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A new English GRASS tutorial for GRASS GIS learning

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Abstract

A new English GRASS tutorial has been developed at the University of Trento. A former version of the tutorial was developed in Italian language and was available since 2000 at the Trento University Website. This first version has been widely used to teach GRASS in University courses not only in Trento but also in many others universities in Italy. The comments of all the Italian users have been taken into account to set up the new English tutorial we present in this work. The new English GRASS tutorial contains some new features and an introduction to the new version 5.7 that should become the next stable version of GRASS. Since the impact on the new users approaching the system for the first time heavily affects the real diffusion of a software application, the request of a new tutorial, designed to help new users all over the world approaching GRASS, was very clear at the international conference "Open Source Free Software GIS - GRASS users conference 2002" held in Trento in 2002. The tutorial has been developed in Italian and then translated in English and has been written using HTML to follow the reasoning paths and logical jumps of operative practice, overcoming the stillness of traditional manuals. The website has been tested with all the available browsers and all the operative systems to guarantee the compatibility of the tutorial. The tutorial is structured to lead the learner through a path that introduces him in a very gradual and friendly way to the system, so, especially at the beginning of the tutorial, the exercises are described step by step and the result of every operation is also displayed allowing the learner to check the result of his own work. In this way GRASS learning can be faster, new users can be productive in a short time and can be attracted fuelling the GRASS diffusion and development.

1 Introduction

It is well known that the real diffusion of every kind of software application heavily depends on the impact on the new users approaching the system for the first time. A good learning curve is a prerequisite for any software system, and this fact is particularly true for such complex systems as geographical information systems. It must be taken into account that the people who are interested in these software need to understand the potentiality of these systems in as short a time as possible.

Together with every software application, several tools are usually available to guide new users in the learning and training process: printed and electronic documentation (on and off line), data samples, tutorials and specific classes. Among these different tools and besides their actual availability, the choice of the right tool depends on several factors such as prior knowledge (specific to the area or not), depth of the study required and time span scheduled.

The "openness" that characterize the open source software usually results in the availability of large collections of documents, describing the system and its use, the source code being the "ultimate documentation" itself. Open source projects have their strength in the public information exchange, therefore the more documentation is around the better chances for further developments are.

In this GRASS can be regarded as a specimen, as its spreading and development boosted after its development control has been taken over by Markus Neteler [7] at the Hannover University and it has been licensed under GPL (GNU public license). Markus Neteler continued his work at ITC Trento and the development of GRASS software has not known interruptions.
A huge documentation is already available for GRASS (see http://itc.it/grass/gdp/index.html), including introductory papers, user's manuals, installation/compiling/programming manuals, tutorials, on line courses and specific tools manuals. Nevertheless, the lack of a beginner tutorial, created to guide the first time user to become familiar with the tool was felt very important not only by the Italian users community but also by the international community. The first version of this tutorial has been developed in 2000 to create a new tutorial in Italian language, based on free data and structured to make easier the approach to GRASS for the first time users without the language barrier; however the tutorial is conceived to be useful also to the skilled GRASS expert [2]. Moreover, while the existing GRASS tutorials are in a traditional text format, our tutorial is written in an hypertext format to exploit the capability of HTML language and to make easier and more intuitive the learning path.
The need of a tutorial with these features in English language was openly expressed by the international users community in the International GRASS Users Conference held in Trento (Italy) in 2002. The present work has been realised to provide a new tool with the features that the international community searched to spread as much as possible the use of GRASS.

2 History of the tutorial

Every long time GRASS user knows that since many years GRASS has the potentiality to compete with many commercial and often very expensive GIS systems. Nevertheless, the great diffusion of this GIS has always be relented by some lacks. The documentation is very complete for someone who has a good knowledge of Internet, a good knowledge of Linux or other Unix-like OS, a good knowledge of Open Source and free software and a certain familiarity to Linux environment and procedures.
Unfortunately, this is not the classic background of the first time GRASS users. Most of the people who are beginning to use a GIS need something that is very easy to comprehend like a step by step guide, to acquire an initial confidence in the new tool and to experience their ability to carry out some simple data management operation. After they have overtaken this initial barrier, the learning process becomes more participated and is sensibly accelerated.
Given for granted that we have chosen a free software to teach GIS in our university, our main problem was to teach GRASS in the fastest and most effective way to our students. From the students point of view, it is important to reach a good skill in GRASS operativity in a reasonable period of time, and to develop good elaboration to reach good exams results. From the teachers point of view, always having in mind the scientific goal of each teacher for his own discipline, it is important that students acquire their ability in a context of technical and practical skills to improve their motivation and to give them the prove that their work with GISs is not only an academic exercise, but something that can be useful both from the scientific and from the practical-technical point of view. In this sense our experience has proved that students who are more involved in their own works, will use GISs in their future professional activity and will probably try to introduce their colleagues to this tool. The need of a tutorial was urgent to us, therefore we created and used for some years a draft Italian tutorial that was too much rough to be used when the number of the students and of the courses increased.
When the project started in 2000 the tutorial was conceived in Italian language to overtake the language barrier for the Italian users and this was certainly one of the most important goal. At that moment, the only existing Italian GRASS tutorial was based on the 4.3 GRASS version. While this was not a drawback for the general system

description, it might cause troubles to novice users for the interface changes and for the different options and layouts available. Moreover, especially in the Italian population aged more than 45, English language knowledge is not so frequent.
The authors have an extensive experience in GRASS, and in general in GIS, classes. GRASS has been used in University courses, Teacher courses, Professional courses in which the type of the students is very different [1,3,4,5]. This experience has been used to design the layout of the tutorial, in particular underlining those points that have proved to be usually tougher for students.
The tutorial exploits the HTML language capability to build a multiface document rather than a monolithic one. HTML links explicitly mimic the logical links between procedures, GRASS commands and interface operations. Multiple paths are possible within the tutorial, following the user's attitude.
A troubleshooting section allows novice users to deal with initial problems which can be easily overcome with experience. The description of the main GRASS commands and their functionality have been rewritten in Italian as well as most of the man pages.
The tutorial has been upgraded and improved many times to keep up with the changes in GRASS versions and sub-versions. For its own nature, Open source software is characterized from continuous development and upgrading. The success of this tutorial, confirmed by the wide use of this tutorial all over Italy, was very encouraging and a continue improvement of the tutorial was necessary, taking into account the users comments. In this way, the tutorial became very reliable, and many Italian university have based their GIS courses on it contributing to the spreading of GRASS in Italy. At the Open Source Free Software GIS - GRASS users conference 2002 held in Trento many international users expressed the need of a tutorial with the feature, the structure and the phylosophy we have tried to give to our Italian tutorial, so the decision to upgrade the tutorial and to translate it in English was taken. The operation has not been a simple translation of the existing Italian tutorial. Some parts of the tutorial have been rethought and perfectioned to make it more responding to the need of the users community.

3 Purpose of the tutorial

The aim of the tutorial is to show and describe gradually and in a friendly way the main functions of GRASS, so that GRASS learning can be fast and new users can be productive in a short time.
A first working English version is described, while future improvements, also with users' feedback, are planned.
The philosophy of the tutorial is to give, at the beginning, a very assisted path in which every operation and every elaboration is described in detail and the results of every single elaboration are shown in images. Gradually, the easiest parts are given for granted, so the student can learn something new at each step.
To make available a GRASS tutorial which uses freely distributable data, the well known Spearfish dataset (GRASS GIS official web site Sample Datasets http://grass.itc.it/data.html) has been chosen. Some additional data, such as isolines, have been generated for exercises on data conversion and map development. Moreover, the tutorial is structured so that it can be useful both for novices and expert users.
In particular the first time approach has been assisted both by starting with simple procedures and providing a troubleshooting section.
It is important to underline that this tutorial is not meant to be exhaustive of all the GRASS potential nor it claims to examine each module and its possible use. It rather aims to make GRASS logic clear, building a base for further studies and to make as simple as possible the first approach of the first time GRASS users.
The commands have been upgraded to the last GRASS versions, javascripts that were present in the first Italian version have been erased to make the tutorial more simple and compatible with all the internet browser.

4 Structure of the tutorial

The tutorial is built in six sections:
1. introduction;
2. what is GRASS.
3. troubleshooting;
4. exercises;
5. commands;
6. useful links;

Students should use the tutorial following the proposed sequence of exercises: while the first exercise are very easy and describe each procedure in detail leading the user step by step and showing the expected results of the elaboration, the last ones just outline the procedures without going deep in each command syntax.
However, each student may choose his entry point in the tutorial, depending on his previous knowledge about GRASS.

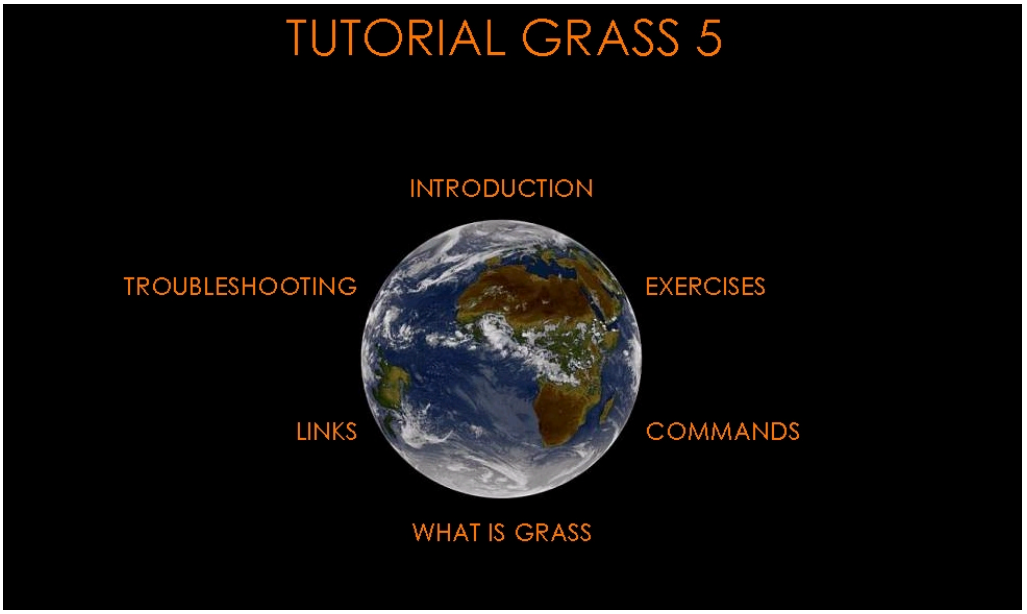

Figure 1: Main tutorial page

5 Sections "Introduction" and "What is GRASS"

In the first section, Introduction, general information about the tutorial are given. The motivations behind this new GRASS tutorial, are explained. In section 6 What is GRASS, a general description of the GRASS system is given, describing its story, structure and general usage. This section reports the present status of GRASS, its availability and system requirements for its use. Finally, references for downloading GRASS and its documentation, as well as hints for further studies on GRASS, are reported.

6 Section Troubleshooting

This section provides an on-line help to the most common problems encountered by novice users.
It uses a "query and answer style" to address the basic questions coming from students. It is based on the extensive experience of the authors in different GRASS classes.

This section is obviously open and suggestion from students and experienced users are welcome for its improvement.

7 Section Exercises

Exercises, which should be carried out in the proper order, allow a gradual learning with growing complexity and information. While some of the exercise are set up to show the use of specific data format, such as raster data in GRASS, other are more generic and guide the user on a logical path to create environmental and decision models.
The following exercises are currently available:

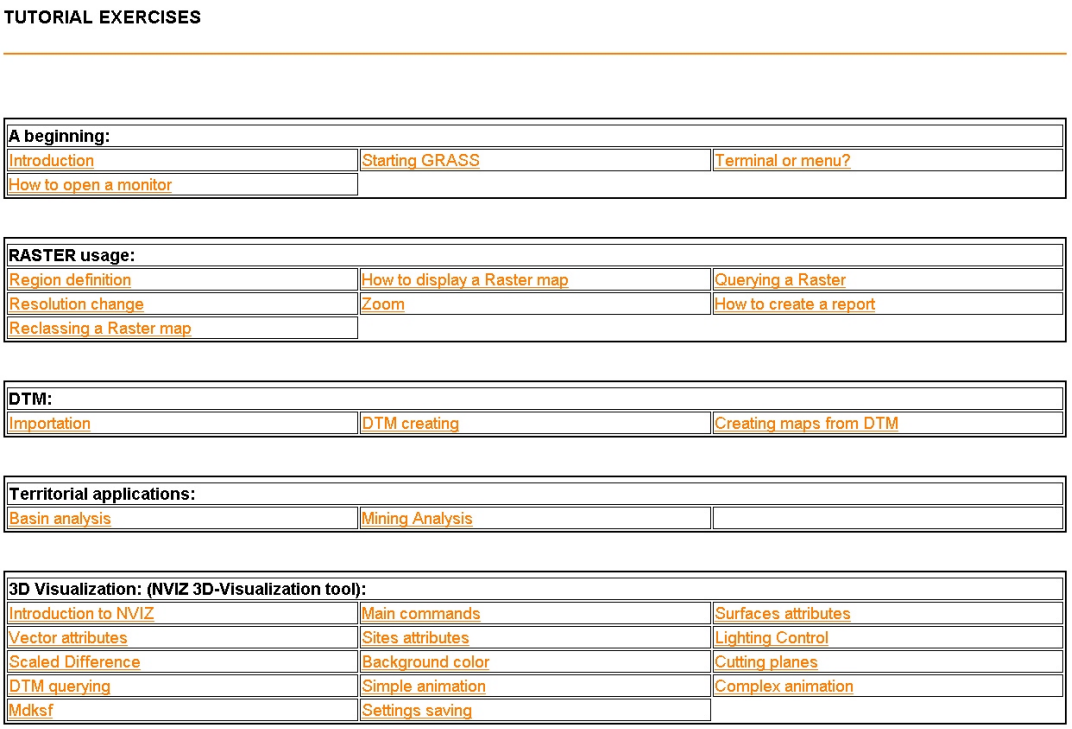

Figure 2: Tutorial exercises page

Exercises:
A beginning

1. Introduction
2. Starting GRASS (how to run the program)
3. Terminal or Menu? (how to enter commands via terminal or via menu)
4. How to open a monitor (how to use a monitor)

Uso dei RASTER:

1. Region definition (Definition of a region)
2. How to display a raster map (Display a raster map)
3. Querying a raster (How to query of a raster map)
4. Resolution Change (How to change the resolution)
5. Zoom (How to display zoom)
6. How to create a Report (What is a Report on a raster map and how to create it)
7. Reclassing a raster map (Reclassification of a raster map)

DTM:

1. Importation (data import)
2. DTM creating (Generation of a DTM)
3. Creating maps from DTM (Production of Maps from DTM)

Territorial applications

1. Basin analysis
2. Mining analysis (Analysis of a mining area)

3D Visualization: (NVIZ 3D-Visualization tool):

1. Introduction to NVIZ
2. Main commands
3. Surfaces attributes
4. Vector attributes
5. Sites attributes
6. Lighting Control
7. Scaled Difference
8. Background color
9. Cutting planes
10. DTM querying
11. Simple animation
12. Complex animation
13. Mdksf
14. Settings saving

While some exercises are original and have been developed by the authors of the tutorial, other are based on tutorial available on the internet. In particular some exercises are based on the tutorial by John Mackenzie [6] of the Delaware University.

A tutorial of GRASS 5.7 is in development and some exercises are provided in the following sections:

GRASS 5.7 Database:

1. Connection of a vector map to a db table
2. Creating a shapefile with db data
3. Creating a vector map as the result of a query

8 Section commands

This section offers GRASS modules' descriptions, with their synopsis and an overall report. These descriptions are fully integrated in the tutorial, since each time the module is mentioned or used in the exercise section, a link is provided to the module's description page. Modules descriptions are sometimes modified pages from the original modules man pages and sometimes original texts suggested from the use of the module. For each module a link to the original manual page (in English) at the official ITC site (http://grass.itc.it/) is available.

9 Section links

The link page provides internet references for accessing more information on GRASS. In particular, links to the GRASS European headquarters at ITC Trento and to the Italian users site, carrying further GRASS documentation, are provided.

Links:

1. Official GRASS GIS Homepage at ITC-Irst, Trento, Italy European Headquarters - Italy (http://grass.itc.it/);
2. Mirror of the Official GRASS GIS Web Site at Baylor University (http://www.baylor.edu/~grass/);
3. Italian Users site (Universita' di Parma) (http://www.geo.unipr.it/~gis/);

4. Geomatics Laboratory, University of Como (Laboratorio di Geomatica dell' Universita' di Como) Geomatics Workbooks (http://geomatica.ing.unico.it/);
5. Transactions in GIS (TGIS).

10 Conclusions

The new tutorial in English for GRASS GIS learning that has been written provides a new tool for supporting the diffusion of GRASS, in particular by attracting new users. At the same time this tutorial assists GRASS teachers, giving them a path for accelerating the first steps with GRASS exercises and make easier a gradual GRASS learning. While this is not today a complete guide to GRASS, it can usefully support new users toward GRASS learning. The tutorial upgrading has been carried out taking into account the tutorial users advices. A difficult task will be the upgrading of the tutorial. We have already experimented that some changes in the software menu or in the procedure of some commands can make difficult to follow smoothly the proposed path.
A significant effort has been made to exploit the hypertext potential of the HTML language, providing a structure where links allow a personal path through the tutorial in a different way than the other existing traditional text tutorials.
Since the Italian version of the tutorial has been successfully used in many different courses for very different type of students we hope that this new improved English version will be useful at the International community level.
The better description of the work is provided by the tutorial itself, as can be found at http://www.ing.unitn.it/~grass/docs/tutorial/english/index_en.htm.

References

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