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ROLE OF MATLAB IN TEACHING - LEARNING MATHEMATICS

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Abstract:
The software like Scilab and maxima leads to many challenges to learn Mathematics. Aims to make both software's the reference for free numerical computation software. How should the mathematics teaching and learning change to best make use of this software? However, software can be used to help students and teachers to develop Mathematical habits of mind and construct Mathematical ideas in simple way. As mentioned software's is an easy to use, multipurpose Computer Algebra System, a system of program for symbolic manipulation of mathematical expressions. It uses its own inbuilt programming language designed for symbolic as well as arbitrary-precision numerical computations. The methods and approaches to learn and teach Mathematics must be restructured to include activities that allow students and teachers to experiment and build models to help explain Mathematical ideas and concepts through software's like Scilab and Maxima. This paper enlightens basic concepts and how to use mathematics in laboratory, this can be used most effectively to help students gather data, and test class problems, modify, and accept or reject conjectures as they think about different Mathematical concepts.

Keywords: Technology, Mathematics, Software and Hardware etc.

Introduction:

The role of software has a long history in Mathematics education. As we know that the role of software in studying Mathematics is not a new issue, since human beings always has been finding solutions to avoid time consuming routine work. Now a day's colleges and university are faces ever increasing requirement in their attempt to ensure that students are well equipped to enter the workforce and direct a complex world. Mathematics is considered as king of all sciences and queen of humanities. From long time, the role of Mathematics was restricted to purely all academic domain. But at present, the role of pure Mathematics was not limited to purely academic domain.

Research shows that Scilab and Maxima software can supply support to teaching -learning, and that is especially useful in developing the higher order problems of critical thinking, analysis, and scientific inquiry. Technology can be useful to the extent which focuses student thinking in ways that are relevant, not extraneous. For most of the students Mathematics is a complex and difficult subject. Most of the student's tendency is to

consider the Mathematics subject as one which is hard, thus, leads to lack of interest in the topics being discussed. Now a day's colleges and university are faces the problems.

Ever increasing requirement in their attempt to ensure that students are well equipped to enter the workforce and direct a complex world. It is great challenge for teachers and educators to find out the solutions, in especially at different levels of study, where in a good study habit and a firm grasp of basic concepts should be developed using through Scilab and Maxima software. The Mathematical software yields high precision numeric results by using exact fractions, arbitrary precision integers, variable precision floating graphs and variable precision floating point numbers. The use of symbolic computation allows to solve many mathematical problems in an accurate manner.

SciLab:

What is SciLab?

Scilab is pronounced with 'SCI' as in Scientific and 'LAB' as in Laboratory.

Scilab is a tool for numeric symbols computing, as are Excel, GNU Octave, Mat lab, etc.

Scilab is released as open source under the Cecil license (GPL compatible), and is easily available for download free of charge at www.scilab.org

- A programming language with a wealthy collection of numerical algorithms
- An Interpreted Language
- Vigorously active compiles and link other languages like FORTRAN, C etc.
- It is a free software with source code
- It focuses on many areas of scientific computing covering like: algebra, calculus, number theory, etc..
- Signal processing, statistic, Plotting functions of two variables Graph and Multiple Graphs etc.
- It provides many Plotting Data
- In SciLab everything is a matrix
- It is a sensitive language
- Libraries of Fortran and C programmer
- Scilab is specular in handling matrices and arithmetical computations, Also it has to create their own functions and libraries.

It is licensed under the General Public License (GPL). Its abilities include symbolic algebra, calculus, plotting, Logical operators, Special Matrices, Matrix Functions, Linear system of equations differential equations and Statistical functions . Scilab includes hundreds of mathematical functions. It has a high level programming language allowing access to advanced data structures, Plotting Data (2D and 3D plots, Points to note, Plotting functions of two variables, Graph Titles Multiple Graphs).

Why do we use scilab?

- It's free open source software
- We need a software which do some stuff which will be a really difficult job if we do it with our own hands.
- There are many library resources and functionality available in scilab, somewhat similar to Mat lab (a famous software but costly and one if you know C, C++, linex, etc.)
- It's very Easy programming interface

Scilab software together with various toolboxes, which are also free, can perform operations like:

- Matrix Operations.
- Control Systems.
- Image and video processing (SIVP).
- Real-time control of Hardware (Serial Toolbox).
- Interfacing Data Acquisition System/Card (HART Toolbox).
- Simulation (Xcos -Block Diagram Simulator).
- Plotting.
- Syntax is very easy.
- Many numerical problems can be expressed in a reduced way, using traditional languages.

Scilab Basics:

>> Common operations:

Here is a list of basic operators in Scilab:

+ Additions

- Subtractions

* Multiplication

/ Division

^ Power

′ Complex conjugate transpose.

E.g.: 1.If a = 15 and b = 225, find (i) a + b (ii) ab (iii) a/b (iv) a^b (v) $(ab)^{ab}$ (vi) $\sqrt{a}$ (vii) $\log_{10} a$

=> (i) 240 (ii) $a * b = 3375$ (iii) 0.06666 (iv) $a \Lambda b = 4.170 + 264$

(v) $(a * b) \Lambda (a * b) = \infty$ (vi) Sqrt(a) = 3.87298 (vii) $\log_{10} \Lambda a = 1.176$

2. Program to find the solution of system of linear equations by testing Consistency.

⇨ clc;

A= [1 2 3; 2 2 1; 3 1 1], B= [1; 2; 6]

If rank (A) ==rank ([A, B]) then

If rank (A) ==min (size (A)) then

mprintf ('\nSYSTEM OF EQUATIINS HAS UNIQUE SOLUTION: \n\n\n');

X=inv (A)*B;

printf(" x = %f\n\n y =% f\n\n z =%f\n\n ",X(1,1),X(2,1),X(3,1));

else

```
mprintf ('\nSYSTEM OF EQUATIINS HAS INFINITELY MANY SOLUTIONS: \n');
end
else
mprintf ('\nSYSTEM OF EQUATIINS HAS No SOLUTION: \n');
end
```

Output:

SYSTEM OF EQUATIONS HAS UNIQUE SOLUTION:

X = 2.333333

Y= -1.666667

Z = 0.666667

What are the limitations of scilab?

- If is not a very flexible programming language.
- Understanding from the scilab relevant documentation is very challenging (basic applicable for people from non-programming background)
- If a very difficult to analyze two or more non constant parameters with respect to another parameter
- If is not basically used unlike Mat lab or Mathematica

Scilab advantages:

- Scilab is similar to Matlab and keeps developing even closer (Mathematical or Statistical). It is quite easy to one step to the other step
- It includes a .m files -to- .sci files translator.
- Scilab requires less disk space than mat lab and GNU octave..
- Scilab in free-if your wanted time and transitions are worth nothing.
- The fight for a limited number of expensive license (mat lab, mathematics, etc.)
- Scilab is free software.
- A friendly software with a lot of functionalizes.
- Scilab developed professionally by scilab enterprise.

Scilab disadvantages:

- The learning effort need by numeric computing is higher than for symbolic computing
- The Help Browser is very radical and of little use to newbies
- Scilab has bugs and tends to swat/lockup.
- Scilab lacks a unified tutorial and /user's manual. You try & cry and waste time Searching for information on its use'
- Scilab tools for creating GUIs are poor compared with mat lab.
- Difficult to build a perfect system
- Conversations-involves more than just words (non-verbal communication stutters etc.).

- It is not a very flexible programming language.
- It is difficult to analyze two/more non constant parameters w.r.to another Parameter
- Scilab will have to complete the relevant documentation is not as good as that of Mat lab and Scilab to c/c++ translator may not be good as Mat lab to c/c++ translator.

Further, Scilab's collection of all tool boxes is not as exhaustive, well relevant documents or of as high quality as those of Mat lab.

Maxima (software):

Maxima is a computer algebra system (CAS), based on 1982 version of Macsyma. It is written in Common lisp and runs on all POSIX platforms such as macOS, UNIX, BSD and Linux, as well as under Microsoft Windows and Android. The operating software is Cross – platform and type of this is known as Mathematical software .It is free software released under the terms of the GNU General Public License (GPL).which was developed at MIT with funding from the United States department of energy and other government agencies.

Developers	:	Macsyma group at project MAC and volunteer Contributors.
Initial release	:	1982
Type	:	Mathematical software
Operating system	:	Cross-platform

DEFINATION OF MAXIMA

Maxima is a powerful computer algebra system (CAS) which combines numerical, symbolic and graphical abilities. See the maxima source forge web page http://maxima.source forge.net/.

A cousin of the commercial macsyma CAS (now available but without support), Maxima is a freely available and open source program with is being continuously improved by a team of volunteers. When we are compared with Mathematica or Maple, Maxima as a more basic interface, but has the advantage price (!). Learning Students, recourse faculties and researches can "own" multiple copies for home, laptop, and desktop without the expense of buying licenses for each copy.

There are known "bugs" in the present version (a new version is available about their times each year), and the volunteer developers and programing experts are dealing with these known bugs has time permits.

Maxima is not only "free software" and will always stay with that way, but also comes with a copy of the underlying source code (in a dialect of the lisp language), which a user can also be modify to suit her own research needs and then share with the maxima community of users .

Numerical Calculation:

Maxima is a full- featured CAS that specializer in symbolic operations, but it also offers numerical capabilities such as arbitrary- precision arithmetic :integers and rational numbers than can grow to sizes limited only by machine memory, and floating- point numbers whose precision can be set arbitrary large.

For calculations using floating point and arrays heavily maxima offers the possibility of generating code in other programing languages, which may execute more efficiently.

Maxima is a general –purpose software, and special case calculations such as factorization of large numbers, manipulation of extremely large polynomials etc…, are sometimes better done in specialized system.

THE MAXIMA HELP MANUAL:

The most important continuous source of information about maxima syntax and reserved word is the maxima manual, which you should leave open in a separate window. To open a separate maxima manual window from inside the x-maxima interface. Click on the x-maxima menu item: help, maxima manual (you can use the short cut alt+ H to open the help menu).

Move around the reference manual via either contents or index.

About Corona (COVID-19):

Coronavirus disease (COVID-19) is an infectious disease caused by a new virus called severe acute respiratory syndrome coronavirus-2(SARS-CoV-2). The disease caused respiratory illness (as like common flu) having symptoms like a cough, fever, tiredness & difficulty in breathing.

WHO announced "COVID-19" as the name of this new disease on **11 February 2020.**

Coronavirus disease spreads primarily through contact with an infected person when they sneeze/cough. It also spread when a person touches any substance or surface that has the active virus on it, then by toughing their mouth, eyes or nose. People may sick with the virus for 1 to 14 days before developing the symptoms. More rarely, the disease can be serious and even fatal. Older people, below five years child and people with other medical conditions (such as asthma, diabetes, or heart disease), may be more vulnerable to becoming severely ill.

Presently there is no any vaccine to prevent Corona (COVID-19) disease.

Example -1

If Number of days required to spread the disease that is, n = 8 & possible spread by a single person is 3 persons per day (that is r = 3) then find total number of positive COVID-19 cases.

Input➔Kill (all) $

a=1$

r=3$

n=8$

/.where a represents cases in initial or first day. /

/.r represents number of spread per day. /

/.n represents number of days. /

/.by using this program one can find number of cases in any instant

Of day. /

TC: $a.(r \wedge n - 1)/(r - 1)\$$

Print ("Number of cases found in first day, a=", a) $

Print ("Total possible number of spread per day by a single

person, r=", r) $

Print ("Number of day, n=", n) $

Print ("Total number of COVID-19 cases will increase by", n,"days =

".TC)$

Output:

Number of cases found in first day, a = 1

Total possible number of spread per day by a single person, r = 3

Total number of Covid-19 cases will increase by 8 days = 3280.

Example -2

If Number of days required to spread the disease that is, n = 14 & possible spread by a single person is 3 persons per day (that is r = 3) then find total number of positive COVID-19 cases.

Output Result: Total number of positive COVID-19 cases will be equal to **2391484**

Example -3

If Number of days required to spread the disease that is, n = 15 & possible spread by a single person is 2 persons per day (that is r = 2) then find total number of positive COVID-19 cases.

Output Result: Total number of positive COVID-19 cases will be equal to **32767**

So by following these preventive measures to eradicate the disease.

- Wash your hands regularly for 20 seconds, with soap and water or alcohol-based hand rub.
- Cover your nose and mouth with a disposable tissue or flexed elbow when you cough or Sneeze.
- Avoid close contact (1 meter or 3 feet) with people who are unwell.
- Stay home and self-isolate from others in the household if you feel unwell.
- Don't touch your eyes, nose, or mouth if your hands are not clean.
- Maintain social distance and avoid touching any substances without any protection.

ADVANTAGES OF MAXIMA:

- A simple calculater & a notebook.
- Can assist young advents beginning their adventures with mathematics.
- A tool for solving complex mathematical problems.
- Maxima has programming capabilities, what greatly increases possible applications.
- It is possible to write scripts solving even every complex, real life, scientific problem.
- Results are accurate in general, compared to analytical modal.
- Help to find unexpected phenomenon, Behaviour of the system.
- Easy to perform ”what- if” analysis.

DISADVANTAGES OF MAXIMA:

- Financial and technical insufficient.
- Expert with computer and computer based mathematics is crucial for attacking the many Problems, which literally can’t be solved. Impoverish of student’s paper and pen skills.
- CAS (computer algebra systems) syntax.
- Much time for class preparation.
- Causes excess demand.
- Consumers who want to consume the good can’t enough of it.
- It can be mentally exhausting.
- Financial insufficient.
- Lack of intimacy with the use of computer.

Conclusion:

Mat lab offers an open source alternative for numerical computing. We can say that these software’s offers strong possibilities the utilisation is pretty easy for simple problem. For advanced problem, it is more complex. Even though users have to convert MATLAB code to make it compatible to both the mentioned software’s, it is sometimes an exercise worthwhile since as software’s provides a rich ecosystem of engineering modules to perform complex mathematical calculations .

Knowing these facts by using this program all the citizens of the world should obey the prevention measure given by the competent authority to eradicate this infectious disease Corona (COVID-19). The simple measure is Stay @ Home, maintain social distance, keep hygiene and increase immunity. Currently there is no vaccine to cure this Corona (COVID-19) disease.

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