Applied Mathematics & Information Sciences
An International Journal

http://dx.doi.org/10.18576/amis/150301

Matlab Educational Tools in Mathematics Teaching

Dragan Obradovic[1], *Lakshmi Narayan Mishra*[2,*], *Nisha Sharma*[3] *and Vishnu Narayan Mishra*[4]

[1]Elementary school "Jovan Cvijic", Kostolac-Pozarevac, Teacher of Mathematics, Serbia
[2]Department of Mathematics, School of Advanced Sciences, Vellore Institute of Technology (VIT) University, Vellore 632 014, Tamil Nadu, India
[3]Pt. J.L.N. Govt. College, Faridabad, India
[4]Department of Mathematics, Indira Gandhi National Tribal University, Lalpur, Amarkantak, Anuppur 484 887, Madhya Pradesh, India

Received: 7 Jan. 2021, Revised: 21 Feb. 2021, Accepted: 17 Mar. 2021
Published online: 1 May 2021

Abstract: The purpose of this paper is to describe the use of educational tools to promote interactivity and aid students and learners in their understanding of mathematics.

Keywords: educational tools, teaching mathematics, MatLab.

1 Introduction

The use of modern information technologies in education not transient in nature and represents much more than combining information technology with the traditional teaching [1]. Students learn to think and be able to follow the modern technological advances. We noticed that students today use Android, iPad, iPhone, tablets, laptops and have access to the Internet. During classes, they can check the information presented to them.Their teachers and parents to the greatest extent do not use modern achievements [2]. Our job is to adapt their environment in which they grew up and similarly we organize classes.

The main problem with teaching mathematics is that mathematics implies work at a high level of abstraction. In class mathematics should harmoniously connect facts, skills, conceptual structures, methods and general strategies in problem solving. It is not an easy assignment. In doing so, one encounters ingrained aversion to mathematics as it is a difficult subject. Question: *"Why is math difficult to learn?*". In any case, in the teaching of mathematics it must exist feedback irelated to each student's activity [3]. Educational software is a computer program that is can be used in teaching. It is possible to observe two basic forms of teaching using of computers:

1. Teaching where computer is used in all teaching stages;

2. Teaching where computer is used in only some stages of teaching.

In both cases, the use of software should cover the following stages of the teaching process: :

1. Preparing students;

2. Presentation of new content;

3. Exercise;

4. Repetition;

5. Check.

This type of teaching should increase interactivity, where the teacher will not be just a source information within the class, but active participation will help students in teaching through resource coordination. This way helps teach faster and better contentsthink, analyze, conclude and discover new concepts [4].

We have various new methods, mathematical software, all with the aim of improving the existing situation. All of these learning models are designed so that professors create teaching content or use ready-made

* Corresponding author e-mail: lakshminarayanmishra04@gmail.com

© 2021 NSP
Natural Sciences Publishing Cor.

tools as an aid means of teaching. Our idea is to modernize the teaching of mathematics using pre-existing software. We are free say that both their number and diversity create confusion and make no sense. Most software is fully covered mathematical content, allows the presentation of new materials, practice, testing and other activities. For that reason it is necessary for teachers to know the situation well market educational software, and to carefully choose the software that they need in specific situations. Among the most commonly used commercial tools are: Mathematica, Maple, MatLab, Manipula Math with Java, Wiris, Sage; while among the most commonly used are: Wolfram Alfa, Microsoft Mathematics, FreeMat, FreeMat Portable, GeoGebra, Octava, Scilab.

It is clear that modern symbolic software cannot perform all calculations for high school materials, and even more difficult at the university level. So the question that arises is to what extent you should adopt computer in teaching? Do the types of software that are currently in uses meet all traditionally defined teaching goals and what are the ways of their use depending on teaching concept. In almost all national teaching plans and programs, the use of computers is mandatory, or at least strongly recommended. The use of tools allows different approaches to teaching as well as creating a large number different methods of teaching [5]. The goal was that students observe the flow of mathematical operations through code, since this way of writing is already ingrained in them.

2 Educational Software in Programmed Teaching

The scientific and technical revolution caused a crisis in the methods of educational activities, as well as numerous changes in the relations between teachers and students, schools and society. No society in the world is satisfied with the quality of school work. No society in the world, is satisfied with the quality of school work. The traditional system of teaching formalizes and patterns the teaching work and the teacher is like a worker on the tape and no longer has the function of education. The goal is to improve of teaching and to individualize the students' work [6]. The development of science and technology, especially the automation of electronics and cybernetics, causes instability of the profession, insecurity of people who find it difficult to cope with sudden changes, frustrations and confusion in the lives of individuals. In the last few years, the development of science and technology has progressed at an increasing level.

Moreover, the school is not able to develop all young people, originality, inventiveness that will help in a constructive way, face life problems, monitor, direct and subject their human needs to scientific and technical achievements, social trends and social institutions. We are increasingly using educational computer software. Educational software is a computer program specifically designed for teaching content. It is designed to improve teaching and develop individual learning [7]. The term educational software means computer programs that are used to improve the content of teaching. It also directs students to individual learning. *"Educational software is a program that is intended for independent design of educational content, which needs to be mastered - tools for and processing, database formation, various calculations, graphics."*

The development of educational software has a long history. It is believed that data on educational software began to appear only in the late 50's, when mathematicians and logicians believed that they could create a computer that could "think".

But that's not the point. The twentieth century and relentless progress offer us a third time, that is. they allow us to quickly take the most complex integrals. The same goes for solving all kinds of equations, drawing functions in the form of cubic hyperboloids, etc. There is a powerful mathematical weapon for such extraordinary, but periodically occurring situations among students [8].

Matlab will solve the equation and approximate and plot the function. This means that it is one of the most powerful data processing packages available today. The name is an abbreviation of MatrikLaboratori. The possibilities of the program cover almost all areas of mathematics. So, with Matlab you can:

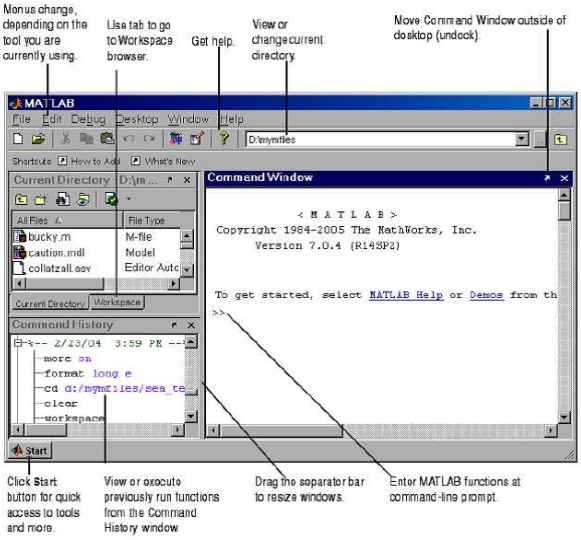

Fig. 1: The graphical interface to the MATLAB workspace

© 2021 NSP
Natural Sciences Publishing Cor.

1. Perform all types of operations on matrices, solve linear equations, work with vectors;

2.Calculate the roots of polynomials of any degree, perform operations on polynomials, distinguish, extrapolate and interpolate curves, build graphs of any functions;

3. Conduct and statistical analysis of data using digital filtering, statistical regression;

4. Solve differential equations. In partial derivatives, linear, because nonlinear, with boundary conditions, it doesn't matter, matlab will solve everything;

5. Perform integer arithmetic operations.

In addition to all this, MATLAB's capabilities allow you to visualize data to create three-dimensional charts and create animated videos.

3 Pedagogy Aspects

All undergraduate programs can be divided into disciplinary courses and service courses. For example, the main theoretical disciplinary courses in civil engineering, that form a basis for deep understanding of specific engineering topics, include engineering mechanics, strength of materials, structural analysis, and structural dynamics. Service courses, such as descriptive geometry, engineering graphics, mathematics, physics, programming, and statistics, are obligatory for successful understanding of the above mentioned disciplinary courses [9].

In social studies programs, methodology courses such as guided reading or courses on research methodology provide students the necessary knowledge required for proper understanding of basic subjects in each department. Service courses are typically taught by lecturers and tutors who do not necessarily have specialized knowledge in each specific program. For example, courses in programming for engineering students are taught by instructors who specialize in computing or mathematics. As a result, engineering students who take such service course acquire only general skills, as the lectures and practical exercises in these courses are not focused on the problems that are related to their engineering speciality. For students, a major issue is discovering the interconnectedness of knowledge (Biggs, 1999). This concept is relevant for the design of service courses, where knowledge may be presen-ted to students out of the context of the important constructs of their core discipline (Gor-don et al., 2007).

Dividing subjects to disciplinary (core) and service (methodology) courses is an artificial division that is generally based on economical considerations [10].

However, if first-year students do not learn how to apply appropriate methods and skills to solve real problems related to their core subjects, they cannot apply the general knowledge acquired in service courses as desired. From the point of view, members of the faculty from the basic department should teach service courses, because only instructors who specialize in the basic discipline know the most useful and most effective method for applying general knowledge (i.e., statistics, mathematics, physics, programming). New technologies do not fully utilize their unique pedagogical and technological advantages unless institutions embark on an institutional or systemic development program that gives equal weight to pedagogy and technology, and ensures that the process trickles down to individual faculty. Several studies highlight the crucial role of instructors in the adoption process of new online technologies in academic teaching (Elstein, 2004). Studies in USA have shown that only 2 out of 10 US college instructors make regular use of computers in their teaching (Leung & Ivy, 2003). Apparently, instructors are also the weakest link in the process of integrating innovative technology in academic institutions (Collis & Moo-nen, 2001; Hagner & Schneebeck, 2001; Leung & Ivy, 2003; Elstein, 2004).

4 Starting and Organization of Matlab

The name Matlab comes from the English words ***MAT****rix* ***LAB****oratory*, which means his basic properties - work with matrix variables and application in the processing of measurement results in the lab.

Matlab is an interactive matrix calculator of the interpreter type based on variables. It allows you to perform the so-called "Matlab function" and owns a graphical user interface [11].

4.1 Starting MATLAB

Starting Matlab depends on the computer platform on which it is running starts. On PCs running Windows Matlab it is possible run in three ways:

1. double-click on the Matlab icon on the Windows Desktop;

2. by applying the Start menu (Matlab is usually located at Start / All Programs / Matlab);

3. by typing the matlab command in the Run window inside Start menu.

When starting Matlab, the screen is short the Matlab sign shown in Figure 2. appears.

© 2021 NSP
Natural Sciences Publishing Cor.

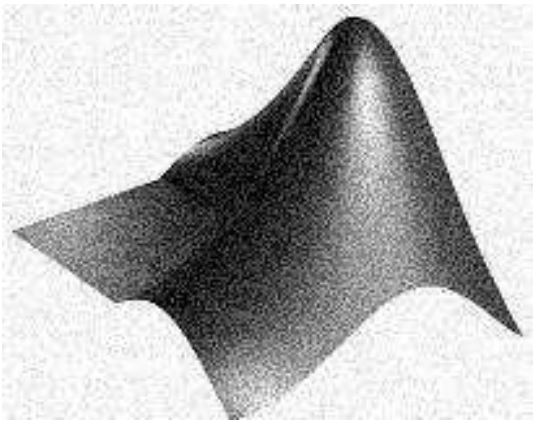

Fig. 2: Starting Matlab

After the Matlab character disappears, the main Matlab window displayed appears in Figure 2.

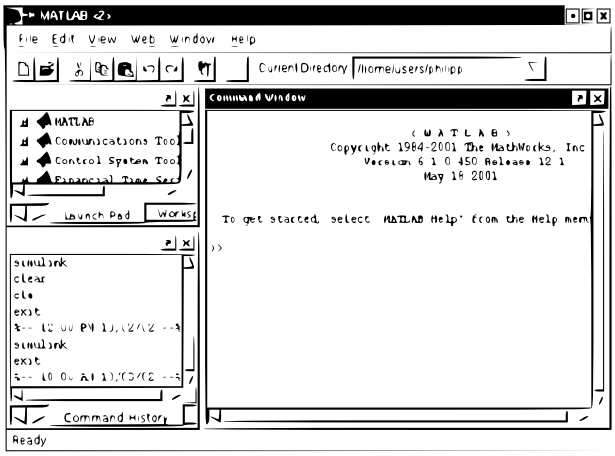

Fig. 3: The main window of the Matlab software system

The main Matlab window contains a menu bar, a toolbar and three windows. In the upper left part of the main window is a window that provides insight into Matlab's Workspace and the current directory. IN in the lower left part of the main window there is a window with a list of executed commands (Command history window). In the right part of the main window is the command window a Command window in which Matlab commands are entered and obtained numerical results. The >> sign in the command window is Matlab's prompt. It is a character that appears last in the window and indicates that Matlab is ready to accept user commands. Behind the prompt is a cursor that marks the place the beginning of the command entry. The entered command is executed by pressing the Enter key. It is important to note that Matlab distinguishes uppercase and lowercase letters when writing commands.

Completion of work with Matlab is achieved with the Quit command. This command is valid without no matter on which computer platform Matlab runs. When running Matlab on a PC on a Windows computer, working with Matlab can also be completed by selecting the Exit command from the File menu or any of the usual ways to close windows in Windows environment.

Help in Matlab is obtained with the help and lookfor commands. The help command itself writes for itself a list of all sub-units and packages in which the required ones can be further found commands. Specifying the name of the subunit after the help command provides a more detailed list possible commands of that subunit. To obtain the syntax and explanation of an individual commands must be written:

```
>> help command
```

where command is the name of the command for which we are looking for syntax. For example, help for the drawing command would be:

```
>> help plot
```

If we do not know the specific name of the command, we use the look for command by listing the keyword of the requested function after the command. For example, we have to mark the axes on the chart, and we don't know the command for that. In that case:

```
>> look for label
```

The result is a list of all commands that contain the word in the name or description label. The first five commands from the list are:

```
PLOTYY Graphs with y tick labels on
the left and right.
XLABEL X-axis label.
YLABEL Y-axis label.
ZLABEL Z-axis label.
CLABEL Contour plot elevation
labels...
```

For each command in the list, you can get detailed syntax using the `help` command. For example, it is possible to use the `xlabel` command to denote the x-axis, and the `xlabel` command `ylabel` etc. The help and look for commands display command syntax and are useful to the more experienced Matlab users. A detailed view of all Matlab commands and functions is available in Matlab's electronic documentation in `html` and `pdf` format which is entered by selection `Matlab Help`

© 2021 NSP
Natural Sciences Publishing Cor.

options in the `Help` menu. This menu opens the window shown in the image 4.

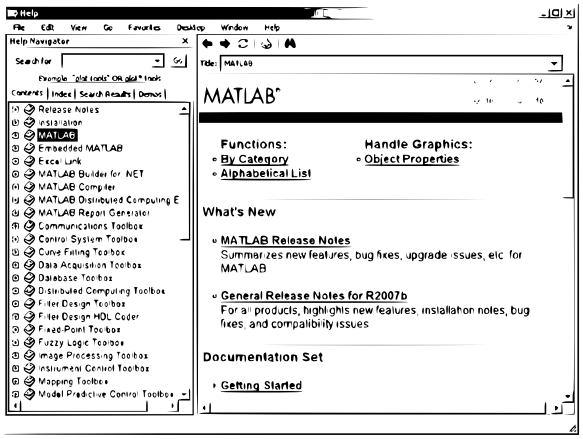

Fig. 4: The main window of the Matlab software system

5 Arithmetic Operators

Arithmetic operators enable arithmetic operations on scalar and matrix variables. The list of operators according to the execution priority is shown in the following table (Table 1.)

It can be seen from Table 1. that parentheses have the highest priority, and summation has the lowest subtraction. Operations within the expression are performed from the highest priority to the lowest, and expressions of the same priority are derived from left to right.

*Example 1.*Priorities in arithmetic. expressions

Task Determine the order of operations in the calculation of an arithmetic expression `11+a(x+y)^3*2.`

Solution

Order of operations:

1. `rez=x+y`
2. `rez=rez^3`
3. `rez=a*rez`
4. `rez=rez*2`
5. `rez=11+rez`

Only square matrices can be potentiated by a scalar, and for potentiation between members of two matrices both matrices must have the same dimension, but they do not have to be square.

Table 1. List of arithmetic operators by performance priority

Priority	Operator	Description	Example
1	()	The parentheses group the expression and give the highest priority.	`a*(b+c)`
2(a)	’	Conjugation and transposition of a matrix (vector).	`a'`
2(b)	.’	Transposition of the matrix (vector).	`a.'`
3(a)	^	Matrix potentiation.	`a^3`
3(b)	.^	Emphasis among matrix members.	a.^b
4(a)	*	Multiplication of scalars or matrices.	`a*b`
4(b)	.*	Multiplication among matrix members.	`a.*b`
4(c)	/	Right stencil division.	`a/b`
4(d)		Left stencil division.	`a\`
4(e)	./	Sharing among members.	`a./b`
5(a)	+	addition.	`a+b`
5(b)	-	subtraction.	`a-b`

Example 2. Emphasis among matrix members

```
>> a = [1 2;3 4]
a =
1 2
3 4
>> b = [3 3;2 2]
b =
3 3
2 2
>> a.^b
ans =
1 8
9 16
```

Matrix multiplication is carried out according to the laws of matrix multiplication, which means that matrices they must have appropriate dimensions. Dividing matrices corresponds to multiplication inverse matrix (i.e., pseudo inverse matrix for non-square matrices). The right division of the matrices `x = b/A` gives the solution of the equation `x * A = b`, i.e., it corresponds expression `x = b * A^-1`, and the left division `x =A\b` gives the solution of the equation `A * x = b`, ie corresponds to the expression `x = A^-1 b.`

*Example 3.*Application of division operators to solve linear systems equation

Task Solve the following system of linear equations in Matlab:

© 2021 NSP
Natural Sciences Publishing Cor.

```
x + y + z &= 1
2 x - y - z &= 2
x + 3y + 2z &= 2
```

Solution

The default system written in matrix form has the form:

$$\begin{bmatrix} 1 & 1 & 1 \\ 2 & -1 & -1 \\ 1 & 3 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$

The system solution is obtained using the left division operator as follows:

```
>> A=[1 1 1; 2 -1 -1; 1 3 2];
>> B=[1;2;2];
>> x=A B
x =
1.0000
1.0000
-1.0000
```

The solution of the system from example 3. can also be obtained by using the command `x = inv (A) * B`, where `inv (A)` is the inverse matrix of matrix A.

6 Functions in Matlab

Functions are a very important part of Matlab and they are what make it the most powerful program system. In Matlab, a multitude of functions have been derived that are by origin can be classified into three groups:

1. Matlab's internal functions;
2. Capital functions in Matlab packages;
3. Capital user-defined functions[12].

The origin of the function can be determined. Origin functions are not important to use because all functions are called in a similar way:

```
>>name_functions (arg1,arg2,...argn)
```

One or more arguments are given in parentheses, depending on the function. Each of these arguments must be either a constant or a variable defined in Matlab's workbook space. In this way, all functions that either belong to the internal group can be called Matlab functions or are stored on the computer disk in the directory specified in Matlab's search path or are located in the current directory.

The defined search path can be obtained with the path command. If in the search path wants to add a new directory, the following commands must be executed:

```
>> p=path;
>> path(p,'new_path');
```

The first command associates an existing search path with the variable p, and the second command defines a new search path by adding a new search path to the old path from the variable p defined by the *new_path* string. The defined search path remains active until leaving Matlab. If this time we want to permanently store in the computer, listed commands must be added to the *startup.m* procedure in the matlabroot toolbox directory local, where matlabroot is the directory where Matlab is installed.

The same effect can be achieved with the `addpath` command. Adding directories The `new_path` to the Matlab search path is also achieved with the following command:

```
>> addpath('new_path');
```

The number and type of functions available in Matlab depends on the number of installed packages. No, but also standard packages contain a large number of functions among which only one can stand out some basic ones, for example: elementary mathematical functions, processing functions vectors and matrices, functions for processing character strings and functions for working with polynomials.

It briefly describes the basic listed functions, as well as the syntax and purpose of other functions that the user can learn from Matlab's electronic documentation. In addition, the user procedure is explained and recommendations for improving and analysing their performance are given.

7 Functions of Linear Algebra

The symbolic package contains a number of functions for working with symbolic matrices and vectors and the functions of linear algebra which are derived in the basic part of Matlab for working with numerical vectors and matrices. The following is an overview of some of the most important linear functions of linear algebra.

7.1 Matrices in the Matlab environment

Matlab software supports multi threaded calculations for a number of functions of linear algebra and the so-called. element-wise numerical functions. These functions are automatically executed on multiple threads. In order for a

© 2021 NSP
Natural Sciences Publishing Cor.

function or expression to execute faster on multiple CPUs, a number of conditions must be met:

1. A function executes operations that can be easily divided into sections that are executed competitively. These sections must be able to be executed with little communication between processes. They should require only a few sequential operations.

2. The amount of data is large enough so that all the advantages of competitive execution outweigh the time required to share data and manage specific execution threads. For example, most functions only speed up when an array contains several thousand elements or more.

3. The operation is not memory related; processing time is not dominated by memory access time. As a general rule, complex functions accelerate more than simple functions.

The operators of matrix multiplication `(X * Y)` and matrix scaling `(X ^ p)` show a significant increase in velocity on large arrays in double accuracy (of the order of `10,000` elements). The matrix analysis functions det, rcond, hess, and expm also show a significant increase in velocity on large arrays in double accuracy.

7.1.1 Kronecker tensor product

Kronecker's product, the crown `(X, Y)`, two matrices is the larger matrix formed of all possible products of the elements of `X` with those of `Y`. If `X` is m-sa-n and `Y` is p-sa-q, then the crown is `(X, Y)` mp-sa-nq. The elements are arranged in the following order:

```
[X(1,1)*Y X(1,2)*Y . . . X(1,n)*Y

...

X(m,1)*Y X(m,2)*Y . . . X(m,n)*Y]
```

Kronecker's product is often used with zero matrices and units to build repeated copies of small matrices. For example, if X is a 2-by-2 matrix

```
X =

1   2

3   4
```

`A 1 = eye (2,2)` is a 2-by-2 unit matrix, then two matrices

```
kron(X,I)
```

```
i

kron(I,X)
```

they did

```
1   0   2   0

0   1   0   2

3   0   4   0

0   3   0   4

i

1   2   0   0

3   4   0   0

0   0   1   2

0   0   3   4
```

7.2 Systems of linear equations

7.2.1 Computational considerations

One of the most important problems in technical computing is solving a system of simultaneous linear equations.

In matrix notation, the general problem has the following form: If two matrices `A` and `b` are given, is there a unique matrix x such that `Ax = b` or `xA = b`? It is instructive to consider a 1-with-1 example. For example, do the equation `7x = 21` has a unique solution?

The answer is, of course, yes. The equation has a unique solution `x = 3`. The solution is easily obtained by dividing: `x = 21/7 = 3`.

The solution is usually not reached by calculating a reciprocal value of `7`, i.e. `7−1 = 0.142857 ...`, and then by multiplying `7?1` by `21`. There would be more work and, if `7−1` is represented by a finite number of digits, it would be less accurate. Similar considerations apply to sets of linear equations with more than one unknown; Matlab software solves such equations without calculating the inverse matrix.

Although this is not standard mathematical notation, Matlab uses the division terminology known in the case of scalars to describe the solution of a general system of simultaneous equations. The two split symbols, slash, `/`, and backslash, '$\backslash$' correspond to the two Matlab functions

© 2021 NSP
Natural Sciences Publishing Cor.

mrdivide and mldivide. mrdivide and mldivide are used for two situations where an unknown matrix occurs on the left or right side of the coefficient matrix:

`x = b / A` Denotes the solution of the matrix equation `xA = b`.
`x = A / b` denotes the solution of the matrix equation `Ax = b`. Consider dividing? both sides of the equation `Ax = b or xA = b` by `A`. The matrix of coefficients `A` is always in the "denominator". Dimension compatibility conditions for `x = A b` require that two matrices `A` and `b` have the same number of rows. The solution x then has the same number of columns as `b` and its row dimensions are equal to the dimensions of the columns of `A`. For `x=b / A`, the roles of the rows and columns are replaced. In practice, linear equations of the form `Ax = b` occur more often than those of the form `xA = b`. Consequently, backslash is used far more often than slash. We will further concentrate on the backslash operator; the corresponding properties of the slash operator can be derived from the identity: `(b/A)' =(A'/b')` .

The matrix of coefficients A does not have to be square. If A is m-sa-n, there are three cases: $m = n$ Square system. An exact solution is required.

$m > n$: Predetermined system. Find the solution of least squares.

$m < n$: Subdetermined system. Find the basic solution with at most m non-zero components.

8 Determining or specifying the diagonal of a matrix

Determining the diagonal of a matrix or creating a matrix with a given diagonal performs the function diag. The syntax of the command is as follows:

```
a=diag(b,k);
```

where `b` is the matrix for which the diagonal is sought or the vector that defines the diagonal matrix, and the resultant vector containing the diagonal of the matrix `b` or the created matrix c vector b as a diagonal, and `k`3 an integer constant that determines the number of diagonals `(k = 0` represents the main diagonal, `+ n` nth diagonal above the main diagonal, a?n nth diagonal below the main diagonal).

*Example 4.*Determining the diagonal of a matrix and creating a matrix with a default diagonally

```
    a =
[ a_11, a_12, a_13]
[ a_21, a_22, a_23]
[ a_31, a_32, a_33]

   >>diag(a)

   ans =
[ a_11]
a_22]
[ a_33]

   >>d=ans

   d =
[ a_11]
[ a_22]
[ a_33]

   >>b=diag(d,1)

   b =
[ 0, a_11, 0, 0]
[ 0, 0, a_22, 0]
[ 0, 0, 0, a_33]
[ 0, 0, 0, 0]

   >> b1=diag(d,-2)

   b1 =
[ 0, 0, 0, 0, 0]
[ 0, 0, 0, 0, 0]

[ a_11, 0, 0, 0, 0]
[ 0, a_22, 0, 0, 0]
[ 0, 0, a_33, 0, 0]
```

In the example, the main diagonal is determined from a square matrix of dimension 3 x 3 and associated with the vector d, and then matrices b and b1 are created from the vector d, wherein matrix b has the vector d in the first diagonal above the main diagonal, and matrix b1 y the other diagonal below it. Since the vector d is of dimension 3 x 1, the matrix `b` is of dimension 4 x 4, and matrix `b1` of dimension 5 x 5.

*Example 5.*Draw a vector given by its coordinates.

```
   >> x=[1,3,5,7,25,33,51];

   plot(x)
```

© 2021 NSP
Natural Sciences Publishing Cor.

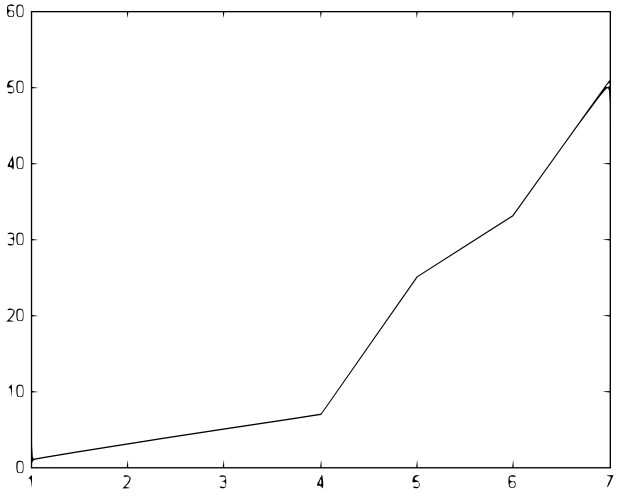

Fig. 5: The graphical interface to the MATLAB workspace

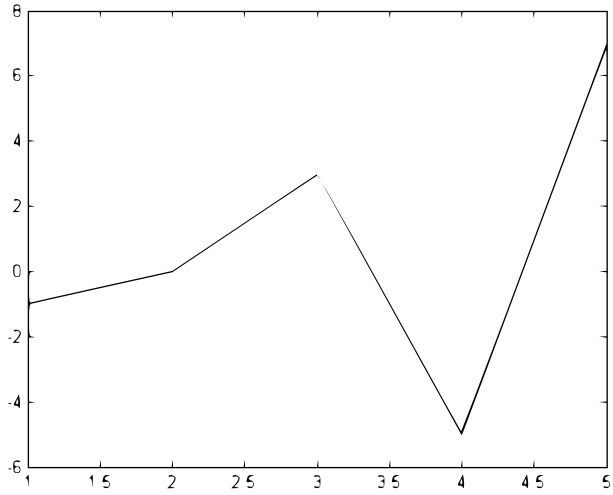

Fig. 6: The graphical interface to the MATLAB workspace

This example shows that MATLAB took the ordinal number of the element for the values of the independent variable x, and their images are the values of the vector X, i.e. the points of the drawn graph have coordinates (1, x (1)), (2, x (2)) ...

In the general case, the plot (x) draws a graph connecting points (i, x (i)), where i = 1,2,3, ... N, where N is the length of the vector. An independent variable can be specified separately. In this case, the plot (x, y) command is used.

*Example 6.*Draw a vector given by coordinates.

```
>>x=[1 2 3 4 5];

y=[-1,0,3,-5,7];

plot(x,y)
```

*Example 7.*Draw the function y = xcos x (?x) 3 in a given range.

```
>> x=-10:1:10;
>> y=x*cos(pi*x)a^3;

>>plot(x,y).
```

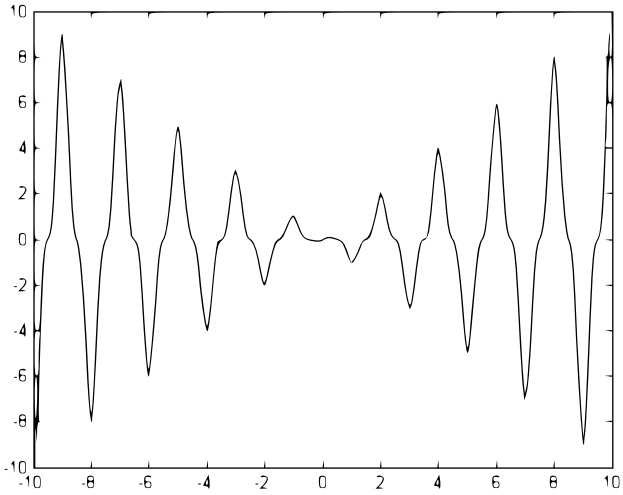

Fig. 7: The graphical interface to the MATLAB workspace

*Example 8.*Using MATLAB we can draw several functions on one graph as shown in the following example.

```
>>x1=-2:2:2;y1=2*x1;

>> x2=-2:.2:2;y2=x2*exp(x2);
```

© 2021 NSP
Natural Sciences Publishing Cor.

```
>>plot(x1,y1,x2,y2)
```

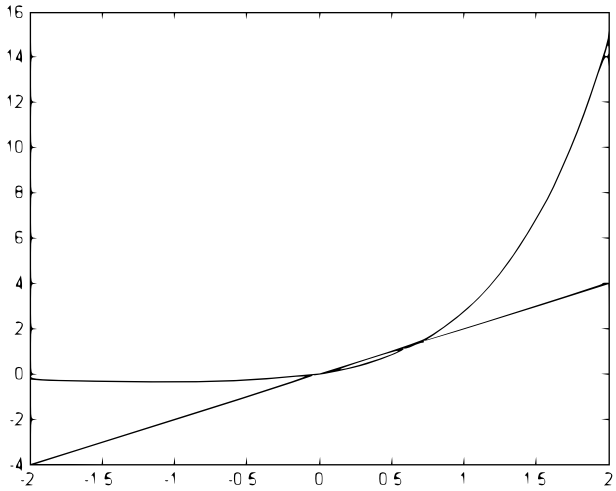

Fig. 8: The graphical interface to the MATLAB workspace

9 Integral Solutions Help Matlab-A

9.1 Indefinite integral

Integration can be done using the int command. This command is used to calculate indefinite and definite integrals. The indefinite integral has the following commands:

1. S can be a label for a previously defined expression, or the expression is written as an argument.

2. When the int (S) command is used if the expression contains only one variable, integration takes place on that variable. If the expression contains more than one variable, the integral for the specified variable is calculated.

3. When the form of the int (S, prom) command is used, suitable for expressions with multiple symbolic variables, integration is performed for the variable prom.

Example 9.
```
>>  int('cos(x)')

   ans =

   sin(x).
```

Example 10.
```
>>syms x

>> S=2*cos(x)-5*x

S =

 2*cos(x)-5*x

>> int(S,x)

ans =

 2*sin(x)-

 5/2*x^2
```

*Example 11.*Calculate the integral
```
>> syms x

>> S=(3*x+5)/(x^2+2*x+2);

>> int(S,x)

 ans =

3/2*log(x^2+2*x+2)+2*a tan(x+1)

>>pretty(ans)

2

  3/2 log(x + 2 x + 2) + 2 a tan(x +
1)
```

10 Analysis of Matlab Application in Certain Stages of Teaching

These examples show how much MatLab allows before all understanding of mathematical concepts. In none at the moment you should not think that MatLab can u completely replacing the teacher in the traditional part teaching process. In order for problems to be solved, mathematical knowledge and problem recognition are required. The traditional way of solving some of these problems with good knowledge of integration methods requires knowledge of feature features to visually present, and then and a greater degree of abstraction to be imagined based on the 2D image 3D image [13].

This concept of work using MatLab, as an aid, allows to ignore the numerical calculations. Of course, this does not mean studying them it is not necessary. Using the software, students can move the slider to adjust the x-coordinate, for example points on the curve and the surface automatically changes, they get are visually different situations, and therefore much clearer picture of the concept of application of certain integrals.

© 2021 NSP
Natural Sciences Publishing Cor.

11 Results and Discussion

The present paper showed that e-learning tools and technologies can very improve the quality of university teaching, and so enable students to more easily adopt teaching materials and achieve better learning outcomes. The results illustrated that the respondents are familiar with the concept of tools and technologies for e-learning. They understood the term theoretically and applied it practically. The majority used tools and technologies for e-learning to improve university teaching. The reason for that is that using them increases the quality of their lectures, and so maximizes the interest of students. Also, the motivation for work maximizes and enhances handling lectures and exercises. Respondents use a variety of tools. Some of these tools are free, and some are commercial and can be used in a trial version. However, some respondents adopted the traditional form of teaching. Most tools increase the level of communication and collaboration, as well as allowed the simulation of work. Of course, there are shortcomings such as the necessary access to computer and the Internet, insufficient knowledge of the tools and technologies, and the absence of oral exams. But all this is very easily compensated when tools and technology are applied in an adequate way, which really achieves better results in the learning process.

12 Conclusion

After applying MatLab, students could gain a basic perception of the capabilities of this software package. Unlike many free online math programs that are primarily limited to the basic needs of students, MatLab offers „countless" possibilities, including independent creation of functions, excellent graphic solutions, simulations, etc. In short, using MatLab allows students to concentrate on thinking about mathematical ideas, on solving problems in a way that is easier and more efficient than without way. It enriches learning of mathematics by enabling the student to research and discover, and also expands the types of problems that can be studied. However, it cannot completely replace the traditional part of the teaching process. To solve problems, it is necessary to have mathematical knowledge and recognition of problems that are adopted in basic courses such as Mathematics 1 and Mathematics 2. Then comes the upgrade with MatLab and similar altos. In addition to basic mathematics courses, programming language courses play an important role in MatLab. It is much easier to learn the syntax of MatLab after learning a language, which is more demanding than students' favorite free math tools.

Conflict of Interest

The authors declare that they have no conflict of interest.

References

[1] M. Danilović, Educational Technology and informatics in order to increase efficiency educational process and learning process, Technology, no. 32, 179-192 (2010).
[2] N. Delic, Information and communication technologies in education, p. 9-22, Banja Luka, (2008).
[3] J. Gavrilovic,I. Kostic , A. Savic, Application of mathematical educational tools in the teaching process, Infoteh Jahorina, Jahorina, Faculty of Electrical Engineering East Sarajevo, 2012, 843-847 (2012).
[4] J. Savicic, V. Popovic V, Educational computer software in the function of improving the quality of teaching and learning, Pedagogy, p. 397-409 (2011).
[5] Computer Aided Teaching, Naucna knjiga, Belgrade 1997, p. 41-52 (1997).
[6] A. Khalid, E. Bingimlas, (2011), Science Technology Education, Journal of Mathematics, 5 (3), 235-245 (2011).
[7] D. Glushac, M. Takach , S. Namestovski, Aspects of adopting computer concepts and improving computer skills in adults, Lecture and learning - situation and problems, University of Kragujevac, Faculty of Teacher Education in Uzice, 17(11), p. 232-236, (2011).
[8] C. Patricia, H. Chris, E. Nerida, F. Gerard, Investigating the Effects of Scientific Software on Learning Mathematics, MATLAB in Early Undergraduate Mathematics: Education Research Journal 2000, 12(3), 219-233 (2000).
[9] T. B. Adavi, Innovation and integration in curriculum and learning, results and experiences from C-SELT projects. Gothenburg: Chalmers University of Technology, 52, p. 419, (2003).
[10] A. Azemi, L. L. Paulei, Lecture of an introductory course in computer programming for engineering using MATLAB, 38th ASEE / IEEE Conference on Frontiers in Education, Saratoga Springs, October, p. 22-25 (2008).
[11] Official MATLAB site: http://www.mathworks.com/
[12] B. Kovacic, Application of Matlab in electronics, mathematics and physics, online edition of a script from the, University of Sarajevo, 2010, p. 155-199 (2010).
[13] A. Savic, J. Gavrilovic, I. K. Kostic, Free math learning software, International Journal of Science, Innovation and New Technology, February 2012, 1(3), (2012).

Dragan Obradovic, born in Požarevac, Serbia. He received his university education at the University of Novi Sad, Faculty of Technical Sciences, Graphic engineering and design, Master's degree was obtained at the same University. Then he finished his academic studies in Belgrade and acquired the title of Bachelor of Computer Science. He then completed a Master's degree at the Faculty of Mathematics. In the meantime, he has published several scientific and professional papers in the country and abroad. He has published two books on graphic engineering.

© 2021 NSP
Natural Sciences Publishing Cor.

Lakshmi Narayan Mishra is working as Assistant Professor in the Department of Mathematics, School of Advanced Sciences, Vellore Institute of Technology (VIT) University, Vellore, Tamil Nadu, India. He completed his Ph.D. programme from National Institute of Technology, Silchar, Assam, India. His research interests are in the areas of pure and applied mathematics including Special Functions, Non-linear analysis & Optimization, Fractional Integral and differential equations, Measure of non-compactness, Local & Global attractivity, Approximation Theory, Fourier approximation, Fixed Point Theory and applications in dynamic programming, q-series and q-polynomials, signal analysis and Image processing etc. He has published more than 125 research articles in reputed international journals of mathematical and engineering sciences. He is referee and editor of several international journals in frame of pure and applied Mathematics & applied economics. He has presented research papers and delivered invited talks at several international and National conferences, STTPs, Workshops & Refresher programmes in Universities in India. Citations of his research contributions can be found in many books and monographs, Ph.D. thesis, and scientific journal articles, much too numerous to be recorded here. Moreover, he serves voluntary as reviewer for Mathematical Reviews (USA) and Zentralblatt Math (Germany).

Nisha Sharma has research interests are in the areas of pure mathematics specially Fixed Point Theory. She has published research articles based on rational inequalities, multi-valued iteration schemes in reputed journals of mathematical and engineering sciences.

Vishnu Narayan Mishra is working as an Associate Professor and Head of Department of Mathematics at Indira Gandhi National Tribal University, Lalpur, Amarkantak, Madhya Pradesh, India. He received the Ph.D. degree in Mathematics from Indian Institute of Technology, Roorkee in 2007. His research interests are in the areas of pure and applied mathematics including Approximation Theory, Summability Theory, Variational inequality, Fixed Point Theory, Operator Theory, Fourier Approximation, Non-linear analysis, Special functions, q-series and q-polynomials, signal analysis and Image processing, Optimization etc. He is referee and editor of several international journals in frame of pure and applied Mathematics & applied economics. Dr. Mishra has more than 240 research papers to his credit published in several journals of repute as well as guided many postgraduate and PhD students (08Ph.D.). He has delivered talks at several international conferences, Workshops, Refresher programmes and STTPs etc. as Resource person. He is actively involved in teaching undergraduate and postgraduate students as well as PhD students. He is a member of many professional societies such as Indian Mathematical Society (IMS), International Academy of Physical Sciences (IAPS), Gujarat Mathematical Society, International Society for Research and Development (ISRD), Indian Academicians and Researchers Association (IARA), Society for Special Functions and their Applications (SSFA), Bharat Ganit Parishad etc. Citations of his research contributions can be found in many books and monographs, PhD thesis, and scientific journal articles, much too numerous to be recorded here. Dr. Mishra awarded as Prof. H.P. Dikshit memorial award at Hisar, Haryana on Dec. 31, 2019. Moreover, he serves voluntary as reviewer for Mathematical Reviews (USA) and Zentralblatt Math (Germany). Dr. Mishra received Gold Medal in B.Sc., Double Gold in M.Sc., V.M. Shah prize in IMS and Young Scientist award in CONIAPS, Prayagraj and best paper presentation award at Ghaziabad etc.

© 2021 NSP
Natural Sciences Publishing Cor.