

## Simulation of an Intranet-Based Module Gnuplot

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**ABSTRACT:** Here we propose a modified module of gnuplot for simulation based on the global network named webgnuplot, which provides an interface with an independent operating environment, thereby performing gnuplot simulation from any connected network computer via a web-based application that can be used remotely throughout the network connection. We describe the module architecture of the web gnuplot and show that this module has been successfully used to perform simulation from any computer with intranet access, without having to install any software or plug-in.

**KEYWORDS:** gnuplot, simulation, webgnuplot, Intranet, Web server, Web-client, modeling.

### 1 INTRODUCTION

Gnuplot is a freely distributed plotting tool with ports available for nearly every major platform. It can be operated in one of two modes, i.e when you need to adjust and prettify a graph to "get it just right," you can operate it in an interactive mode by issuing commands at the gnuplot prompt. Alternately, gnuplot can read commands from a file and produce graphs in batch mode[1]. The batch-mode capability is especially useful if you are running a series of experiments and need to view graphs of the results after each execution, or when you are needing to return to a graph to modify some aspects after the graph was originally generated.

With the increase of Internet opened which a new opportunity in the areas of distributed design and the World Wide Web has emerged as the most desirable platform for distributed access to information. The described module of gnuplot in [2] together with our developed model webgnuplot allowing simulation and training in the field of technology as a local (Intranet), and as a global network of Internet .

The main problem that needs to be solved is the possibility to develop the module of gnuplot that can be used on the internet. Therefore, it is important to develop methods that can be taken into consideration in order to the precedence over the network and then browsers independent platform.

The main problem requires to solve the following sub problems :

1. Minimization of the amount of data which must be sent to the network
2. Problem sharing between web server and web client
3. Choosing of programming tools used for various tasks
4. Development of special user interfaces
5. Use of multiple servers distributed around the world and job sharing among them
6. Security and account processing
7. Mobiles software used on servers and clients.

The special feature is that the web application runs the server automatically and the client in this case only receives the results. Transferring requests and results of their processing takes place through the internet and displays query results as well as receiving data from the user and that can be transmitted to the server and usually handled by a special application – "Internet Explorer".

## 2 MODELING IN GNUPLOT MODULE ENVIRONMENT

Gnuplot converts raw tabular data into a graphic file image. Popular formats are png, pdf, and jpeg, and they can then be presented either on the fly or directly to an X terminal. The image can also be imported into documents. A command interface is used to interact with gnuplot using the 'set' commands to specify how the image is to be formatted and presented. Typically this includes the sizing of the graph, colors to be used, the scale, x,y coordinates, and the output image name. The plot command is then used to actually generate the image using the gnuplot engine. There is also the splot command that will draw 3-D graph images[3].

### Using gnuplot:

There are two main ways:

**First**, using command Gnuplot and after starting the program you will be prompted:

```
gnuplot>
```

Then, you can enter commands For example, the string:

```
gnuplot> plot "xyz.dat".
```

**Second** (more convenient),gnuplot can read commands from a file offered to it (usually - with the extension .gnu). For example, the command “gnuplot howtoplot.gnu” indicates gnuplot to execute the file “howtoplot.gnu”. fig. 1 shows the main window of the gnuplot module.

The following code will help you to get start:

```
set title "webgnuplot"
```

```
set xrange[-10:10]
```

```
set yrange[-2:2]
```

```
set zeroaxis
```

```
plot (x/4)**2,sin(x),1/x.
```

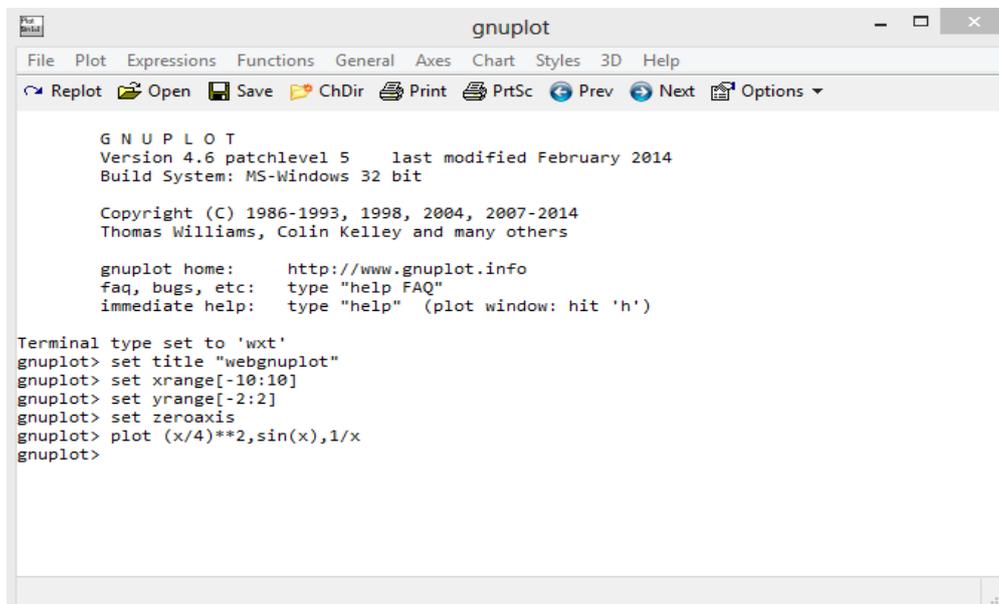
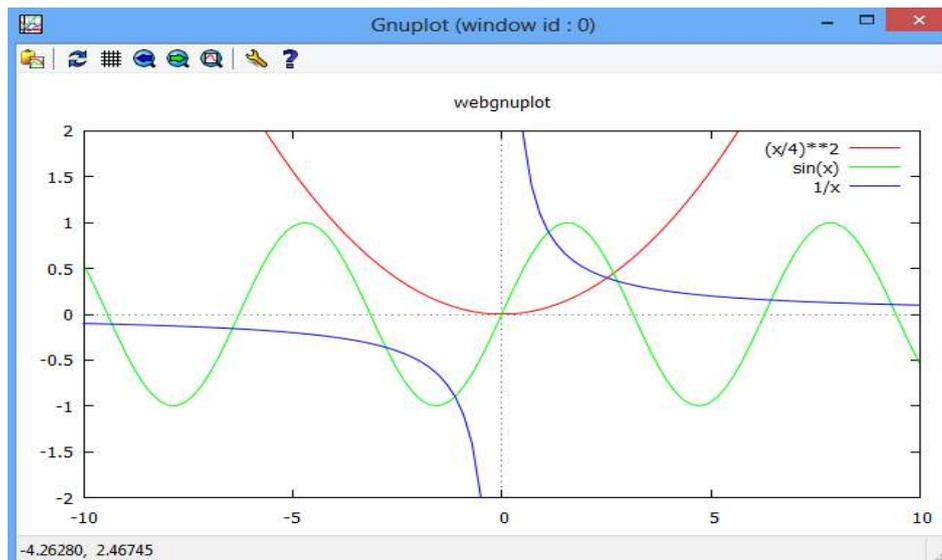


Fig. 1. The Main Window of the Module Gnuplot

The main window consists of the standard menus, toolbars, a field to enter the input parameters in the work file and simulation results for previous plot function will be displayed in the form of graphs as shown in Fig. 2.

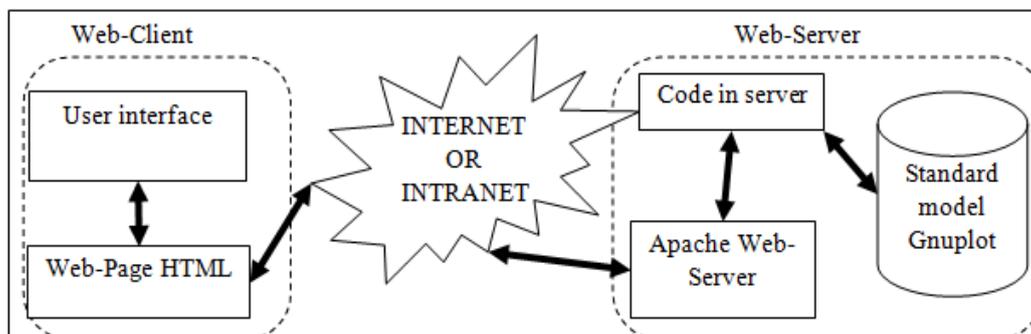


**Fig. 2.** The window with the results of modeling in gnuplot

### 3 USED NETWORK APPLICATION TECHNOLOGY

Although it is possible to develop network applications using php or other compiled languages, the approach presented here is far more efficient. It is much easier to develop networked applications using dedicated software, and there are several very well developed network programming tools available today, these tools include HTML, PHP, JavaScript, C#, Java, and PERL [4-6].

Web applications are transferred through a network when requested, and execution is performed entirely on the client machine that makes the request. In php much less information has to be passed to the server and the server executing instructions based on the given information and sending the results back to the local machine that makes the request. Fig. 3 shows the program component division and data flow in a network based application.



**Fig. 3.** Data Flow in a Network-Based Application

Some of these calculations are performed on the server and the other part on the client machine. Some of information can be sent frequently in both directions between the client and the server. It would be nice to follow the concept of the web-based applications and have most of the computing done on the client machine.

This approach, however, is not viable for three main reasons:

1. Gnuplot package, usually very large, and thus not practical to send via the network completely.
2. Developers give your software without the possibility of monitoring its use.
3. WEB- applications used on-line and on-demand slower than regular software.

For example, graphics should be generated on the server and sent to a client as a GIF or PNG file, or should only text and binary data be sent to the client. The data traffic between the server and client in the first case is bi-directional with little data sent as requests from client to server, and much more sent back to the client as images created after receiving the request. In the latter case, all data is transferred to a client machine together Web- Application. The main function of this Application is to process the user's requests of data visualization without further transmissions from the server. The first case, should be chosen with small overhead in data transfer before data could be displayed.

To be successful, **two** conditions must be met:

- The Internet should have a proper bandwidth.
- Gnuplot tools should be developed differently than the software running on the same computer.

## **4 WEBGUNPLOT ARCHITECTURE**

### **4.1 PROPOSED MODULE**

Webgnuplot is a client-server application as shown in Fig 4: On the client side, a graphic user interface, called gnuplot, is used for simulation. The server side basically consists of a php that manages the entire data flow between the Gnuplot simulation, the Gnuplot Input Interpreter(GII) and the Gnuplot Output Interpreter (GOI) which are used for graphical post processing of the simulation results.

Starting the simulation will cause Webgnuplot to generate a Gnuplot data of the PlotScript and send it to web server. On the web server, the PHP load data into the Gnuplot Input Interpreter (GII) and starts a Gnuplot simulator corresponding to the data. Although simulation the results will be loaded into the Gnuplot Output Interpreter (GOI). The proposed following code in php sends the simulation result as image in png format:

```
<?php
function getfileName ( $Wgnuplotsrc ) {
    // determine the file format of the plotted graph image - default is png
    $format = "png";
    $tpos = strpos($Wgnuplotsrc, "set terminal ");
    if( $tpos !== false ) {
        $format = "";
        $tpos = $tpos + strlen("set terminal ");
        $done = false;
        do {
            $char = substr($Wgnuplotsrc, $tpos, 1);
            $tpos = $tpos + 1;
            if( $char !== false ) {
                if( ($char == " ") || ($char == "\n") || ($char == "\t") ) {
                    $done = true;
                } else {
                    $format .= $char;
                }
            } else {
                $done = true;
            }
        } while( !$done );
        $format = trim($format);
        if( (strlen($format) == 0) || (strlen($format) > 6) ) $format = "xxx";
    }
    $filename = md5($gnuplotsrc) . "." . $format;
    return $filename;
}??>
```

The GOI send the data into portable network graphics format (png). PNG is a raster graphics file format that supports lossless data compression. PNG was created as an improved, non-patented replacement for Graphics Interchange Format (GIF), and is the most used lossless image compression format on the Internet". Thereafter, the images are embedded into a

dynamically created HTML-document which will be sent back to the web client. The emerging network traffic of this method is negligible, because one image has a size of 5 kByte. Block diagram of the Internet for remote simulation environment webpuplot module is shown in Fig. 4.

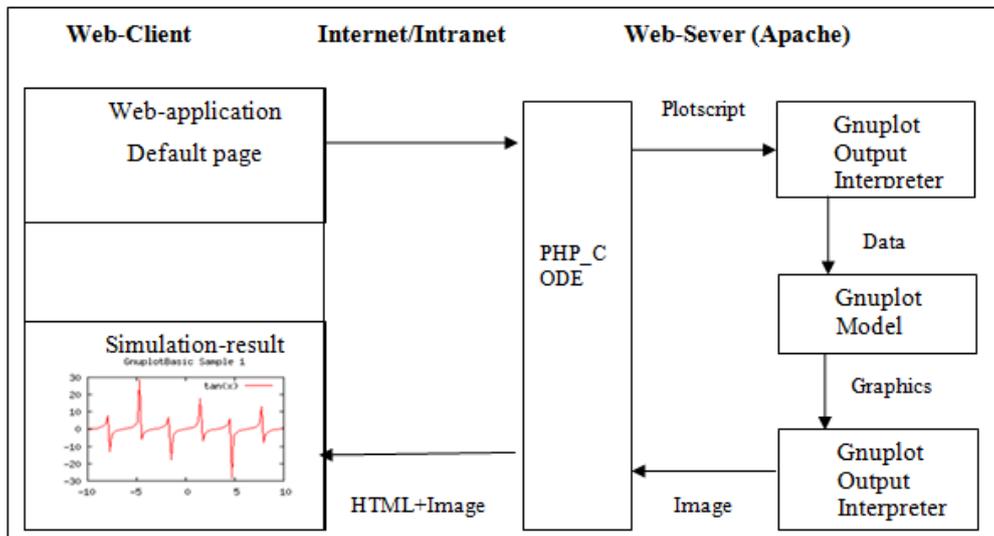


Fig. 4. Webgnuplot Architecture and Data Flow

The central place in the creation of systems owned Web-server that hosts used for the design and calculation of the software. The web-server provides the user to access to the site, as well as conducting the processing of all requests entered by the user through the browser and to exchange information on the current status of the project, received and processed at the user's request. Thus, Web-server is the link between the Internet and the user's web browser.

#### 4.2 IMPLEMENTATION OF WEBGNUPLLOT

In the development of Webgnuplot, we will creat distributed applications, and is it implement browser-independent platforms.The Webgnuplot is based on the three-tier client/server-computing model in which on the client side the front-end software allows the user to prepare input text files, send them to the server, set simulation parameters and run the simulator in the server and view output via standard Web browsers to the user.

##### Simulation algorithm in Webgnuplot:

1. Starting webgnuplot through web browser.
2. Writing the gnuplot code between the tag `<gnuplot>` , `</gnuplot>`.
3. Sending written tag in web client to the server of gnuplot for simulation .
4. The web server will generate and send it to web client.
5. The graph image (e.g. 4011db...0072995.png) is then shown on the fig.7.

Therefore, we will explain some of simulation algorithm, which will be run through web browser home page, shown in fig.5.

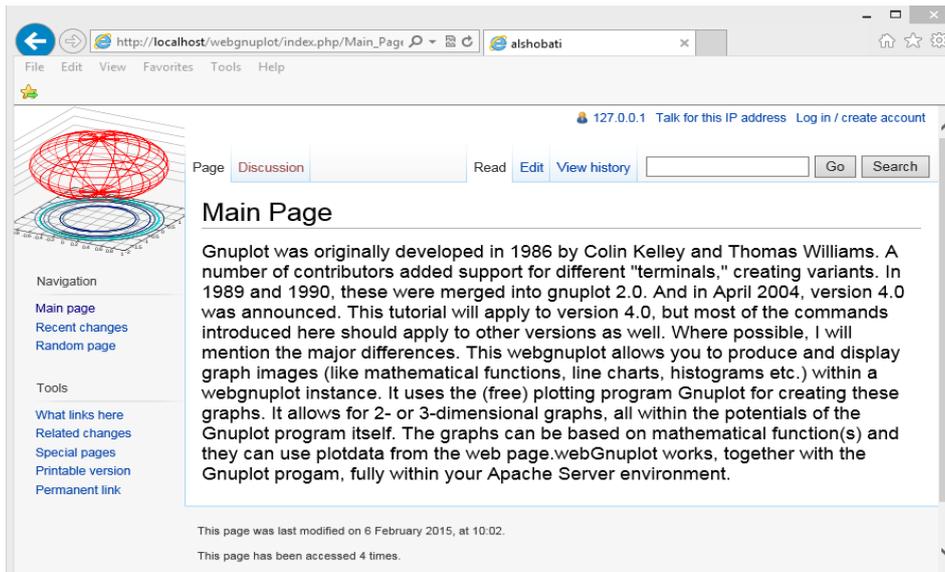


Fig. 5. Home page Web-site with Module Webgnuplot

On the Web-site which contains information describing the software package gnuplot. Directly on the Web-site have the option to call button edit with dynamic envelope (fig. 6), intended to enter the directives and parameters on the simulation environment webgnuplot.

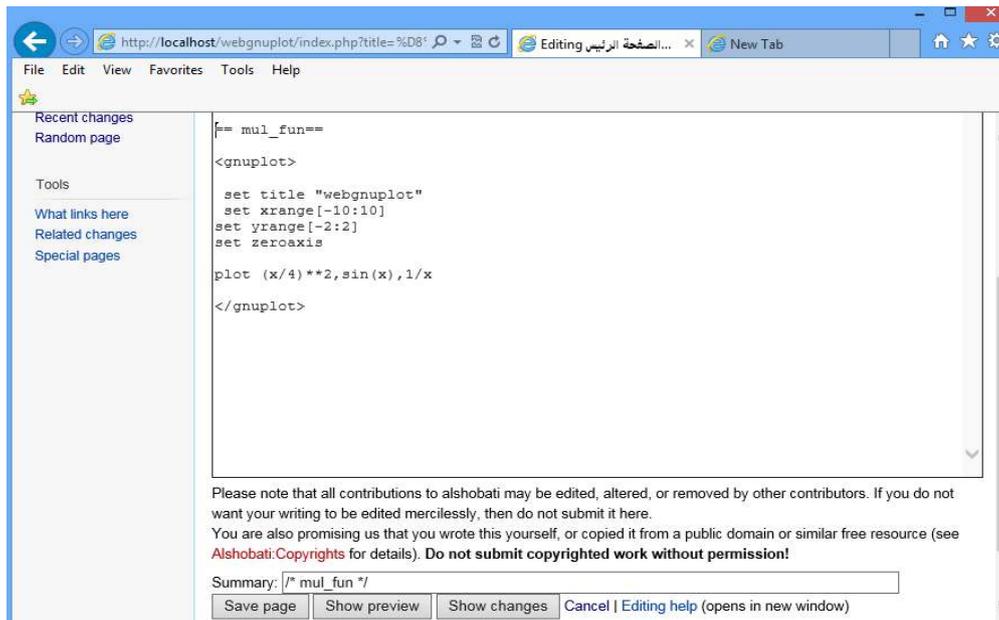


Fig. 6. Window Web-sites with dynamic envelope

The button "Save page" is used to submit the form with the task of modeling. The content of the form is read and written to a temporary file that is used by Gnuplot modeling to build and save a PNG graphs. Simulation results will be displayed in specified area in the form of graphs shown in Fig. 7.

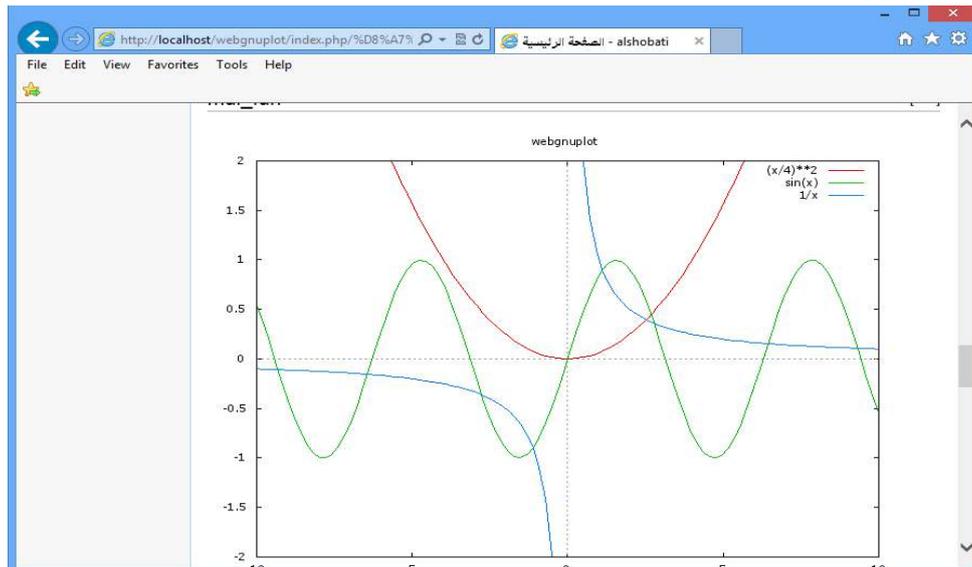


Fig. 7. Window Web-site with the Results of Modeling in Webgnuplot

## 5 CONCLUSION

In the present paper Webgnuplot module was developed and implemented, that organizes the simulation by intranet. It was developed a web tool "Webgnuplot" based on gnuplot, which provides web access to gnuplot for windows operating systems. Webgnuplot provides inputting data through web browser and simulates these data and sends the simulation results back to web client as image in png format.

## REFERENCES

- [1] David Tansley, "Using gnuplot to display data in your Web pages" IBM DEVELOPER WORKS System Administrator Ace Europe .19. January .2010. [www.ibm.com/legal/copytrade.shtml](http://www.ibm.com/legal/copytrade.shtml).
- [2] Nishanth Sastry, Staff Software Engineer, IBM "Visualize your data with gnuplot". 22 Jul 2004. <http://www.ibm.com/developerworks/library/l-gnuplot/>
- [3] Hank Shiffman, Boosting Java Performance: Native Code and JIT Compilers, <http://www.disordered.org/Java-JIT.html>
- [4] Object management Group, The Common Object Request Broker: Architecture and Specification, v. 2.2, published by Object Management Group, February 1998. <http://www.cobra.org/>
- [5] Thomas Williams & Colin Kelley, "gnuplot An Interactive Plotting Program "Version 4.2 organized by: Hans-Bernhard Broker, Ethan A Merritt, and others .3 .March .2007. P.39-75.
- [6] Aleksander Malinowski, Bogdan M. Wilamowski, "Web-based C++ Compiler "Bradley University, Peoria, IL / University of Wyoming, Laramie, WY Session 2532.
- [7] David Kotz,/" LATEX and the Gnuplot Plotting Program": Principal author of this tutorial for gnuplot 3.0, July 3, 1991
- [8] M.N. NAJBUK, V.V. NELAYEV, "Software-Hardware module GUI-SUPREM III for microelectronics technology design and training" Minsk, 220013, Belarusian 2007.P.136-144.
- [9] Starzak L., Swiercz B., Zubert M., Napieralsky A., "SPICE-Based simulation Website: Application to Teaching of Power Electronics", Proc. CADSM'2003. Lviv-Slavsko, Ukraine, 2003. P. 334–336.
- [10] Sweet, W. and Geppert, L., "It has changed everything, especially our engineering thinking," IEEE Spectrum, January 1997, P. 23-37.
- [11] D.Alles and G.Vergottini, Taking a Look at Internet-based Design in the Year 2001, Electronic Design, Jan.6, 1997, P. 42-50.
- [12] <http://www.gnuplot.info>
- [13] <http://www.mediawiki.org>
- [14] <http://www.wikipidia.org/>
- [15] <http://www-tcad.stanford.edu>
- [16] <http://www.php.net>
- [17] <http://www.perl.net>

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