Our Heritage

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The Vocational Implementation and Analysis of Computing Software For The Department of Mathematics

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Abstract

The mathematics department is considered one of the building blocks for advanced logical analytics and base for several evolved domains like Computer Science, Physics, Mechanics, Thermodynamics, Electronics, Space Science, Medicine etc. With the vast study of the department, the research area and formulation kept on increasing. After the invention of computers, mathematical calculations became easier and much accurate. Our paper is about the analysis of such software implementations in schools and colleges to help Mathematics students to come up equal to another department of technically equipped students. There was a time when all the works in offices used to happen only on registers and files. Now the place is taken by computers. All the mathematicians worldwide provide their lectures, papers, researches online. They even use mathematical analysis tools like MATLAB, SCILAB, Octave etc. to come to conclusions. Any mathematical problems can be solved in a fraction of seconds using this software. Then why being available for many years, this software is not implemented in the Indian education system. We have to find the answers to some more questions also, like how we implement, what will be the drawbacks, how students will take it and what will be the effect on the next generation. We also analyze whether this software will reduce the computational capabilities of students or help them to achieve the results much easier.

Keywords: *MATLAB, SCILAB, Octave, Mechanics, Thermodynamics, Space Science*

1. Introduction

Evolution is the universal law which propagates evenly in all directions. Our paper discusses the evolution of mathematics towards betterment by means of software capabilities. Most of the core departments deal with software systems and simulations to obtain better results and understanding. Now, this is the time for mathematics to grow multidimensional. Our paper discussed all necessary parameters by which calculation and simulation software can help mathematics fraternity to exhale. Recently many institutional departments like Physics, Mathematics, Computer Science and electronics started to organize workshops on different analytics and designing tools like MATLAB, Scilab, Octave," R" etc. which shows the change is coming. Especially Mathematics students who get a job in different sectors like Railways, Panchayat, Tourism, Analysis and Education feel really tough to cope up with computers in front of them used for higher-order analysis. Our initiative is to equip them for the change when there is enough time available in the form of Vocational Courses, Workshops, Seminars so that they can bring change in society with better understanding and employability.

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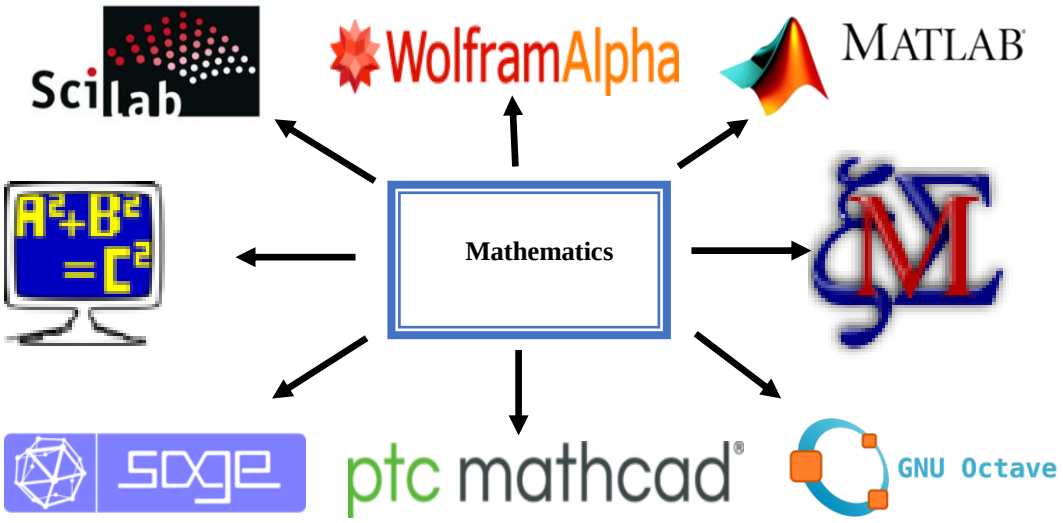

Fig.1: Major CAS for Mathematics

2. CAS – A necessity today: An Overview

Computer Algebra System (CAS) is a term commonly used for the mathematical high-end software which can mimic or interpret the traditional computations of mathematicians, researchers, scientists and provide a reliable result. Though CAS is extremely useful for students from science streams of Physics, Chemistry, Mathematics, Electronics etc. still is unknown to most of the educationalists. The evolution of mathematics is immense from a simple calculator to a high advance CAS. The visual capabilities of CAS are extremely fabulous. For example, if we imagine some solution of Linear Equation in terms of the intersection of Lines then we can only imagine but to visualize it we need to draw it on a 2D plane. Drawing a 3D imagination on 2D plane automatically limits our imagination.

3. The Practical Implementations

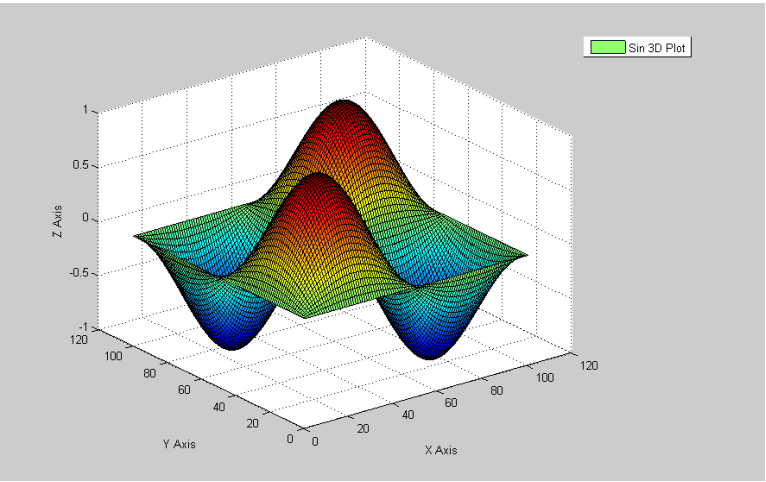

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Fig.2: 3D Plot of SIN in a popular CAS

Using CAS we can visualize the outcomes with a much wider perspective. In several countries, the CAS has shown the huge impact on students understanding but in India, it is still not so popular. Some institutions are coming forward to organize workshops and location courses on such topics but still, there is a long way to go on. MATLAB was one of the first CAS started in 1970 which boosted the mathematics development, is still leading the educational system due to its capabilities and universal acceptance.

Scilab, Maxima and YACAS are other CAS which are very simple. Yet effective tools to perform the mathematical calculations with great ease and understanding with proper implementation they can be highly acceptable and informative to students, researchers and professors.

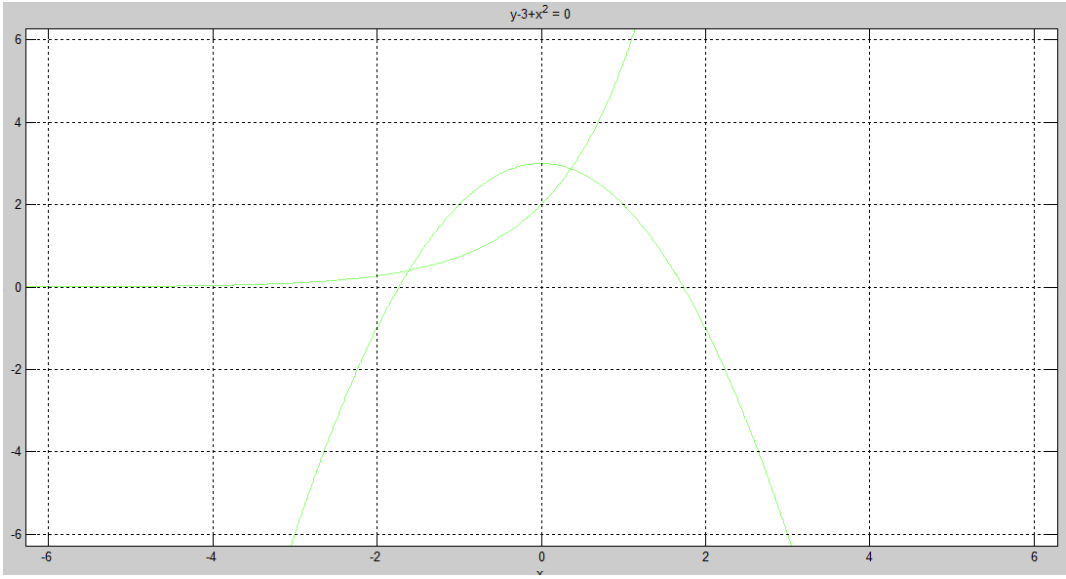

Fig.3: Intersection Points of 2 expressions in a popular CAS

Expand Taylor Series for e^{2x} about x = 25 to order 16

exp(200) + 8*exp(200)*(x -25) + 32*exp(200)*(x -25)^2 + (256*exp(200)*(x -25)^3)/3 + (512*exp(200)*(x -25)^4)/3 + (4096*exp(200)*(x -25)^5)/15 + (16384*exp(200)*(x -25)^6)/45 + (131072*exp(200)*(x -25)^7)/315 + (131072*exp(200)*(x -25)^8)/315 + (1048576*exp(200)*(x -25)^9)/2835 + (4194304*exp(200)*(x -25)^10)/14175 + (33554432*exp(200)*(x -25)^11)/155925 + (67108864*exp(200)*(x -25)^12)/467775 + (536870912*exp(200)*(x -25)^13)/6081075 + (2147483648*exp(200)*(x -25)^14)/42567525 + (17179869184*exp(200)*(x -25)^15)/638512875

Result.1: A complex calculation of Taylor Series by a popular CAS

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4. The benefit and drawback perspectives

Benefits of software used for computation.

- Students and Researchers understanding of the subject.
- Better visualization and grasping of problems and solution.
- Faster results.
- The real-time result in the form of graphs and statistics provides intersect to solve many complex problems.
- An easy demonstration of how a small input changes can alter wider results.
- Helps student for the job and increase their employability.
- Mathematics no longer remains a complex and tough subject as per the perspective of many people.

Drawbacks of software used for computation

- Addiction of software and lesser concentration towards manual calculations.
- Learning latency.
- Only experts who work in the field for a very long time can take the classes.
- Evaluating the exam papers are extremely complex because the same output can be produced by different program logic.

5. Conclusion

Thus we studied over the recent scenario of the CAS system for Mathematics domain. We observed how quickly and efficiently a CAS can solve the problem and help our young and expert mathematicians to have a wider perspective of mathematical processings. There is a huge need to learn and motivate institutions to come forward in order to promote CAS. This will conclude to the better and expert mathematics fraternity. Already the results produced by CAS is universally accepted then why not to add them in the curriculum itself and make maximum usage of that. Teachers should take care of the fact to teach traditional mathematics and then teach CAS to solve the mathematical problems can short out the issues and confusions.

References

1. Schneider E. (2000). Teacher experiences with the use of a CAS in a mathematics classroom. The International Journal for Computer Algebra in Mathematics Education, 7/2,119-141.

Sierpinska A. & Lermann S. (1996). Epistemologies of mathematics and mathematics education, in Bishop & al. (eds), Handbook of Research in Mathematics Education, p. 827-876, Kluwer academic publishers, Dordrecht

3. Guin D. & Trouche L. (1999). The complex process of converting tools into mathematical instruments : the case of calculators. The International Journal of Computers for Mathematical Learning, 3(3), 195-227.

4. Kendal M., Stacey K., Pierce R. (to appear). New work plans in the classroom.

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Vol-68-Issue-1-January-2020

5. Kovacs A. (1999). Computer algebra : impact and perspectives. Nieuw Archief voor Wiskunde, 17/1, 29-55.

6. Lagrange J.B. (1999a). Techniques and concepts in pre-calculus using CAS : a two year classroom experiment with the TI92. The International Journal for Computer Algebra in Mathematics Education, 6/2, 143-165.

7. Lagrange & al. (2001). A meta study on IC technologies in education. Text to be presented at PME 25 (Utrecht)

8. Bodner, G.M. (1986). Constructivism: A theory of knowlwdge. Journal of Chemical Education. Vol. 63 no. 10.0873-878.

9. Cockcroft, W.H (1986). Mathematics Counts. London: HMSO

10. Countryman. 1992. Hakikat Pembelajaran Matematika.Surakarta:

11. DepdiknasDepdiknas (2006). Permendiknas Nomor 22 Tahun 2006 Tentang Standar Isi Sekolah Menengah Atas. Jakarta: Depdiknas

12. Doni Koesoema.A. 2013. Hasil PISA 2012 dan Kurikulum2013?Pemerhati (Kompas, Rabu 11 Des 2013)

13. Eileen Phillipsa& Ann Andersonb.1993. Early Child Development and Care . "Developing mathematical power: A case study".Volume 96, Issue 1, 1993. DOI: 10.1080/0300443930960111. Published online: 07 July 2006.

14. Ernest, P. (2001). The Philosophy of Mathematics Education. Hampshire (UK):

15. Hudoyo, Herman, 1990. Strategi Mengajar Belajar Matematika. Malang: Penerbit IKIP Malang.

16. Kemendikbud (2013). Kurikulum2013 : Konsep Dasar Pendekatan Saintifik

17. Mary Muller and Lourdes Z. Mitchel. 2005. Building Mathematical Power: Why Change is So Difficult. International Journal for mathematics teaching and learning. ISSN. 1473-0111 This journal is indexed in both ERICand EBSCO. www.cimt.plymouth.ac.uk/journal/muller.pdf

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