Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

MGI33-01 Room:202 Time:May 22 09:00-09:15

Current implementation status of WISE-CAPS, browsing, sharing and analyzing system of lunar and planetary data

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We are now developing data browsing, sharing and analyzing platform for lunar and planetary exploration data. This system is called ”WISE-CAPS”,

Web-based Integrated Secure Environment for Collaborative Analysis of Planetary Science.

The WISE-CAPS aims for efficient analysis of vast amount of data obtained by lunar and planetary exploration, particularly one for image data, and sharing among registered researchers. The final processing, analyzing the data, is our goal for this implementation.

System is fully web-based, Web-GIS, therefore users do not need to prepare any special software other than browser to use WISE-CAPS. The base of system is map (image based) and it is also the reason that this system is entirely based on maps. However, WISE-CAPS has several unique functions such as data addition by users (uploading of data which are created by users) and its sharing to other users, including selection of users. Furthermore, as this system is constructed fully upon open-source software and is open platform and protocol compliant, the linkage with other systems and vendor-independent re-construction, modification and enhancement can be made easily with low budget. Extension of functions by users are in our sight for future implementation.

We have made large improvements for WISE-CAPS since last year and now the

system has become more user-friendly and powerful. We will address the improvement points and future directions for more improvement.

Keywords: Web-GIS, lunar exploration, planetary exploration, web

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MGI33-02 Room:202 Time:May 22 09:15-09:30

New version of Zindaiji, a GUI visualization tool for large number particle simulation data.

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Visualization of 3D/4D simulation data is important not only for research but also for public outreach.

The tools of scientific visualization are often designed for the former purpose. However, for outreach purpose, these tools have often difficulties, because they often lack the functions such as camera work editing or drawing modelled objects, texturing, etc. On the other hand, using general purpose 3DCG softwares, it is easier to visualize objects with higher quality. However, converting data to the format which can be read by these softwares requires skills of computer graphics, and researchers do not have it in general.

We have developed a GUI application (Zindaiji) to visualize particle data, several years ago. In NAOJ 4D2U Project, we have made high quality movies for public outreach, with up to 2 million particle N-body simulation data. However, Zindaiji is developed as 32bit windows application, so that it can not handle recent larger scale N-body simulation data.

Thus, we are now developing new versions of Zindaiji as 64bit applications, and basic functions have now been implemented. The features of Zindaiji are,

1)Ability to make movies from sequential particle data.
2)Implementation of interpolation of data.
3)Fast rendering using OpenGL.
4)GUI based, and time-line based interface.

In Zindaiji 3, we have improved following features.

5)Making as 64-bit application, memory limitation is much alleviated.
6)Great improvement in operability.
7)Improvement in the rendering speed by reexamination of a drawing algorithm.
8)Reduction of waiting time by multithread-izing and data prefetch.
9)Multi-platform (Windows/LINUX/MacOSX)

On the now, Zindaiji3 is not implemented with the features such as motion blur or lens flare (which are implemented in Zindaiji). We will add these features to Zindaiji 3 as the future works.

The binary and source code is published to the web.
http://th.nao.ac.jp/~takedatk/COMPUTER/ZINDAIJI3/Zindaiji3Top_E.html

Keywords: Visualization, N-body simulation

Japan Geoscience Union Meeting 2012
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MGI33-03 Room:202 Time:May 22 09:30-09:45

Inter-university Upper atmosphere Global Observation NETwork (IUGONET) project

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The Inter-university Upper atmosphere Global Observation NETwork (IUGONET) project (2009-2014) is an inter-university program by the National Institute of Polar Research (NIPR), Tohoku University, Nagoya University, Kyoto University, and Kyushu University to build a database of metadata (data of data such as observation period, type of instrument, location of data, and so on) for ground-based observations of the upper atmosphere since the IGY in 1950s. The IUGONET metadata database (MDDB), which archives the information on a variety of observations by radars, magnetometers, optical sensors, helioscopes, etc. in different locations all over the world and in various altitude layers from the troposphere up to the heliosphere, will be of great help to researchers in efficiently ?nding and obtaining observational data they need. This should also facilitate synthetic analyses of multi-disciplinary data, leading to new types of research in the upper atmosphere. Last year we finally released the MDDB which we had developed by modifying a repository software DSpace as well as the integrated data analysis software called UDAS based on the THEMIS Data Analysis Software (TDAS) written in IDL. Both of them are freely available to all researchers. The IUGONET project is just starting its fourth year, that is, the first year of the latter half of the six-year project. We continue to add newly-coming metadata to our MDDB so that it provides more extensive coverage for the data search. Our effort is also made to have more IUGONET data supported by UDAS and to develop new functions for data processing/visualization on the UDAS platform. The achievements of the project for the first three years with some scientific results as well as the road map for the latter half of the project period are presented in the talk.

Keywords: upper atmosphere, metadata, repository, ground observation, database

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MGI33-04 Room:202 Time:May 22 09:45-10:00

An ambitious challenge of ”science cloud” in NICT

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Main methodologies of Solar-Terrestrial Physics (STP) so far are theoretical, experimental and observational, and computer simulation approaches. Recently ”informatics” is expected as a new (fourth) approach to the STP studies is a methodology to analyze large-scale data (observation data and computer simulation data) to obtain new findings using a variety of data processing techniques.

The first approach, theory, does not require any infrastructure. Maybe, pen and paper would be enough. In the STP fields, the infrastructure for observations is observatory and satellite. For simulations, the infrastructure is, of course, super-computer. What is the infrastructure for the fourth methodology? The answer is cloud. The cloud computing environments should play significant roles in science and technology. However, a variety of clouds have been used mainly for business fields, and

At NICT (National Institute of Information and Communications Technology) we are now developing a new research environment named OneSpaceNet. The OneSpaceNet is a cloud-computing environment, which connects many researchers with high-speed network (JGN: Japan Gigabit Network). It also provides the researchers with rich computational resources for research studies, such as super-computer, large-scale storage (disk) area, data processing parallel cluster workstations with GPGPUs, licensed applications, DB (database) and meta-DB, and communication devices. What is amazing is that a user simply prepares a terminal (low-cost PC) to make use of the resources. After connecting the PC to JGN, the user can make full use of the rich resources via L2 network. Using communication devices, such as video-conference system, streaming and reflector servers, and media-players, the users on the OneSpaceNet can make research communications as if they belong to a same (one) laboratory: they are members of a virtual laboratory.

We present two initial results using the OneSpaceNet for large-scale computer simulation data transfer and virtual observation data transfer system.

Keywords: Big Data, Science Cloud, OneSpaceNet

Japan Geoscience Union Meeting 2012
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MGI33-05 Room:202 Time:May 22 10:45-11:00

Visualization for Oceanic General Circulation Model via Multivariate Analysis

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Visualization of numerical simulation data is necessary to understand intuitively natural phenomena or structures. However, it is difficult to extract informative data from large scale datasets that is output from large scale high resolution simulation on the massively parallel supercomputer.

We, then, research the feature extraction method and generation method of transfer function to obtain effective visualization results from high-resolution numerical simulation. In this work, the feature extraction methods from the ocean general circulation model (OFES) data and the visualization methods which emphasis the feature are development. The features such as ocean currents, vortices or water masses are extracted by using a multivariate analysis which clustering from temperature, salinity, fluid velocity and etc. Good visualization results with emphasis features can be made by using these extracted features.

In this presentation, we will report the application examples to visualize the currents of the Kuroshio / Kuroshio Extension region and the water mass of the thermohaline circulation.

Keywords: OGCM, visualization, multivariate analysis, cluster analysis, transfer function

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MGI33-06 Room:202 Time:May 22 11:00-11:15

Development of ASTER Hot Spot Detection System using International Standards

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[1]AIST

In this presentation, we propose a new design of ground data management system for earth observing satellite data archive, in order to achieve an alert system development for volcanic acitivities, forest fire, environment monitoring, etc. There are some major activities, such as MODIS Rapid Response. However, these system are usually maintained by organizations who has a ground data management system. Therefore, it is hard to construct such rapid monitoring system by research groups outside from ground data management system. In order to soleve this inconvenient, we propose a design of ground data management system using international standards such as GeoRSS, WMS, WCS and WPS. In addition, we present ASTER hot spot detection system using international standards as an example implementation.

Keywords: ASTER, GeoRSS, OGC

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MGI33-07 Room:202 Time:May 22 11:15-11:30

Provision of map data through Digital Japan Web System

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[1]GSI of Japan

The use of GIS is changing over time. Purchasing desk-top GIS was common method to view map images and to superimpose geospatial data on them; however, Web-GIS usage has been popular. In this presentation we explain about Digital Japan Web System and mention the Ver.3 (Sato et al., 2011) that uses open source software, published in December, 2011.

Reference
Sato T, Iita G, Tachibana Y, Syudo T, Sato HP, 2011, Development of Digital Japan Web System open source version. Proceedings of 2011 Meeting on GIS Association of Japan, F-7-2.

Keywords: Web, GIS, Map, Digital Japan Basic Map (Map Information)

Japan Geoscience Union Meeting 2012
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MGI33-08 Room:202 Time:May 22 11:30-11:45

Integration of Public Borehole Information Databases in Kanto Region

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In the Kanto region, some local governments, such as the prefectures of Tokyo, Gunma, Tochigi and Kanagawa and the City of Kawasaki, share their borehole data on the Internet.

It is convenient for users if they are not only able to view underground structure data, registered in the portal site, and public borehole data of other organization, posted on the Internet, displayed concurrently on the map but also allowed to browse borehole data held by other organizations through portal site access. This can be beneficial for data providers as well.

To link with borehole data of local governments posted on the Internet, a function that registers metadata, such as borehole data location and total excavation length, is added to the portal site. This allows URLs of public borehole data to be associated.

Keywords: underground structure, database, borehore data, geophysical exploration, metadata, portal site

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MGI33-09 Room:202 Time:May 22 11:45-12:00

A visualization tool for Yin-Yang grid data and virtual reality visualization of frozen-in vector fields

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We have developed the following two visualization tools and methods. Details will be reported in the talk.

(1)
We have developed an interactive visualization software, ”SV4” for Joint Project for Space Weather Modeling (JPSWM) project. One of characteristic features of SV4 is that it visualizes data defined on a spherical grid system named Yin-Yang grid. Although SV4 is developed as a part of JPSWM project, it can be used in other projects that make use of Yin-Yang grid. Since Yin-Yang gird is now widely used in various fields in geophysics and astrophysics, SV4 would be useful for them, too. Another characteristic feature of SV4 as a visualization software is its base programming language. SV4 is coded in Fortran90 with a graphics library f90gl which is a Fortran interface for OpenGL and GLUT. Having found that most researchers involving JPSWM project use Fotran90/95 and they are not familiar with C/C++, which are standard languages used in computer graphics, we have decided to develop a fully Fotran-based visualization tool and provide the source codes in order that the simulation researchers can customize them. SV4 displays magnetic field lines with their releasing points from which magnetic field lines are integrated. The user can control a releasing point by the mouse drag. The magnetic field line is calculated in real time and shown on the screen. SV4 can visualize scalar fields by the isosurface method. The isosurface level is interactively controlled by the mouse drag. One can rotate, translate, and zoom in/out the visualized 3-dimensional objects in the display window. Another visualization method for scalar data implemented in SV4 is the ortho-slicer in which distribution of the scalar is shown by color contours on x-y, y-z, and z-x planes.

(2)
To analyze three-dimensional data of computational fluid dynamics and mag- netohydrodynamics (MHD), a new visualization method based on virtual reality (VR) technology is developed. In this method, a ”tracer line” is transported or advected by the target flow in three-dimensional VR space. Observing its deformation process, one can intuitively understand the flow’s structure, especially the stretching and twisting components. Since a tracer line is identical to a line of force of a vector field that is frozen-into the flow, the VR tracer line method proposed in this study can also be regarded as a new visualization method for the frozen-in vector field such as magnetic field in the ideal MHD or vorticity field in the Euler fluid. A program named TubeAdvector is developed for the implementation of the VR tracer line method. In TubeAdvector, its initial condition or the initial curve of a tracer line is intuitively specified by moving a portable controller or a 3D mouse in the VR space. The initial curve is then released to be advected by the target flow to be analyzed. When a distance between a pair of consecutive points becomes larger than a pre-defined length, a new point is inserted between them. Since the stretching and twisting components of the flow are key features of the magnetic field generation process in the MHD, the VR tracer line method is useful to analyze geodynamo or solar dynamo simulations. A problem of the VR tracer line method is that it does not convey local flow information around the curve. To resolve this problem, wheel-like objects are added to the tracer line. Radial change of a ring in each wheel shows the divergence component of the flow away from the tracer line at that position. Local colors of the tracer line and their temporal change convey stretching rate of the tracer line there. The original TubeAdvector and the improved one named wTubeAdvector are tested on three kinds of analytically defined flows as well as output data of a geody- namo simulation, and the usefulness of the VR tracer line method implemented by TubeAdvector and wTubeAdvector is confirmed.

Keywords: data visualization, Yin-Yang grid, virtual reality