Practical Use and its Subject of Computer Algebra Systems in Mathematics Education

Tadashi TAKAHASHI *

Kobe University

1 An Ideal Method for Education Use of Computer Algebra Systems

The following thing becomes possible afresh by utilizing computer algebra systems in the class room education.

Expectation $\rightarrow$ Proof of computer experiment $\rightarrow$ Observation $\rightarrow$ Theorem

or

Expectation $\rightarrow$ Computer experiment $\rightarrow$ Observation $\rightarrow$ Proof

The efficient use of computer algebra systems will be changing mathematics education.

2 Interface of Computer Algebra Systems for Education

2.1 A characteristic of interface of DERIVE

Superior point of DERIVE

DERIVE is personal computer version of (MSDOS, Windows95, Windows98) and graph electronic calculator version(TI92 use). Popup of a menu and a selection in a menu utilize mouse (direction controller) or cursor key. We can select the function names on a menu. We can use Windows version on a hardware of a little memory. Graphics is easy.

We can picture a graph of a function. There software developed for education is available through Web easily.

*takahasi@kobe-u.ac.jp

Weak point of DERIVE

It is not a programming language, a program is hard to write it.

2.2   A characteristic of interface of Mathematica

Superior point of Mathematica

A name of built-in functions begins in capital letter by all means, and there is consistency of operation. In particular, as for version after 3.0, the palette input function was equipped. Its input and output as mathematics are an advanced description. It can write a mathematical expression decently. It is a functional language, it is easy to understand it compared with a procedure-oriented language. It is very comfortable to program. Graphics is provided simply. Various kinds of packages are attached and are convenient to use it as a tool. There are many books.

Weak point of Mathematica

We need the hardware which has much memory. It is expensive.

3   Ideal Method of Interface for Education in Mathematics Education

The operation that a beginner is easy to understand is necessary. Complicated operation lets learning person confuse. Learning person gets impossible to understand learning contents. We simplify operation and learning person can learn. Think about operation burden of learning person. It is nothing of advantage to use a computer for as a tool not to need to repeat the input of that purpose from the beginning. A function to show progress in the way is necessary. We need various interface from a beginner to an advanced learner, a purpose of learning person. In this case other functions had better be hidden. We need to have a function to show case sending in an answer, a process in the way if it is necessary as education business.

4   The Present Situation of Mathematics Education that used Computer Algebra Systems

We introduce an example of mathematics education that used DERIVE and Mathematica and consider a trend after now.

4.1   Mathematics education which used DERIVE

After 1993, mathematics education by using DERIVE in Europe began. About 50 senior high school mathematics teachers / university mathematics teachers gathered from Europe America / Japan, and "First DERIVE International Congress" was done in Krems in 1994 by support of the education ministry of Australia. In the flow, TI92 which had several sets handling DERIVE built-in in 1995 was developed. Study of mathematics education that used TI92 simultaneously began. After 1995, European DERIVE group and alternating current of American T cube group progressed. And DERIVE Conference was renamed to "DERIVE and TI92 CONGRESS" for 1996 years.

4.2   Mathematics education which used Mathematica

In a course in mathematics of Illinois university , there are a lecture of "Calculus and Mathematica". The lecture / practice does a lecture of calculus that Mathematica was used. The part of contents of this lecture is shown on Internet.

URL http://www-cm.math.uiuc.edu/

TA teach students politely. And, after the lecture, a student of doctoral course explains learned contents to students in a general classroom and teaches a way of thinking as mathematics. It is needed for students to teach a way of thinking as mathematics. Students must understand mathematics in order to use Mathematica effectively. Mathematica user society is doing active activity. Information about Mathematica user society in Japan is the following Homepage.

http://www.hs.konan-u.ac.jp/math/Mathematica/

5   A Subject about Practical Use to Mathematics Education of Computer Algebra Systems

A practical use to mathematics education of computer algebra systems is a demand of a lot of people. It is an important problem in mathematics education of the next generation. We must think pupil / student so long as we think as mathematics education. In a frame of current mathematics education (curricula), it is fact that it is difficult to take it in. But we must develop as a new method of mathematics education with using technology. In a curricula of current mathematics education, it is possible fully to take in partially use of computer algebra systems makes even a way of thinking flexible. By the thing, a new investment to mathematics education is not wasted. Agreement of many people will become possible.