

USER'S & DEVELOPER'S MANUAL (DRAFT VERSION)

WEB GEOMETRY LABORATORY

URL: <http://hilbert.mat.uc.pt/WebGeometryLab/index.php>

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Part I
User's Manual

Chapter 1

Introduction

The *WGL* platform, had its roots in GeoThms,¹ a Web-based framework for exploring geometric knowledge that integrates a DGS, Geometry Automatic Theorem Provers (GATPs) and a repository of geometric constructions, figures and proofs (Quaresma and Janičić, 2007). From this system some of the authors developed a first system, *GeoGCLC*, where a DGS and a repository of geometric constructions were integrated into a Web-based framework for learning geometry. The difficulties encountered in the integration of *GeoGCLC* in the learning management system Moodle,² as a SCORM module (Wisher, 2009), lead to the conclusion that there is a need for a more flexible approach regarding the integration of DGS applets in a learning environment (Santos and Quaresma, 2008). This led to the development of the *Web Geometry Laboratory* (*WGL*).

With the development of *WGL* our aim was to build a blended learning Web environment for geometry with collaborative, adaptive and automatic reasoning features. An environment to be used in a classroom, in synchronous interactions, mediated by a teacher, but also in synchronous and asynchronous, remote access.

The main features of the *Web Geometry Laboratory* (v1.4) are:

- An integrated DGS;
- A user's management module for: administrator(s), teachers and students, allowing the definition of classes and groups;
- A repository of geometric problems: each user has his/her own list of constructions;
- A permissions system allowing the sharing (or not) of each construction between users and groups;
- A collaborative module, where a given geometric task can be worked collaboratively by a group of users;

¹<http://hilbert.mat.uc.pt/GeoThms/>

²<https://moodle.org/>

- An adaptive module, allowing the capture of all the information regarding the students interactions with the system. This information can then be viewed and analysed by teachers;
- A chat, to allow the exchange of short textual messages between users engaged in a collaborative session;
- A forum to allow the exchange of messages between users about different subjects regarding the *WGL*.

In the next chapters we will describe all these features in detail.

1.1 Base System

A classroom session using *WGL* is understood as a Web laboratory where all the students (eventually in small groups) and the teacher will have a computer running Web browsers, with the *WGL* site opened.

The *WGL* is a client/server application. The *WGL* server is the place where all the information is kept: the log-in information; the groups definitions; the geometric constructions of each user; the users activity logs; etc. The clients will access the server through a Web browser, loading an instance of the DGS applet each and using the server to all the needed information exchange. For a remote access to the *WGL* servers³ we estimate that a normal bandwidth (≥ 20 Mbps) will be enough.

There are four distinct types of users: administrators, teachers, students and anonymous visitors. The administrator(s) main role is the administration of teachers. They have also access to the log-in information of all users, information that can be used to streamline the server.

Teachers are privileged users, in the sense that they are capable of defining other users, their students. At the beginning of each school year the teachers should define all their classes, the students in each class and, if needed, the aggregation of the students into groups.

The students, each linked to a given teacher, are able to work on the platform, performing tasks created by their teachers and/or pursuing their own work. Students are unable to create other users.

Finally, the anonymous visitor is a student-type user, not linked to any teacher and because of that, unable to participate in collaborative sessions. The purpose of this type of user is solely to allow unregistered users to test the *WGL* platform.

Each user (teachers/students) has access to a “scrapbook” in the server where she/he can keep all the geometric construction produced using the DGS integrated in the *WGL* platform. Each user will have full control over this personal scrapbook, having the possibility of saving, modifying and deleting each construction produced. Each user has also access to the list of constructions made available by the other users.

³International/Portugal: <http://hilbert.mat.uc.pt/WebGeometryLab>; Serbia: <http://jason.matf.bg.ac.rs/wgl>

To allow sharing geometric constructions among users, a permissions system was implemented. This permissions system is similar to the usual “file permissions system”, but more flexible so far the users/groups relationship is concerned allowing to specify reading, writing and visibility permissions, per geometric construction, user and group. By default, the teachers will belong to all the groups they had created, giving them the group access privilege to their students’ constructions (Santos and Quaresma, 2012, 2013a)

1.2 WGL Open Project

The *Web Geometry Laboratory* is an open-source project.⁴ The server must be hosted by an Web-server, the (e.g. Apache server) clients may use any Web-browser available. The database; (to keep: constructions; users information, constructions permissions, etc.) the DGS JavaScript applet; the synchronous and asynchronous interaction, are all implemented using free cross-platform software, namely GeoGebra, PHP, JavaScript, AJAX, JSON, JQuery, MySQL, and Web-standards like HTML5, CSS style-sheets and XML. The *WGL* is an internationalised system with the English language as the default language and already localised to the Portuguese and Serbian languages.

⁴<http://webgeometrylab.sourceforge.net/>

Chapter 2

Teachers

2.1 Setting a Class

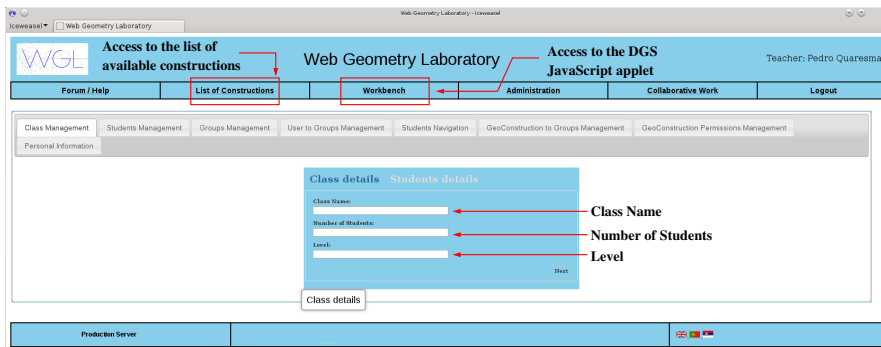


Figure 2.1: Creating a Class

2.2 Preparing a Work-session

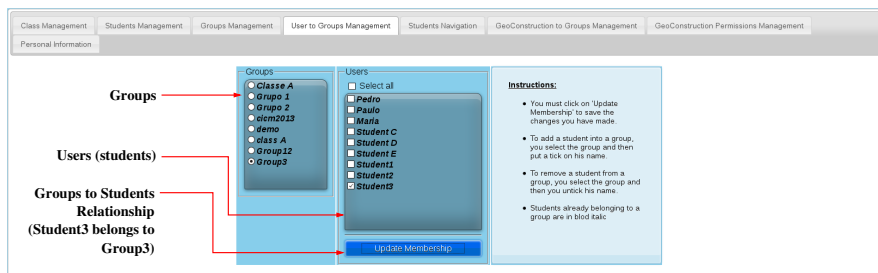


Figure 2.2: Groups to Students Relationships

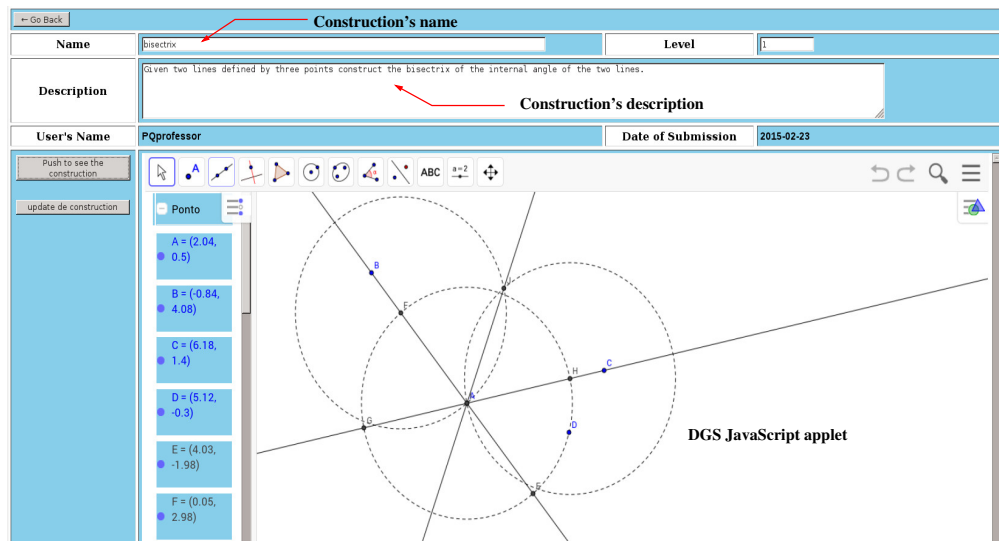


Figure 2.3: Preparing a Task—Angle Bisector

2.2.1 Teacher's Stand-alone Work-session

2.2.2 Teacher's Collaborative Work-session

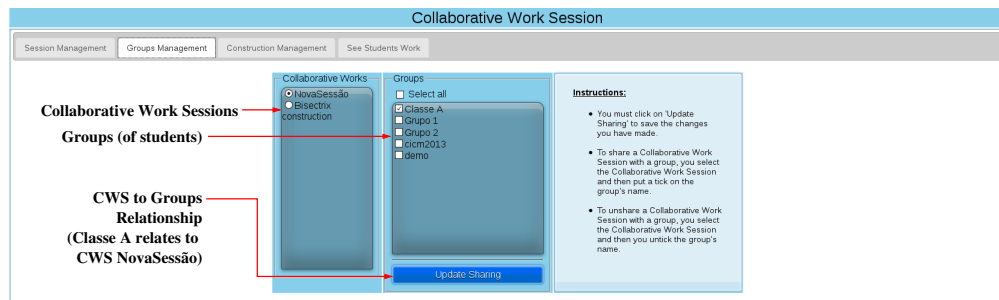


Figure 2.4: Collaborative Work Sessions to Groups Relationship

2.3 Adaptative Module

2.3.1 Capturing the Information

2.3.2 Visualising the Information

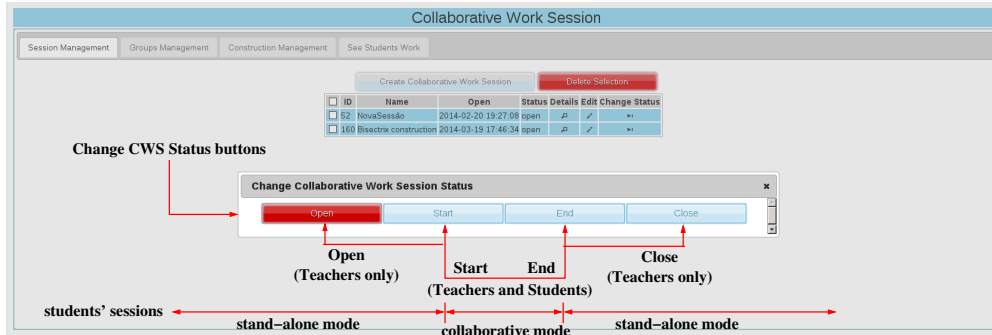


Figure 2.5: Collaborative Work Sessions—Changing the Status

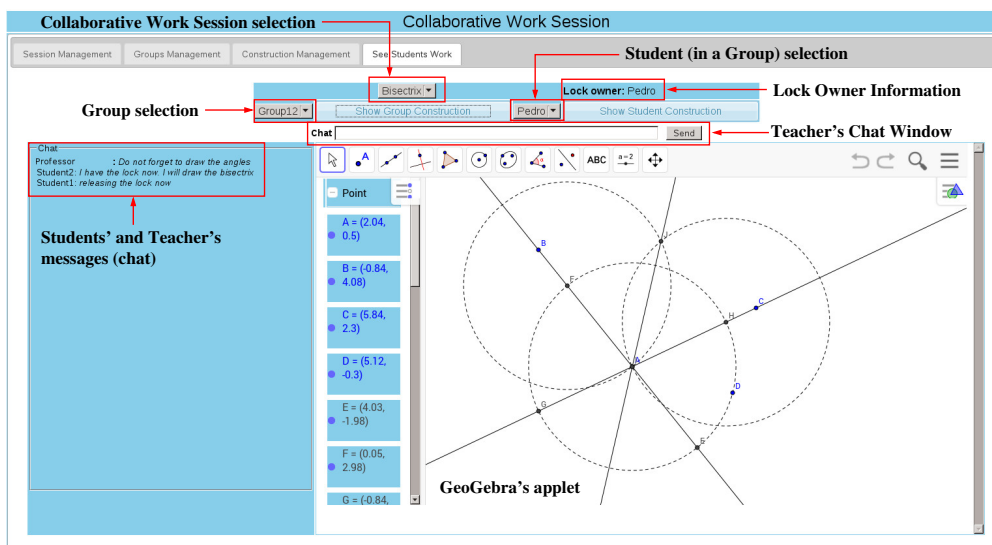


Figure 2.6: Collaborative Work Sessions—Teachers' Perspective

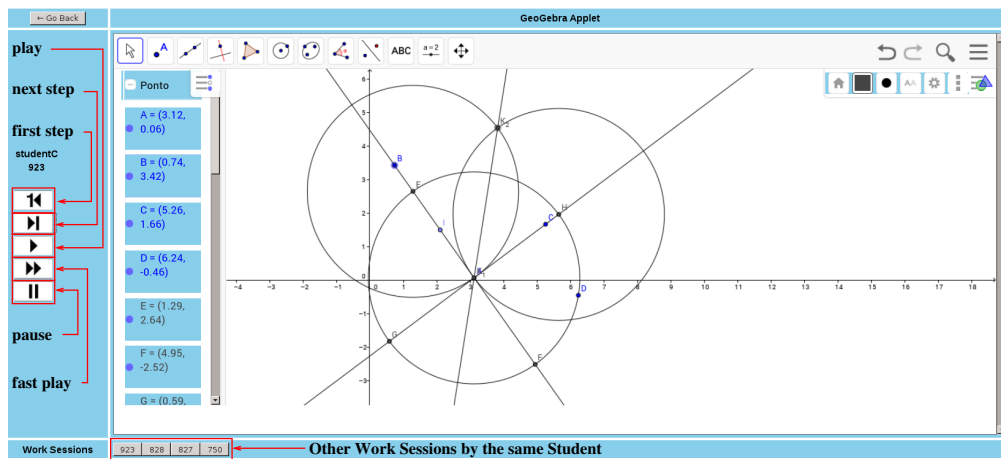


Figure 2.7: Playing Students' Workbench Work

Chapter 3

Students

3.0.3 Student's Stand-alone Worksession

3.0.4 Student's Collaborative Worksession

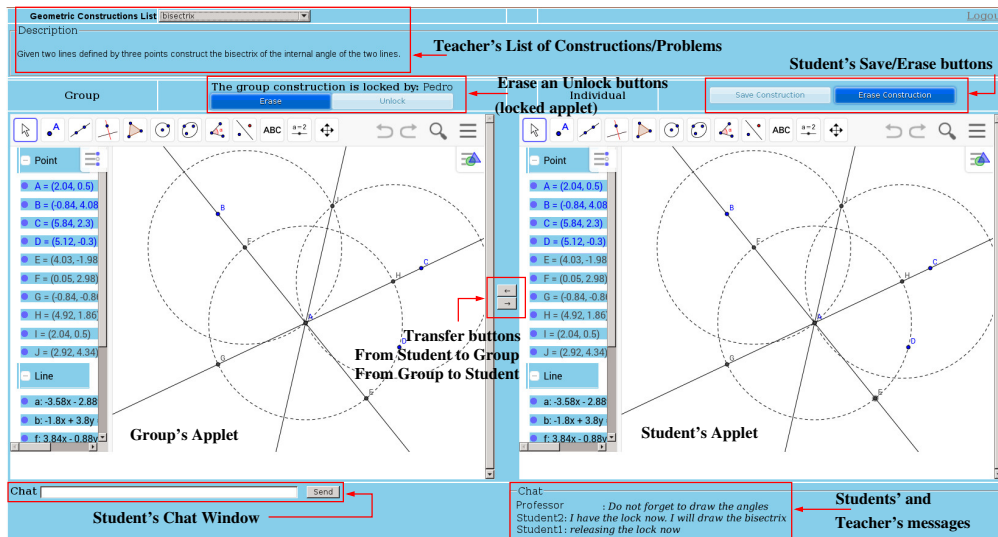


Figure 3.1: Collaborative Work Sessions—Students' Perspective

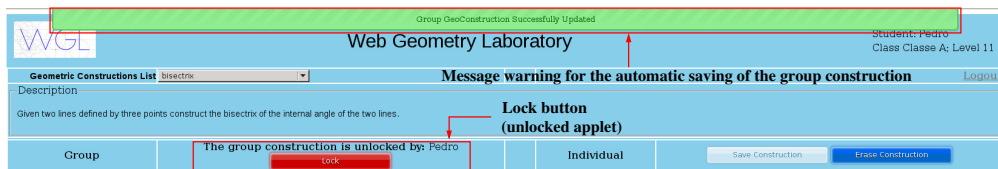


Figure 3.2: Collaborative Work Sessions—Students' Perspective, Lock Released

Chapter 4

Administrators

4.1 Setting a New Server

Setting a new server is possible given the fact that the *WGL* is a open-source project.

To install a new *WGL* server you need to have a PHP¹ compliant Web-server (e.g. Apache²), a MySQL³ server.

As a future development we will have a Debian Linux installation package (and maybe other types), but for the moment the installation of a *WGL* server is a non-automatic procedure.

4.1.1 WGL files

As a first step you should access the *SourceForge*⁴ project at <http://webgeometrylab.sourceforge.net/> and download all the files to a directory of your chosen.

After downloading all file you have to create the files `.gttu.php` and `server.php`. The first one contains the information allowing to connect to the database, the second some settings that allow the installation of the new server in any directory.

The file `.gttu.php` contains the usernames and passwords of three database users (that must be created, see Section 4.1.2), corresponding to three different access profiles (see Table 4.1)

You must fill the “<...>” fields accordingly to the values you fixed when installing the database.

This file contains vital information and should be protected accordingly. We suggest that this file be placed in a directory outside the *WGL* directory and without access by the Web-server. We also suggest that the owner and the group of this file should be the

¹<http://php.net/>

²<http://www.apache.org/>

³<https://www.mysql.com/>

⁴SourceForge is a Web-based service that offers a source code repository, downloads mirrors, bug tracking and other features. It acts as a central location that software developers can use to control and manage free and open-source software development

```

<?php
$dbregular = "<username_low_privilege>";
$dbregpass = "<passwd_reg>";
$dbcontrib = "<username_medium_privilege>";
$dbctrbpass = "<passwd_contrib>";
$dbadmin = "<username_high_privilege>";
$dbadminpass = "<passwd_admin>";
?>

```

Table 4.1: Access to the Database Information File

Web-server user (e.g. `www-data` on a Debian Linux, Apache server) and that the file privileges should be `-rw-r-----`, i.e. only the user and the group has “read privileges”.

The file `server.php` contains all the local information regarding the directories.

```

<?php
// servers
$servidorHTML = "<URL_local_host>";
$servidorMySQL = "<MySQL_server>";

// entry points
$entradaURL = "<entry_URL>";
$entradaFILE = "<entry_Linux_Directory>";

// Server administrator email
$eAddressAdmin = "<email_administrator>";

// Data base name
$databaseName = "<database_name>";

// Sets de timezone correct
date_default_timezone_set('<time_zone>');
?>

```

Table 4.2: WGL Local Information File (fragment)

Again, you need to fill in all the “<...>” fields.

A last (optional) customisation regards the style files contained in the `StyleSheets` directory. The main style file `webgeometrylab.css` should be edited if, for example, you want to change the background colour.

4.1.2 WGL Database

Contained in the distribution is a file `DB_SecurityCopies/db_structureOnly.sql`. This file has all the structure of the *WGL* database and, after setting the database users, is the file needed to re-create the database.

The default name of the database is “WebGeometryLab”, but this can be changed during the installation. Note that this must be the name that was specified above (see Table 4.2). You should also create three new database users with access to that database, again the *usernames* and *passwords* should be the same as in the file `.gttu.php`.

The three new users should have the following privileges. User *dbregular*: `select`, `insert`, `update` and `delete`. User *dbcontrib* adds to that the `lock tables` privilege. The user *dbadminpass* is the administrator user so adding to those of the *dbcontrib* he has the `show view`, `create`, `alter`, `references`, `index`, `create view`, `drop` and `create temporary tables` privileges.

4.2 Adminstrating Users

The administrator(s) main role is the administration of teachers. They have also access to the log-in information off all users, information that can be used to streamline the server.

4.2.1 Create new users

Confirm the registration of new users using the form “New Teacher registration” (see Figure 4.1) any user can ask to be confirmed as user of the *WGL*. In red all the mandatory fields, in black the optional fields.

The designated administrator receive a electronic mail message whenever (see Table 4.3) someone tries to register in the system.

New Teacher registration

Mandatory fields

Name

E-mail:

User name (max 18 characters):

Password (6 to 18 characters):

Password confirmation:

Optional fields

Affiliation

URL

Teachers registration only: this is subject to confirmation by the administrator

Figure 4.1: New Teacher Registration Form

The confirmation (or not) is done accessing the “Teachers Listing” page. For example in figure 4.2 it can be seen that for user 824 the administrator can “Confirm Registry” or, in a opposite decision, to “Remove User”.

```

newTeacher register him/herself at WebGeometryLab
Name: newTeacher
Affiliation:
URL:
Electronic mail: newTeacher@email.email
Date of Submission: 2015/06/03
Username: newteacher

```

Type: ToBeConfirmed

Table 4.3: Electronic Message sent to Administrator

Teachers Listing

54 Users

				Add a new Teacher	
User Id	Name	username			
74	Pedro Quaresma	PQprofessor	See Details	Remove Teacher	
83	Helena France Rodrigues Cardoso	helenafrance	See Details	Remove Teacher	
92	Vanda Santos	vasantos	See Details	Remove Teacher	
506	Fernanda Coutinho	fernanda	See Details	Remove Teacher	
507	Maria Helena Sargaço Pinto Loureiro	helenasargaço	See Details	Remove Teacher	
508	Carla Maria do Quinteiro Rodrigues Gonçalves	Carlagoncalves	See Details	Remove Teacher	
509	Eufrásia Martins	Eufrasia	See Details	Remove Teacher	
510	Maria da Graça Marques Pereira Lopes	glopes	See Details	Remove Teacher	
824	José Carlos Monteiro Pinto	josecarlos1102	Confirm Registry	Remove User	

Figure 4.2: Teachers Listing

4.3 Adminstrating the Server

The administrator can view the logs, i.e. the user's access to the *WGL*server. All the accesses have a time stamp associated, so this log information can be used to “clean up” the server removing users no longer using the system.

For the moment, apart from confirming and removing users, there are no administrative tasks to be preformed by the administrator.

Part II

Developer's Manual

Chapter 5

Introduction

With the development of *WGL* our aim was to build a blended learning Web environment for geometry with collaborative, adaptive and automatic reasoning features. An environment to be used in a classroom, in synchronous interactions, mediated by a teacher, but also in synchronous and asynchronous, remote access.

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¹International/Portugal: <http://hilbert.mat.uc.pt/WebGeometryLab>; Serbia: <http://jason.matf.bg.ac.rs/wgl>

²<http://webgeometrylab.sourceforge.net/>

Chapter 6

Global Structure

Chapter 7

Collaborative Module

Chapter 8

Adaptive Module

Chapter 9

DGS Integration

Chapter 10

GATP Interation

Chapter 11

Permission System

Chapter 12

Database

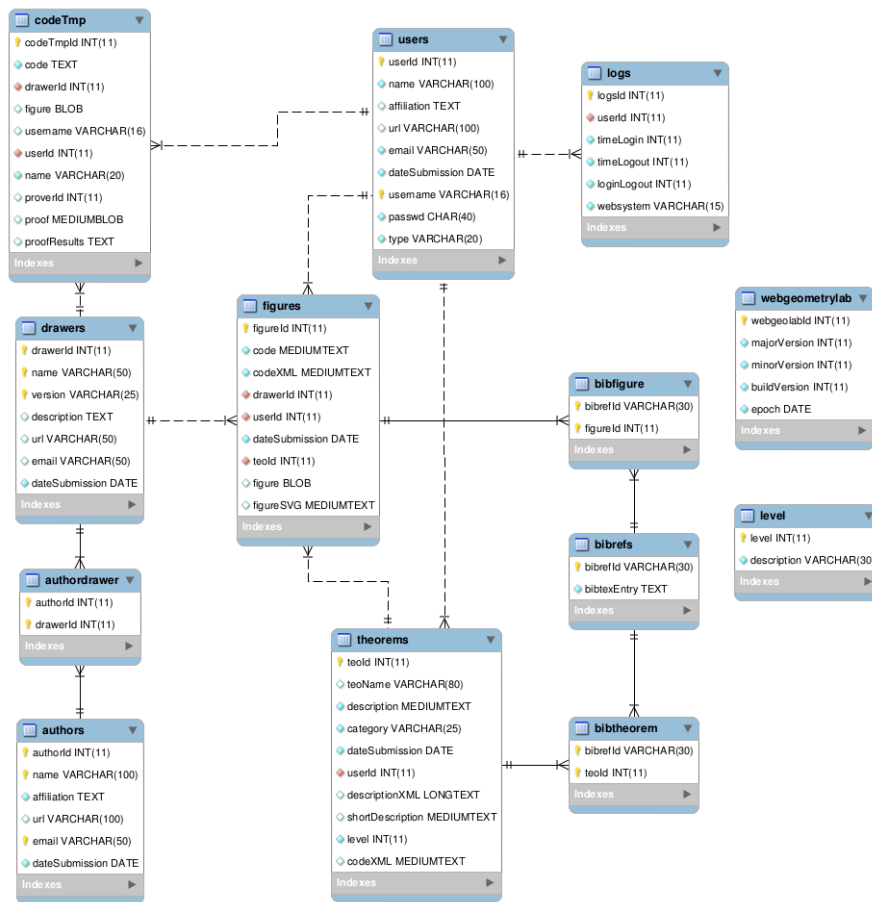


Figure 12.1: Entity-Relationship Diagram (MySQL-Workbench)

Chapter 13

Internationalisation / Localisation

The system use the library *gettext* in order to allow the translation of all the output messages. In the following the steps needed to adapt the PHP files to become “internationalised” and the translation procedure are described.

13.1 Internationalisation (i18n)

13.1.1 Environment Variables

```
LANG=pt_PT.UTF-8
```

```
export LANG; LANG=pt_PT.UTF-8
```

13.1.2 PHP i18n

To transform a non-i18n PHP program into a i18n PHP program we have to set some global parameters and to transform all outputs.

1. Global Parameters (`index.php`)

```
// Specify the translation file directory and encoding
bindtextdomain("index", "./Locale");
bind_textdomain_codeset("index", 'UTF-8');

// translation domain
textdomain("index");
```

2. Transformation of all outpur instructions including a call to the `gettext` library.

```
echo "<center>
  <h2 class='maketitle'>".gettext('Web Geometry Laboratory')."</h2>
</center>";
```

13.2 Translation (l10n)

13.2.1 Prepare the Translation Files

1. Use the `xgettext` program to **create a new** translation template file POT.

```
xgettext --from-code=utf-8 -o index.pot -k_ -kN_ index.php
```

2. Use the `msgmerge` program to **update** a POT file.

```
msgmerge index.po index.pot > novo_index.pot
cp novo_index.pot index.pot
```

3. Copy the template file POT to a translation file PO.

```
cp index.pot index.po
```

13.2.2 Translate

1. Use Emacs or Kbabel (or another specialised program) to make the translations.
2. Transform the PO file in a MO. The MO is a binary version of the PO file, to be use on run time.

```
msgfmt index.po -o index.mo
```

13.2.3 Install the Translations

1. Copy the files MO to the directory LOCALEDIR.

For example, if you have, in the PHP programa:

```
bindtextdomain("index", "./Locale");
```

Then, you must do the following:

- (a) If you have not done it yet, create the `Locale` directory:

```
mkdir Locale
```

- (b) For every new language, create the directory corresponding to that language:

```
Locale/<language_code>/LC-<category>/
```

For example (for the Portuguese Language):

```
mkdir pt_PT/LC_MESSAGES/
```

- (c) Copy all the MO file to that last directory.

2. In order that all these settings became functional the package `php-gettext` must be installed. You can check that using then function `phpinfo()` and then look for:

```
GetText Support      enabled
```

13.3 Translations

Language	Translation Team	Contact	Status
Portuguese	Vanda Santos, Pedro Quaresma	vsantos@gmail.com	good
Serbian	Milena Marić	milena.maric.f@gmail.com	good

Table 13.1: Translations

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