

User Manual for Benchmark

Project 12, eNTERFACE07

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1 Introduction

We outline some information regarding the programs used for installing and running the benchmark. Linux with Debian 4.0 has been used in the workshop preparations. In the tarball provided there are three directories:

- **Database/**, which contains the elements of the database.
 - **Face/**, which contains the face images.
 - **Function/**, which contains the Matlab files of the functions.
 - **Hand/**, which contains the hand image files.
 - **Result&Report/**, where result and report files will be stored after the script has run.
 - **Template/**, which contains the template files.
 - **Text_files/**, which contains the files necessary for loading the database.
 - **Voice/**, which contains the voice files.
- **gui/**, which contains the benchmark.
- **Library_windows/**, files necessary for Windows installation.
- **docs/**, which contains all relevant documentation.

For the rest of this document `$installdir` shall represent the directory in which you have installed the benchmark files.

2 Database installation

If you have a MySQL account running on your machine already you can change the values in `$installdir/gui/mysql.c` to represent your own user name, password and host name.

```
27 char *host = "yourhostname";
28 char *user = "yourusername";
29 char *passwd = "yourpassword";
```

In this case you should use this user name in place of root in the instructions below.

2.1 Linux

The database storing the individuals, functions and hash values is implemented using MySQL 5.0. It is necessary to install all relevant client and server modules in order to run both in the same computer. In Debian 4.0 the packages required are:

```
mysql-server-5.0
libdbd-mysql-perl
libmysqlclient15off
mysql-admin
mysql-admin-common
mysql-client_5.0
mysql-client-5.0
mysql-common_5.0
mysql-server_5.0q
```

To initialise the database structure the `$installdir/gui/Database_creation.sql` MySQL script needs to be run:

- Move into directory `%installdir/gui`.
- Type from the command line `mysql -u root`.
- Run `Database_creation.sql`:

```
mysql> source Database_creation.sql
```

2.2 Mac

After installing MySQL 5.0 you should be able to follow the Linux instructions above.

2.3 Windows

To install benchmark under Windows using `mysql.dll` provided and MySQL 5.0:

- Copy `.dll` to `$installdir\gui\`.
- Download `mysql-5.0.45-win32.zip` and install it (complete installation, including executables in Windows path)
- Copy `C:\Program Files\MySQL\MySQL Server 5.0\lib\opt\libmysql.dll` to `C:\WINDOWS\system32`
- Check that mysql server is running, issuing `services.msc` from Start → Run
- In a command prompt type `mysql -u root`, and then `source Database_creation.sql` at the mysql prompt
- Start Matlab.
- Check that `mysql.dll` works trying next `mysql(1)` and `mysql(2)`
- Copy `$installdir\gui\Database_creation.sql` and `$installdir\gui\Load_data.sql` in your mysql bin directory.

2.4 Loading Data

To load data into the database the following needs to be done:

- You need to have a `.txt` file containing a list of the names of the initial individuals to be added to the database. This file needs to be in the `$installdir/Database/Text_files` folder. The format of the file should be one identifier per line. The `.txt` file for the included database is
- Alter `fid` in `$installdir/Database/Text_files/gen_text_file.m` to the name of your file:

```
fid = fopen('yourfile.txt', 'r');
```

- The supplied `gen_text_file.m` needs to be updated so that the paths therein point to the relevant locations in your system:

- Linux/Mac:

```
pathDatabase = 'yourinstalldir/Database/';
```

- Windows:

```
2 pathDatabase = 'yourinstalldir\\Database\\';  
12 pathF = strcat(pathDatabase,'Face\\');  
16 pathH = strcat(pathDatabase,'Hand\\');  
20 pathV = strcat(pathDatabase,'Voice\\');
```

- Then run `gen_text_file` from the Matlab prompt.

```
> run gen_text_file
```

- The `$installdir/gui/Load_data.sql` file's paths must also be updated.

- Linux/Mac:

```
LOAD DATA LOCAL INFILE "yourinstalldir/Database/Text_files/individual.txt"  
INTO TABLE individual;  
LOAD DATA LOCAL INFILE "yourinstalldir/Database/Text_files/face.txt"  
INTO TABLE fingerprint;  
LOAD DATA LOCAL INFILE "yourinstalldir/Database/Text_files/hand.txt"  
INTO TABLE fingerprint;  
LOAD DATA LOCAL INFILE "yourinstalldir/Database/Text_files/voice.txt"  
INTO TABLE fingerprint;
```

- Windows: You must escape all `\` in your path with another `\`, i.e. they become `\\` as in the path below.

```
LOAD DATA LOCAL INFILE "yourinstalldir\\Database\\Text_files\\individual.txt"  
INTO TABLE individual;  
LOAD DATA LOCAL INFILE "yourinstalldir\\Database\\Text_files\\face.txt"  
INTO TABLE fingerprint;
```

```
LOAD DATA LOCAL INFILE "yourinstalldir\\Database\\Text_files\\hand.txt"
INTO TABLE fingerprint;
LOAD DATA LOCAL INFILE "yourinstalldir\\Database\\Text_files\\voice.txt"
INTO TABLE fingerprint;
```

- Then this file must be run in MySQL with root privileges.

```
mysql> source Load_data.sql;
```

3 Matlab & Mex file

We have been using Matlab 7.0 for creating the benchmark GUI. In order to interface Matlab to MySQL it may be necessary to compile the Mex file `mysql.c` provided (dynamic library, written in C). This compilation requires the headers of the MySQL client libraries.

3.1 Linux

The provided `.mexglx` file can be used instead of compiling from scratch. Though if compilation is necessary do the following.

In Debian 4.0, the package needed for this is `libmysqlclient15-dev`. The Mex file is compiled by means of the Makefile provided typing `make mexfile` from the command line when in folder `$installdir/gui/`, which generates `mysql.mexglx`.

Note: It is possible that the paths in the provided makefile may need to be adjusted to reflect your system.

3.2 Mac

You should be able to follow the Linux instructions above though it is likely that the paths in makefile might need to be adjusted slightly. Note: It is important that there be no spaces in the install directory on a Mac.

3.3 Windows

The provided `.dll` file can be used instead of compiling from scratch. It must be copied to `$installdir/gui\`. However if you need to compile the Mex file under Windows the following is necessary, using gcc 3.4.2 and MySQL 5.0:

- Download MinGW-5.1.3 and install it in `C:\MinGW`. Include this directory in Windows path (My computer → Properties → Advanced → Environment variables)
- Download gnumex-1.11 and install it in `C:\gnumex-1.11`

- Download mysql-5.0.45-win32.zip and install it (complete installation, including executables in Windows path)
- Copy C:\Program Files\MySQL\MySQL Server 5.0\lib\opt\libmysql.dll to C:\WINDOWS\system32
- Check that mysql server is running, issuing `services.msc` from Start→Run
- In a command prompt type `mysql -u root` and then `source Database_creation.sql` at the mysql prompt
- Start Matlab. Issue `addpath C:\gnumex-11` and then run `gnumex`. Configure it for MinGW linking, safe compile, and processor all, and then generate `mexopts.bat`. Mex will use this file for compilation as default.
- Copy C:\Program Files\MySQL\MySQL Server 5.0\lib\opt\libmysql.lib to the project directory where `mysql.c` is found.
- Generate the dynamic library `mysql.dll` issuing within Matlab

```
mex -I"C:\Program Files\MySQL\MySQLServer 5.0\include" mysql.c libmysql.lib
```

- Try next `mysql(1)` and `mysql(2)` to check that it works.

4 Running the Benchmark

The database and Mex file should be installed and compiled before attempting to run the benchmark. To run the benchmark:

- In Matlab change directory to `$installdir\gui\`.
- At the Matlab prompt type the command `mainWindows`.

5 Using the GUI

The initial window opened is `mainWindows` which serves to open and close the connection to the database. When the button **Open Connection** is clicked the connection shall be established and then it is possible to make use of the benchmark. The connection can be closed from within the main GUI window.

The main window, see Figure 1 also allows you to access the the database and the various libraries. The subwindows are described in the following sections.

5.1 Database of Individuals

The database of individuals allows you to add, remove and edit individual database entries. It is also possible to add and remove audio and image files associated with an individual in the database.

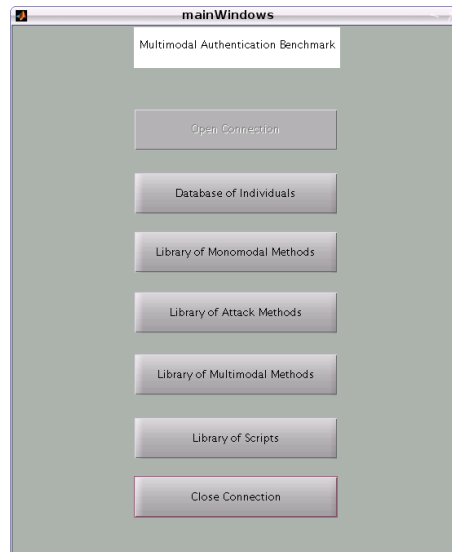


Figure 1: Main window

- To add an new individual to the database enter there name in the textbox and click the **Add** button.
- To edit an individuals information select their name in the list and select **Edit**.
- To remove an individual from the database merely select their name from the list and then click **Remove**.

Once you have entered the **Edit** dialogue you can add and remove files of the type of the supported modalities for the selected user.

5.2 Library of Monomodal Methods

Here you can add and remove monomodal methods in the form of **.m** files. When adding a Monomodal method you must specify the modality it opporates on as well as its Hash and Comparison functions and their respective parameters.

5.3 Library of Attack Methods

Here you can add and remove attack functions in the form of **.m** files. When adding an attack function you specify the modality on which it operates and its parameters. In attack function the first to parameters must be name and rang of attack, respectively. Both these parameters values will be passed to the attack functions by the scripts.

5.4 Library of Multimodal Methods

Here you can add and remove multimodal functions in the form of `.m` files. When specifying the details of a multimodal function you may choose four monomodal functions and an attack function to associate with each from the existing libraries. You must also specify the weight you associate with each monomodal function. The weights can be any positive numbers a, b, c . These will be normalised as a/T , b/T and c/T where $T = a + b + c$.

5.5 Library of Scripts

This interface allows you to run existing scripts and display their outputs. It is also possible to generate new scripts from existing templates using the multimodal functions in the database or from new templates written by the user. Currently the creation of templates is not an automated function. New styles of attack and multimodal function would mostly likely require the creation of new template scripts. Template scripts are `.m` files which define the structure of the benchmark scripts.

- To generate a new script enter its name into the text box and choose which template and multimodal method you wish to use.
- **Run Script** will run the selected script writing output to the file `<scriptname>.output.mat`.
- The results can be plotted once a script has run, i.e. has `status=2`. A new window will open that will allow you to navigate through all plots contained in `<scriptname>.output.mat`.
- **Create Report** allows you to create a detailed report about the selected script. The report contains information about the various functions used, their parameters and the outputs of the script.