

DEVELOPMENT OF THE PLANETARY CARTOGRAPHY WEB-SITE WITH OPEN SOURCE CONTENT MANAGEMENT SYSTEM

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Considerable success in the field of extraterrestrial territory investigations has led to intensive development of planetary cartography. The planetary cartography is called now for the decision a lot of problems to basic of which concern a route navigation on the celestial body surface («Moon rovers», «Mars rovers»), a choice of perspective areas for research, thematic maps for the analysis of surface physical properties, the analysis from the comparative planetology point of view and geography of extraterrestrial territories.

The Planetary Cartography Laboratory is one of the Space Center units in the Moscow State University for Geodesy and Cartography. It is engaged in research of extraterrestrial territories in the fields of geodesy and cartography, geography and information systems. There was a requirement for creation and placing in the Internet of Planetary Cartography Laboratory website. It will be placed the information received as a result of successful carrying out of space programs, development of extraterrestrial territories and astronautics explorations.

Content Management System

Content Management System (CMS) is the software using for creation, management and support of Internet-resource. If this basis is chosen correctly it would be possible to develop site in future and make it more useful. Incorrect choice of CMS can corrupt all the efforts, time and the next work with it.

We had compared 10 most popular free Open Source CMS (Drupal, Joomla, WordPress and others) and chose CMS MODx Revolution to create Planetary Cartography website. MODx is written in the PHP programming language and uses the MySQL database. It has active, global end-user and developer communities and translated into many languages, including French, German, Italian, Russian and Spanish.

This system is called not CMS, but CMF (Content Management Framework), that is a web application framework for publishing content on the world wide web and intranets. Built-in API-function and event handler allows you to create virtually any Web application, and change the core MODx is not interfering in the source code.

Since MODx is not a classical Content Management System, it is inherent high flexibility and ability to adapt to the developer needs. At the heart of MODx is an extensive modular structure, which consists of several groups – «snippets», «chunks», «plugins», «contexts» and «template variables».

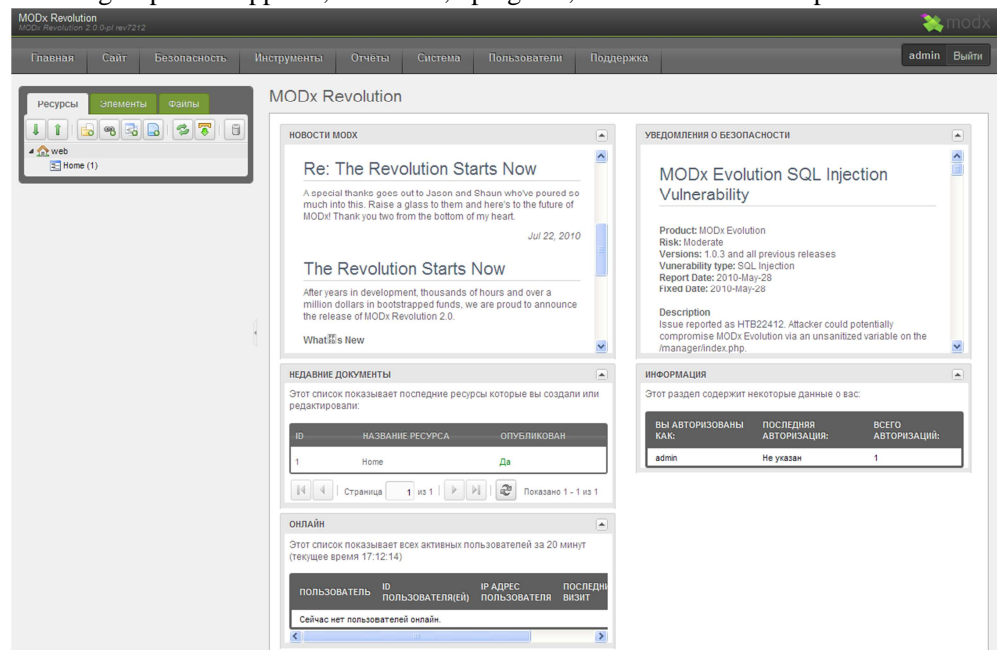


Fig. 1. CMS MODx Revolution control panel

CMS MODx allows to significantly simplify the process of creating search engines friendly websites. Each page (document) in MODx, besides the title and description, has its own set of automatically generated meta-data. In addition, MODx allows you to generate a variety of ways friendly URLs.

The Planetary Cartography web-site

Site Laboratory planetary cartography consists of 8 sections, which are presented in figure 2.

Section «Laboratory planetary cartography» contains the history of Planetary Cartography Laboratory, the main stages of its activity, employee information, conferences and commissions. Also represented here by the archive of publications from journals and conferences, which are published out in PDF.

Node «Cartographic studyness» is a database of general geographic and thematic maps characterizing hypsometry, morphology, gravity anomalies, climatic and other parameters of the heavenly bodies.

Section «Gazetteer» is a database with detailed information about all names of topographic and albedo features on planets and satellites (and some planetary rings and their systems).

Node «Glossary» is the Dictionary of the Planetary Cartography in five languages, which currently consists of 200 terms.

Section of «The Atlas of the Terrestrial Planets and their Moons» is an electronic version of a 1992 atlas.

Node «Geodesy» includes information on the relevance of surfaces and coordinate systems.

Section «Mapping» provides information on the classification of maps, scale number, map projections and how to display content, symbolization and classification of landforms.

Section «Projects» includes:

- A series of multilingual maps of the Moon, Venus, Mercury, Mars, Phobos, Deimos;
- «Atlas of the Solar System»;
- The textbook «Geography of extraterrestrial territories»;
- Project «Phobos-Grunt».

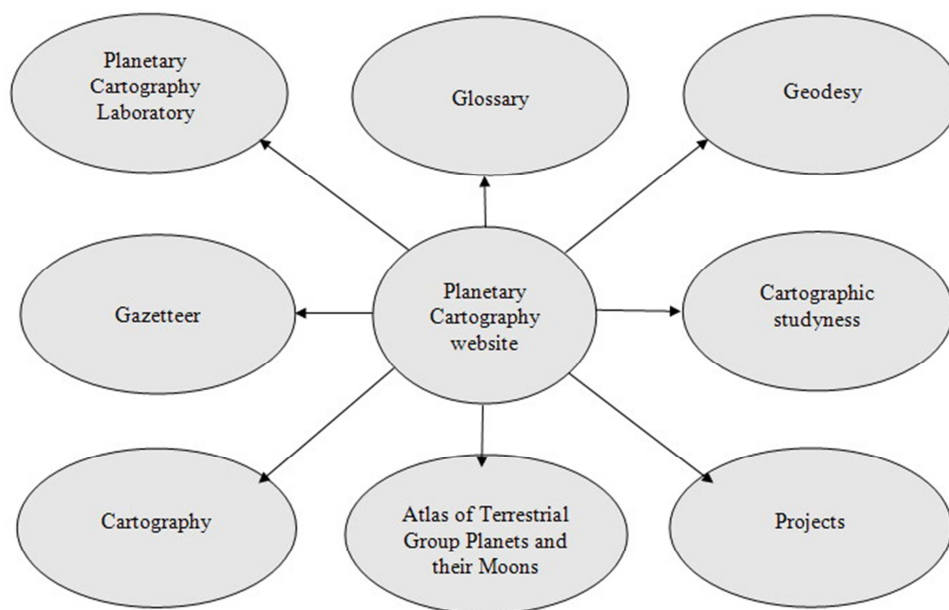


Fig. 2. Structure of the Planetary Cartography website.

Currently the site consists of 4 databases. Table 1 shows the largest sites sections and types of data in them. Separate databases are used for nodes Gazetteer, Cartographic studyness and Glossary.

| Section | Database | Text, images | GIS |
|--|----------|--------------|-----|
| Atlas of Terrestrial Group Planets and their Moons | | + | + |
| Gazetteer | + | + | + |
| Cartographic studyness | + | + | + |
| Glossary | + | + | |
| Geodesy | | + | |
| Cartography | | + | |
| Laboratory | | + | |
| CMS | + | + | |

Table 1

To work with external databases are used specially written snippets of the CMS MODx, which communicate with databases and ensure your search results for them. The principle of operation of these snippets shown by the example of section Gazetteer in figure 2.

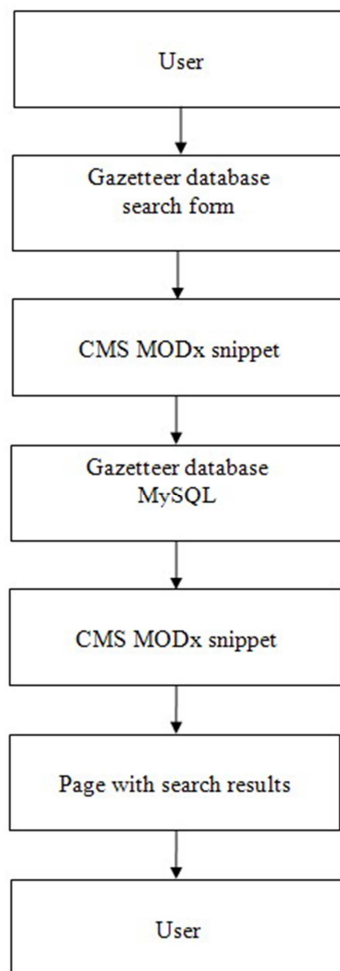


Fig. 3. Principle of Gazetteer operation

The user enters the necessary criteria for searching in the database of nomenclature of planetary bodies and presses the button «Search». Snippet of CMS MODx sends a query to the MySQL server, and returns the received data on a search results page.

Creating a structure of the site in the CMS MODx

On the left side of each page of the administrative section of the CMS MODx located a section «Resources» that contains a tree of the site. To create partitions and/or pages of the site using the button «New Document». In the press box after it is enough to fill the field «subject» and «resource content», not

forgetting to mention the item «Published». After clicking the «Save» page will be created and appear on the site.

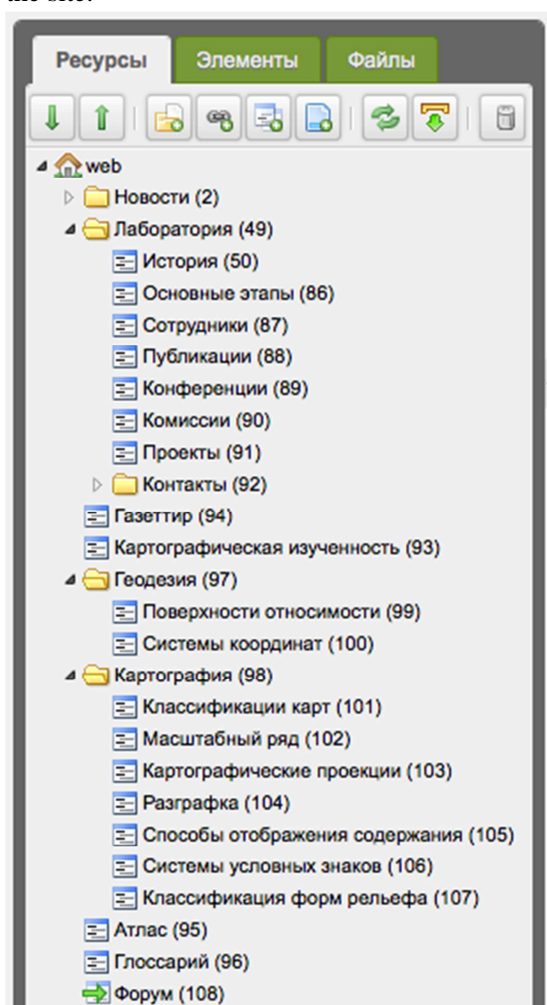


Fig. 4. Structure of the Planetary Cartography website in CMS MODx

Thus are 8 main sections of an information system that form the basis structure of the resource.

Following the establishment of a framework of information system stage - its content. For placement and design of text materials used by the visual editor TinyMCE, which allows to issue articles and provide them with the images without knowledge of HTML-code.

To implement a bilingual version of the site of planetary cartography was used in the previously mentioned MODx tool called «Context». Russian version of the resource is available at <http://www.planetmaps.ru/>, English - <http://www.planetmaps.ru/eng/>. To switch between language versions there are links like «Russian | English» on every page.

Creating an electronic version of the Atlas of Terrestrial Group Planets and their Moons

The basis for the most volume section of the Planetary Laboratory website is the Atlas of Terrestrial Group Planets and Their Moons. The printing version of Atlas has been published in 1992 and for the last years was essentially added by the new information. The saved up data on materials of planetary surveying is collected and analyzed in it. For the first time the Atlas information has comparative-planetologic character, reflecting also peculiar features of celestial bodies. The maps characterizing planets of terrestrial group and their moons both from the point of view of a surface relief structure and of various thematic properties are shown. The arrangement of materials in a cartographic part of Atlas is defined by distance of planets from the Sun. The following order of map representation is accepted: Mercury, Venus, the Earth, the Moon, Mars, Phobos and Deimos.

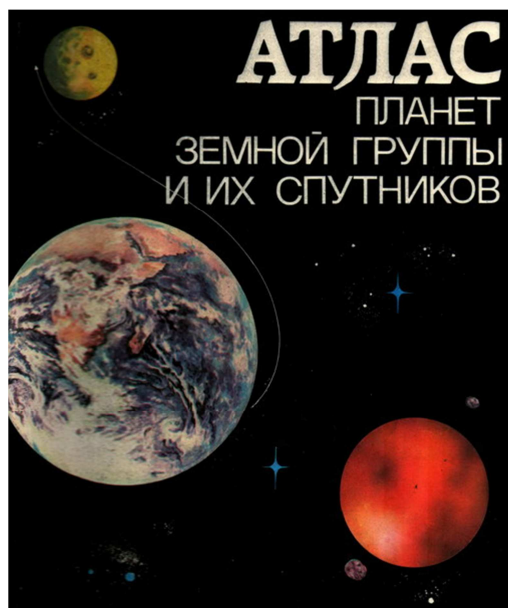


Fig. 5. The printed version of the Atlas of Terrestrial Group Planets and Their Moons

The process of creating and posting on the Internet electronic version of the Atlas of Terrestrial Group Planets and Their Moons has been divided into the following stages:

- Scan the pages of Atlas.
- Work with text, recognition in the program Abbyy Finereader and adjustment.
- Work with charts and tables, processing in a graphics editor Adobe Photoshop.
- Finding better images presented in the section «From the history of cartography» and printed in very low resolution.
- Collection of maps created at the Laboratory of Planetary cartography in the past since the publication of the printed Atlas years.
- Develop the layout of the Atlas electronic version.
- Creating an Atlas electronic version in CMS.
- Preparation of the English version of Atlas.

As a result of the work «Atlas of Terrestrial Group Planets and Their Moons» was scanned, the texts have been recognized and corrected, the images are processed in a graphics editor Adobe Photoshop. In addition, the layout was designed by an electronic version of Atlas.

Unlike the printed version, which materials are presented in comparative-planetological as an electronic version also offers users information on the distribution of bodies within the Solar system. Thus, information on the terrestrial planets and their satellites can be viewed as selecting the interested scientific direction, and a celestial body.

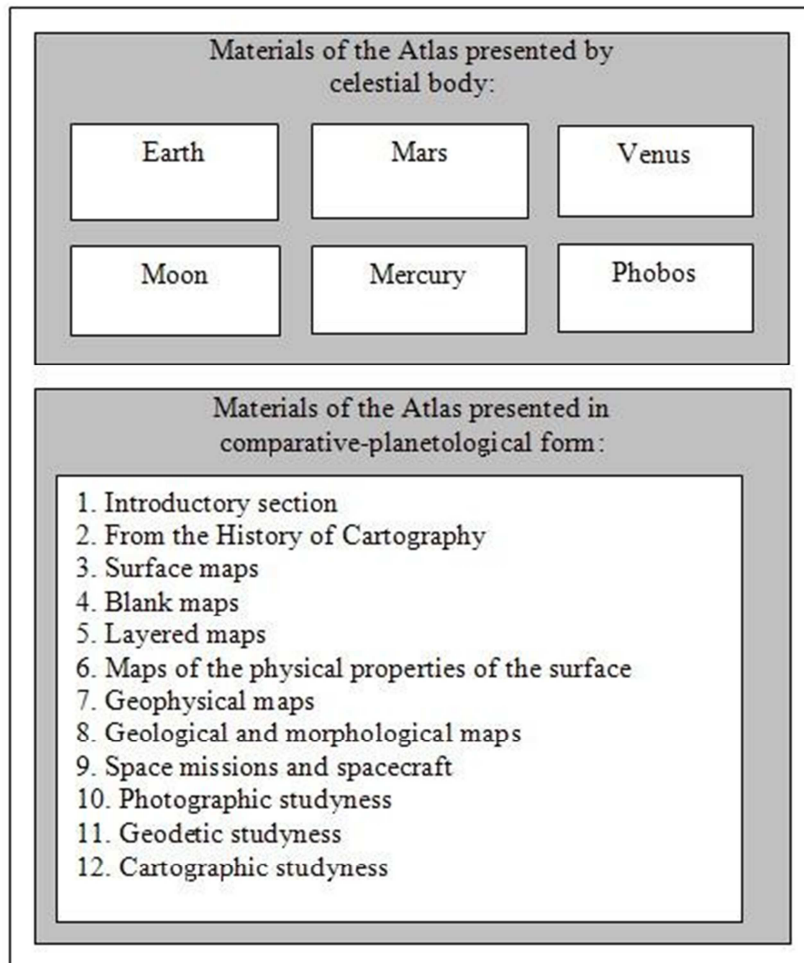


Fig. 6. Structure of the Atlas of Terrestrial Group Planets and Their Moons electronic version

To create the main page of the electronic version of the Atlas of Terrestrial Group Planets and Their Moons in CMS MODx need in the sidebar «Resources» click on the name of a previously created section of the Atlas. In the «Resource content» you must first add a table that will contain the first version of the Atlas content presentation (the celestial body), and below it - contents of the Atlas similar to the printed version (on scientific direction). This will be the home page of the electronic version of the Atlas of the terrestrial planets and their satellites.

The table consists of 2 rows and 3 columns, a total of 6 cells for each of the planets (Earth, Mars, Venus and Mercury) and satellites (Moon, Phobos), presented in the Atlas. Each cell contains the name of the planet / satellite, its image and a list of information about it available in the Atlas: maps of the surface, a blank map, hypsometric maps, flying, shooting surface.

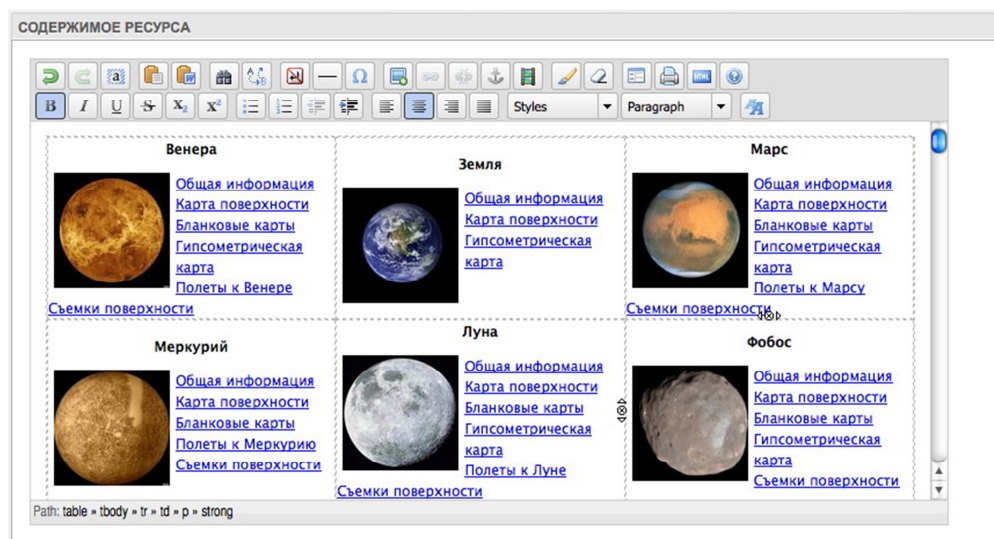


Fig. 7. Editing the Atlas of Terrestrial Group Planets and Their Moons content in CMS MODx Revolution

Below the table is the second option to represent the content of the Atlas (in comparative-planetological form), which fully corresponds to its printed version. The electronic version of the Atlas consists of 90+ web pages. To create each of them it is need to right click on the section of the Atlas (in the left block «Resources»), select «New» - «Child document». For each of the pages are filled with the field «Title», «Alias» and «Resource content». When all the pages are created, it remains to add links to them on a previously prepared for the home page of Atlas.

Plans to develop the planetary cartography website

The next stage in the development of the Planetary cartography website is the addition of GIS component. Geographic information systems (GIS) or geospatial information systems is a set of tools that captures, stores, analyzes, manages, and presents data that are linked to locations. In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology. GIS systems are used in cartography, remote sensing, land surveying, public utility management, natural resource management, photogrammetry, geography, urban planning, emergency management, navigation, aerial video, and localized search engines.

One of the most promising combination of GIS and Web technologies are geoportals - electronic geographic resources placed in a local network or the Internet. Main goal of the Geoportal is providing access to relevant spatial data to all interested parties with the subject. The most important property currently being developed web-based GIS is that, applying them, Internet users are able to work actively with geodata, without wasting resources on their collection and primary analysis. The main tool works remain only an Internet browser equipped with some standard or specialized software applications.

In the developed Planetary cartography website GIS component will find its use in several sections – «Gazetteer», «Cartographic studyness» and «Atlas of Terrestrial Group Planets and their Moons».

Creating a geographic information system on the planetary cartography consists of several stages:

- Selection of GIS package;
- Collecting and analyzing relevant data;
- Preparing images of celestial bodies and databases;
- Establishment of communication facilities of a vector image with attributive databases.

The range of GIS software today is very broad. The major producers of geographic information systems include the company ESRI, Integrgraph, MapInfo, Bentley and others. Currently the market of Geoinformatics appears more and more inexpensive or completely free of charge and at the same high-quality developments.

Among the freely available GIS products that support the ability to publish maps on the Internet, the most powerful are the Quantum GIS, GRASS and PostGIS. To create a geographic information system on the planetary cartography is supposed to use Quantum GIS, as the most convenient and the emerging free GIS. Quantum GIS runs on all major operating systems (Microsoft Windows, Mac OS X, Linux, UNIX), constantly improving the developer community and consumes fewer computer resources than most commercial GIS. For placing maps on the internet Quantum GIS uses a bunch of MapServer - one of the most popular creation of cartographic web-services with open source. As a server GIS database

(geodatabase) will be used by the DBMS MySQL Server, which also belongs to the category of open source and is free for noncommercial use.

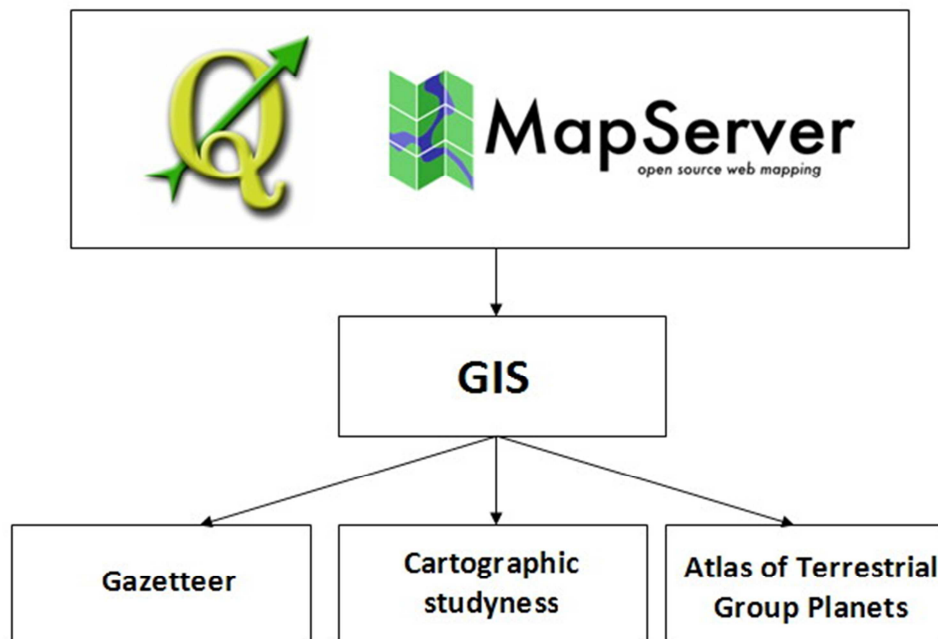


Fig. 8. The software used to create a Planetary cartography GIS portal

The result of the plans implementation for the development of the created website will become a modern GIS system for planetary cartography, working entirely on free open source software. In addition to the CMS MODx Revolution, for this will be applied free applications Quantum GIS and MapServer, which are powerful tools for creating Web mapping services, and in terms of functionality, ease of reconfiguration and integration are not inferior to commercial software.