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METHODS FOR PLOTTING FUNCTION GRAPHS IN COMPUTERS USING BACKEND AND FRONTEND INTERNET TECHNOLOGIES

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Abstract:

The article describes the structure and various tools for developing web sites and building a graph of functions studied in the course of mathematics using Internet technologies. Markup and web programming languages, tools for site design and the use of a database for storing information are considered. The programs presented in the article, which perform graphing with given coefficients, can be used as a visual aid for users, applicants, etc. in the study of functions, as well as as a demo example in the study of the frontend and backend programming environment.

Keywords: Frontend, BackEnd, Web-site, PHP, JavaScript, HTML, CSS, Database.

INTRODUCTION

In modern times, the construction of graphs of functions using programming in computers is widely used in the field of scientific and technical research to increase the visibility and readability (readability) of the results. It finds application in various computer spheres of human activity, such as scientific research (visualization of the structure of matter, vector fields, etc.), medicine (computed tomography, ultrasound, coronary angiography), experimental design, etc. Computer graphics are widely used in technical and mathematical problems with a visual presentation of the results of practical calculations]. Computer graphics, together with computer animation, are a necessary tool in such areas as the automotive industry, aircraft construction, cinema, advertising, art, architecture, simulation of dynamics, as well as in the creation of computer games, etc. New areas of application of computer graphics appear, and, accordingly, methodological approaches to solving problems in these areas are needed [2].

This problem is associated with global informatization and the widespread use of computer graphics in the life of society. The need for widespread use of graphic software tools has become especially tangible in connection with the development of widespread use of computers in the field of production. As a result, any technical task requires demonstrable results.

The article takes into account the situation that users know the basic algorithmic structures and foundations of the considered programming languages of Internet technologies. Working with graphics in programming languages is a rather complicated thing that requires knowledge: about algorithmic constructs, about data types (string variables and their compatibility, loops, standard and custom procedures and functions, coordinate method), about knowledge of the display device and its modes of operation [3].

The study of this article contributes to the deepening of knowledge not only in computer science, but also in other subjects. Function plotting and scaling is used in many mathematical applications. Plotting a function allows you to understand screen coordinates, graphic primitives and their use, working with strings, numerical methods for solving mathematical problems. After studying the article, users should be able to: scale (Cartesian) coordinate systems for displaying on a monitor, build graphs of continuous functions and coordinate axes, digitize coordinate axes, build several graphs, illustrate mathematical problems by plotting functions [3].

The purpose of the research is to develop a program code for plotting a graph of functions studied in mathematics courses using backend and frontend Internet technologies

LITERATURE REVIEW, RESEARCH METHODOLOGY, ANALYSIS AND RESULTS.

The Internet is working today and continues to appear online services focused on solving various mathematical problems. Users often have to work with a graphical representation of some equation. In such situations, they will need a flexible and convenient online service. Therefore, the authors decided to develop this online service.

We know all the content displayed in websites targeted to Internet users are located on computers (Web-servers) with special software installed. And each site has a frontend and backend. The frontend (or client) part is needed

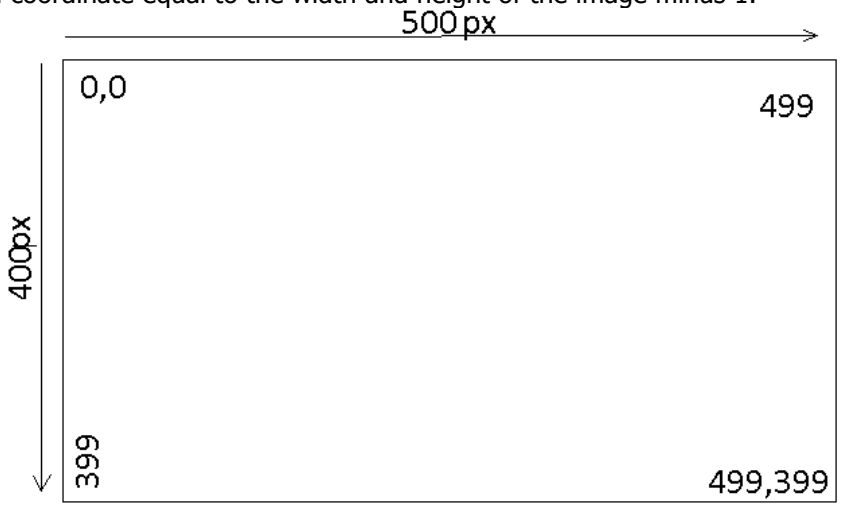
- to display site content: text, title, image, table, text, list;
- for design content: font color and size, positioning of elements, displaying borders, block sizes;
- For interaction with the user: checking the entered data, displaying dialog boxes, adding and hiding html-elements.

The client side is what the user sees on the page. It is through the browser that the user interacts with the web application by creating requests. The result of the execution depends on the user's browser and can be executed in different ways on different versions of it. In the developed project, the client should enter the required mathematical equation in special forms. Form data is submitted using scripts generated in JavaScript.

The server part (backend) provides the formation of html-code, saving user data, interaction with third-party web services. The server side of a web application is a program or script on the server that processes requests from the browser that the user is using. In the developed project, the client will receive the required graphical representation of the mathematical equation in the form of a web page. The image is created using scripts created in PHP. You can also use PHP libraries (GD, ImageMagic, etc.). The process of creating function graphs in PHP is easily[2].

PHP not only exists to interact with the user, connect and manipulate databases and send information by email, but it can also be used to add graphics to Web pages, which means that using PHP, users can generate graphics at runtime. This means that PHP also has the ability to dynamically create images, there is a wide range of functions that allow you to open, manipulate and display graphics both in a Web browser and on disk. Before creating images, users should understand concepts like: colors, image coordinate systems, using PHP drawing tools, learn how to create images from scratch, draw straight lines, curves and various shapes in images. In PHP, users can work with existing images, for example, create watermarks in images, create thumbnails, and add text to an image [5].

PHP functions for image processing are based on the GD library developed by Boutell.Com. In PHP 4.3, the library code has been built into the PHP installer and includes some enhancements such as alpha blending. The built-in version of the GD library is well supported in PHP and is more stable. Since PHP5, the library includes support for reading GIF files, reading and writing JPEG, PNG and WBMP files. In PHP, coordinates are counted down to the right from the top left corner. The first pixel in the upper left corner has coordinates 0,0. The last horizontal and vertical pixel in the image has a coordinate equal to the width and height of the image minus 1.



Images can be vector and raster. Modern GD libraries allow generating images of the three main file raster formats: JPEG, PNG, and BMP. PHP GD functions do not generate vector images. To create a new image in PHP, we first create an empty canvas of the new image using the vimagecreate () or imagecreatetruecolor () function. Both of these functions take two parameters, the width and height of the empty image that is being created:

resource imagecreate (int x_size, int y_size)

$myPic = imagecreate(400, 300);

The resulting image is 400 pixels wide and 300 pixels high and returns a value. The $myPic variable contains an image ID that refers to a new empty image in memory. Before creating an empty image, we define the colors to use, and then we call the imagecolorallocate () function, which takes four parameters:

$ClrGreen = imagecolorallocate($myPic, 10, 230, 5);

The first parameter is the identifier of the image for which you want to create a color. The other three parameters are red, green, and blue values that define the color in the RGB model. After defining the required colors, the PHP graphics library provides functions for drawing points, lines, rectangles, ellipses, arcs, and polygons. All drawing functions have a similar set of accepted parameters. The first parameter is the image identifier. The x and y coordinates (in pixels) required to draw shapes or lines are always involved. For drawing one pixel, only one pair of coordinates is specified. To draw a line, you specify the x and y coordinates (the start and end points of the line). The last parameter is the color of the drawn line [5].

Example. Draw pixel (piksel.php):

```
int imagesetpixel (resource image, int x, int y, int color)
imagesetpixel($myPic, 220, 320, $ClrRed);
```

Example. Write code in PHP to draw an arbitrary line (line.php):

```
<?php
    $myPic = imagecreate(600,600);
    $ClrWhite = imagecolorallocate($myPic,255,255,255);
    $ClrBlue = imagecolorallocate($myPic, 0, 0, 255);
    imageline($myPic, 10, 10, 360, 360, $ClrBlue);
    imageline($myPic, 10, 510, 560, 60, $ClrBlue);
    header("Content-type: image/png");
    imagepng($myPic);
    imagedestroy($myPic);
?>
```

Note. If an error occurs and no graphics appear, check the status of the GD. To enable GD, delete the comment symbol in the php.ini file in the extension = php_gd2.dll line). After making changes to the PHP configuration, you need to restart the web server.

When creating other primitives, the following functions are used:

- When drawing a rectangle - imagerectangle ()
- When drawing circles and ellipses — imageellipse ();
- When drawing an arc - imagearc ():

Now let's look at an example of creating a graph of some function in the PHP programming language and displaying it on a web page.

To build a graph of functions, we take the following settings:

1- step. Abscissa of the origin point

```
$x0 = 600;
```

2- step. Ordinate of the origin point

```
$y0 = 350;
```

3- step. Drawing precision (more precision - less speed)

```
$ps = 0.01;
```

4- step. Scale the coordinate system

```
$m = 5;
```

Now we will write the program code for plotting the graph of the function which we draw. Here, $x is the value of the function argument, the return value is the function value from the given argument. All PHP math functions are supported.

```
function grafik ($x) {
    return 2*sin($x)-1;
    }
```

5- step. Begin

```
set_time_limit(90);
$m = $m * 10;
```

6- step. Drawing image

```
$img = imagecreate($x0 * 2 + 1, $y0 * 2 + 1);
```

7- step. Adjusting colors for the graph function

7.1- step. цвет фона

```
$bgColor = ImageColorAllocate($img, 245, 245, 245);
```

7.2- step. Mesh color

```
$lnColor = ImageColorAllocate($img, 230, 230, 230);
```

7.3- step. Axle color

```
$odColor = ImageColorAllocate($img, 0, 0, 0);
```

7.4- step. Chart color

```
$grColor = ImageColorAllocate($img, 0, 0, 255);
```

8- step. Fill bachground

```
ImageFill($img, 0, 0, $bgColor);
```

9- step. draw a coordinate grid

```
for ($i = 0; $i <= $x0 * 2; $i++) {
```

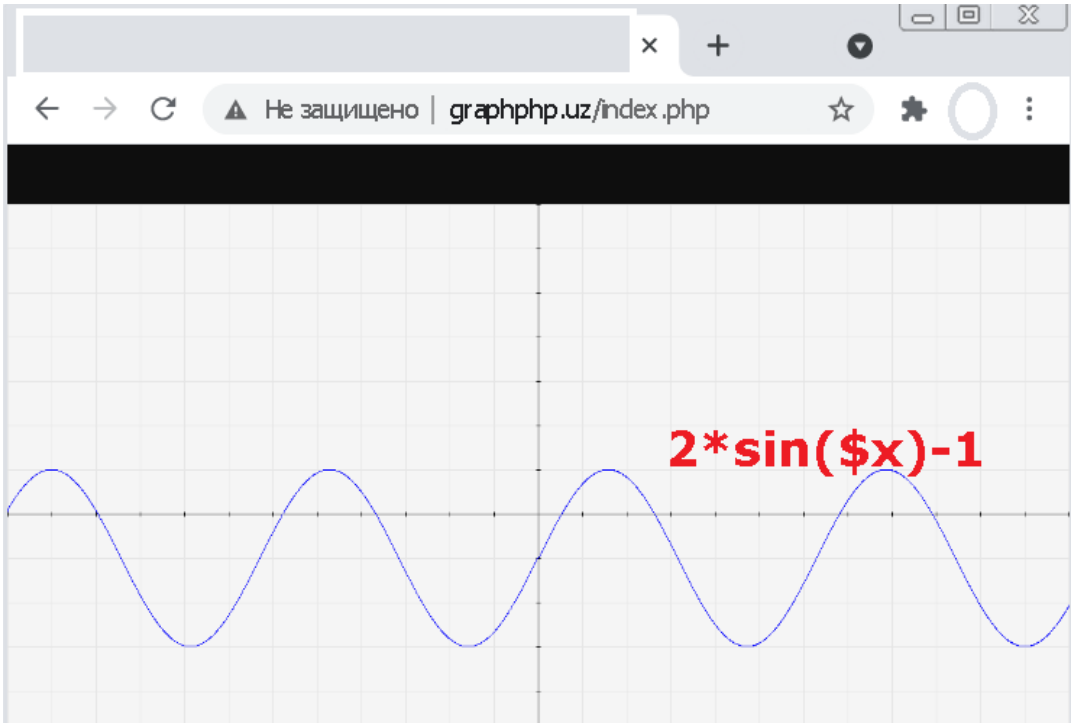
9.1- step. Draw lines

```
ImageLine($img, $i * $m, 0, $i * $m, $y0 * 2, $lnColor);
ImageLine($img, 0, $i * $m, $x0 * 2, $i * $m, $lnColor);
```

9.2- step. Draw dashes

```
ImageLine($img, $i * $m, $y0 - 2, $i * $m, $y0 + 2, $odColor);
ImageLine($img, $x0 - 2,  $i * $m, $x0 + 2, $i * $m, $odColor);
```

```
            }
        9.3-step. Building coordinate axes
ImageLine($img, $x0, 0, $x0, $y0 * 2, $odColor);
ImageLine($img, 0, $y0, $x0 * 2, $y0, $odColor);
        9.4- step. Draw graph function
for ($x = -$x0; $x < $x0; $x += $ps) {
            if (
            /* call function, begin */
            $y = grafik($x)
            /* end */
            ) {
            if ($x >= 0) $d = 1;
            else $d = 0;
            $qx = $x * $m;
            $y = $y * $m;
            ImageLine($img, $x0 + $d + $qx, $y0 - $y, $x0 + $d + $qx, $y0 - $y, $grColor);
            }
}
        10- step. Print graphics
header("Content-type: image/png");
ImagePng($img);
ImageDestroy($img);
        11- step. End programming and exit
exit();
?>
```



All the given program blocks must be placed in any order in one module. The developed program is quite versatile. To plot another function, you just need to replace the body of the function with the name grafik [3].

The algorithm for plotting the graph, marking the grid, digitizing the axes is similar to the algorithm for plotting the full screen plot. If, when solving a problem, it is necessary to know about the presence of the roots of the equation, then both the coordinate axis and the grid can be displayed on the screen. The determination of the roots of the equation can be selected either in a separate procedure or in a separate module, which can be used in solving other problems. The problem of the size of the grid cells must be considered separately [1].

CONCLUSION/RECOMMENDATIONS.

When writing an article on programming function graphs using Internet technologies, various forms of work were used: discussion, independent work, writing finished products and presenting them to those interested.

In this article, a ready-made template for plotting a function was offered to familiarize users. Demonstrated the results of the algorithms and explained the implementation of the function graphing algorithm using simple

examples. To analyze the operation of the algorithm, problems were considered for plotting graphs of trigonometric functions, such as, 2sin (x) -1. Analyzed the results of the program.

The construction of graphs of functions on a computer gives a more visual representation and therefore it is convenient to demonstrate them when explaining complex material, to solve complex technical, mathematical and physical problems. With a visual representation of the graph, scaling factors are introduced and it was suggested to manually calculate them to split the screen into any number of parts. Conducted the construction and digitization of the coordinate axes.

Summarizing the works, the following conclusions can be drawn. In sites for creating a graph of functions using only HTML, it is impossible. You can use the following options to create graphics in website scripts:

- Formation of graphs programmatically images (HTML + CSS).
- Using Flash, that is, using Open Flash Chart 2. The chart is created on the client side, using the Flash player.
- Formation of graphs through the GD library.
- Formation of graphs through the ImageMagic library.
- Formation of graphs through the GraPHPite library.

CONCLUSION

As a result, we can conclude that the used software environments are diverse when constructing graphs of functions. Some use user-side programming tools such as JavaScript during the build process. Some use server-side programming tools such as PHP to graph functions. The result depends on the accuracy of the calculation. Both technologies used in charting become an efficient and fun process.

REFERENCES

1. Sh.Q. Shoyqulov, A. M. Shukurov. Propagation of non-stationary waves of transverse displacement from a spherical cavity in an elastic half-space // International Journal of Advanced Research in Science, Engineering and Technology Vol. 7, Issue 4, April 2020. p. 13291 –13299)
2. 2.Kudratova H. Sh., Shoykulov Sh. K. Information and communication technology in the educational process of preschool educational organization // International Engineering Journal For Research & Development Vol. 5, Issue 5, 22-08- 2020. p. 1 –5)
3. Sh. Q. Shoyqulov. Kompyuter grafikasi: o'quv uslubiy qo'llanma. Qarshi.: Qarshi DU, 2016. (Shoykulov Sh.K. Computer graphics: study guide. Karshi: Karshi SU, 2016.)
4. V.K.Yegerev, B.A.Radunskiy, D.A.Talskiy. Metodika postroyeniya grafikov funksiy.- M. : «Visshaya shkola», 1970. (V.K.Yegerev, B.A.Radunskiy, D.A.Talskiy. Function graphing technique.- M. : «Visshaya shkola», 1970)
5. Dave W. Mercer, Allan Kent, Steven D. Nowicki and oth. Beginning PHP5. Wrox; 1st edition, 2004. 888 p.