. Therefore, the working mode with intelligent perception services and ubiquitous service can be achieved in geological survey. Meanwhile, based on the HBase storage model and rules of ontology domain knowledge, the dynamic participle knowledge database can be created via machine learning mechanism. Hence, overall efficiency and accuracy of data discovery and mining can be improved.

Nowadays, intelligent mobile phone has powerful perception ability of location, attitude, motion, and environment information. First, it becomes a semantic electronic field record book for the digital geological survey system, which combines description of geological route, assisted recording of audio and video, perception of geology attitude, and profile of route. Second, it provides automatic perception service that covers from the physical coordinates to semantic geological location (including the geographical map and the geological position at the current location). This new generation geological survey system has been applied to the geological mapping in China since 2011.

References:

[1] YU Tao,YU Bin.Smart Space-A New Paradigm for the Harmonious Coexisting between Human and Nature[M].Zhejiang Gongshang University Press,2011：84-91.

[2]LI Deren,ZHANG Liangpei,XIA Guisong(2014) Acta Geodaetica et Cartographica Sinica 43(12):1211-1216.