Build Homepage for a Course

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Abstract

To build homepage for a course is very useful for both of teaching and learning. According to my experience of giving course named Complex Variable in last two years, we show how to make a homepage to be an Internet reference for textbooks. Furthermore, the homepage also provides a new communication method between teacher and students by message board being able to input various formulas.

In Tang dynasty, a Chinese philosopher and litterateur Hanyu said that the duty of a teacher is to impart and disabuse for their students. Impressed deeply by this apothegm, I try my best to improve the education quality. In last few years, I paid the attention to the use of the information and communication technologies, which are dramatically changing the way dealing with document. Electronic publishing is rapidly growing, more and more publications becoming available on the Internet. As modern and powerful authoring tools are becoming increasingly easier to use, the construction of Web pages including graphics and animations can be carried out by non specialist. Such status encourages me to build homepages which could help students to understand the material more easily in the textbook — Functions of A Complex Variable.

1 Content of Homepages

As an expansion of textbook the homepages include mainly following materials:

A. **Key points of every chapter** The theorems and formulas in the textbook are not of equal importance, so to know the key points is very useful for students to understand the content of whole chapter even whole book. For example, the sameness

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and differences between real analysis and complex analysis, the importance of Cauchy integral theorem and Cauchy integral formula, the relation between harmonic and holomorphic functions, the main idea of proving Riemann mapping theorem, e.g... This part is always on the homepage.

B. **FAQ** This part includes questions being asked by students of every year. For example, the clarifying of unvalued branch for a multivalued function, the construction of conformal mapping by element functions, the key point of calculating integral by residue, how to apply Schwarz lemma, e.g... This part is always on the homepage.

C. **Solution to exercise** There are over hundred students in one classroom, while only one graduate student helps me to correct their papers by marking "right" or "wrong". The students desire to know "why is wrong", in particular, for the exercise involving arguments. So the answers are usually put on the homepage after returning the homework and canceled before new term.

D. **Tests of past years** Surely, every student are seeking good record. Despite review of the book, they would like to know not only the type and quantity of the questions in an exam but also the part of the questions which examed often. Accordingly, providing papers used a few years ago could make them relaxedly. Once a student even downloaded the paper from web and printed to each others. You can see the importance from this. That content is still on the web.

E. **Message board** This is a new method of communication between teacher and students. To establish a message board is more difficult than other parts, which we will discuss detail in late.

To make students have more interest to explore the homepages, I have sited something that can advance the math's studying. Especially the introduction of several complex variable and the research about this doing by me and my students. In addition, there have some introduction and relevant link to math's technology which involve math's software, data analysis, math's mechanization, etc. The above materials are located at two chief websites:

http://seminar.533.net
http://math.fudan.edu.cn/teacher/123/index.html

2 Display of Equations

The kernel that ties together all attempts to use the Web for math is the need to put mathematical notation in homepages. There are basically four strategies for publishing mathematical material to the Web today:

Non-HTML Formats This is the simplest way to publish a mathematical document created in a format that natively supports math (e.g. Adobe PDF, TeX/DVI files, Word documents) is to put the document online as is.

Browser-native HTML One can use only the mainstream browsers' native HTML capabilities. That generally means images of equations for complicated material, or a combination of text, symbols, fonts, tables. The big advantage of this method is that

it reaches the widest audience by far without to obtain additional software, such as browser plug-ins. However, the downside are that the quality tends to be lower, and such documents are quite difficult to author and maintain.

HTML with Components The techniques for integrating special purpose components such as apples, plug-ins and behaviors into Web pages. A great deal of work has been done on such techniques.

Server-side Programming The advantage of this technique is obvious −− readers get the highest quality, most engaging and dynamic version of a page that their browsers are capable of supporting. The disadvantage is that requires expert knowledge and access.

For more comment on these strategies please consult [1]. In fact, none of above four strategies is without drawbacks. Totally think of the advantages and disadvantages of the above 4 ways, especially practicality and convenience, we choose the ways of Non-HTML Formats and HTML with Components.

The strategy of Non-HTML Formats has the significant advantage that we retain total control over the formatting. Although it requires the reader to have the software to display that format on his or her machine, but using Adobe's PDF format can minimize the software problem, since the Acrobat Reader is free and widely available. We use Adobe's PDF format for C, D in the previous section, which contains a lot of equations and only needs superficially integrated into the rest of the homepages.

For producing a PDF file from the document containing mathematical formulas and Chinese characters we need at first the software TyWin developed by East China Normal University (ftp://wims.math.ecnu.edu.cn) to transform a text file with extension name ".ty" to a ".tex" file. Then the ".tex" file can be processed by LaTex to produce a ".dvi" file, thereafter PDF file.

Clearly, authoring pages that make use of HTML with Components is generally quite difficult and the components have generally not integrated very seamlessly into the surrounding page. For our case, there are fewer equations and more explanation in A, B, the strategy of HTML Components is accessible. At last, we found that HTML with HotEqn as applet to show mathematical symbols is suitable for us.

HotEqn containing eight class files is a Java applet to view and display mathematical equations on the Web. The applet uses partly the familiar LaTeX notation to code its equations. There are five fontsizes being variable, so the applet can be used to display most inline equations as well. The software HotEqn is free and easy to use, which can be downloaded from

http://www.esr.ruhr-uni-bochum.de/VCLab/software/HotEqn/

3 Message Board

The Internet enables students and teachers to communicate as never before, without the restrictions imposed by the traditional professors' office hours. Interaction over the Web offers a compelling blend of the thoughtfulness of written communication, and

the immediacy and informality of spoken communication. The partial anonymity of interacting through the Web can have a liberating effect on shy students who might otherwise be too reticent to fully engage with learning. In particular, the quizzing and answering are open that it is of benefit to every student, which can't accomplished by "office hours". Furthermore, students may also discuss each other on Web.

Since the students haven't authority to upload files in general, so the message board is to a turn for the need of intercommunion. Usually, the messages on a message board are simply typed in text format, well then how to input and display the mathematical formulas? At last we decide to take Latex as the input format and use HotEqn for display.

Why we use Latex as input format in the message board? The obvious reason is that LaTex has widely used in the mathematical world. Most journals require Tex file when you publish a paper so that every student should know the language if he or she will take a job on mathematics. Why don't we let students get to Latex early? Someone argue that so many commands of LaTex that students can't in control of it very well in their limited time. In fact, quite many commands of LaTex are used for setting up special type, besides which they have evident meaning of mathematics. Furthermore, much less LaTex commands on equations are frequently used in one textbook. For example, if one understands the following commands

$\times$	$\backslash times$	$\prod$	$\backslash prod$
$\div$	$\backslash div$	fraction	$\backslash frac$
$\sum$	$\backslash sum$	$\int$	$\backslash int$
$\leq$	$\backslash leq$	$\geq$	$\backslash geq$
∞	$\backslash infty$	lim	$\backslash lim$
cos	$\backslash cos$	sin	$\backslash sin$
cot	$\backslash cot$	tan	$\backslash tan$
log	$\backslash log$	$\neq$	$\backslash neq$
$\in$	$\backslash in$	$\forall$	$\backslash forall$
$\cdots$	$\backslash cdots$	big space	$\backslash quad\ \backslash qquad$
$\cap$	$\backslash cap$	$\cup$	$\backslash cup$
∂	$\backslash partial$	conjugate	$\backslash overline$

and some common used symbols

$+$, $-$, $<$, $=$, $>$, $|$, $($, $)$, $[$, $]$, $'$, _(subscript), ^ (superscript)

in almost every software, then the most questions and answers on the materials in our textbook named *Functions of A Complex Variable* can be written. Certainly, the more commands you know, the more concise the sentence involving mathematical symbols is. So it's advisable to add "help" including more commands for further learning.

Note that the HotEqn is merely an equation viewer, which has two defects for displaying a mathematical formula involving some text. There is no space between words and only one line for whole sentence. Fortunately, we developed a java script to overcome these problems. You only let the equations be bounded by symbol $ and press "enter" key if the new line is needed.

Now you can see in figure 1 that a standard Tex sentence has been input. Before submission the message you can preview to inspact it's right or not(see figure 1). You can modify the input file up to the preview is correct.

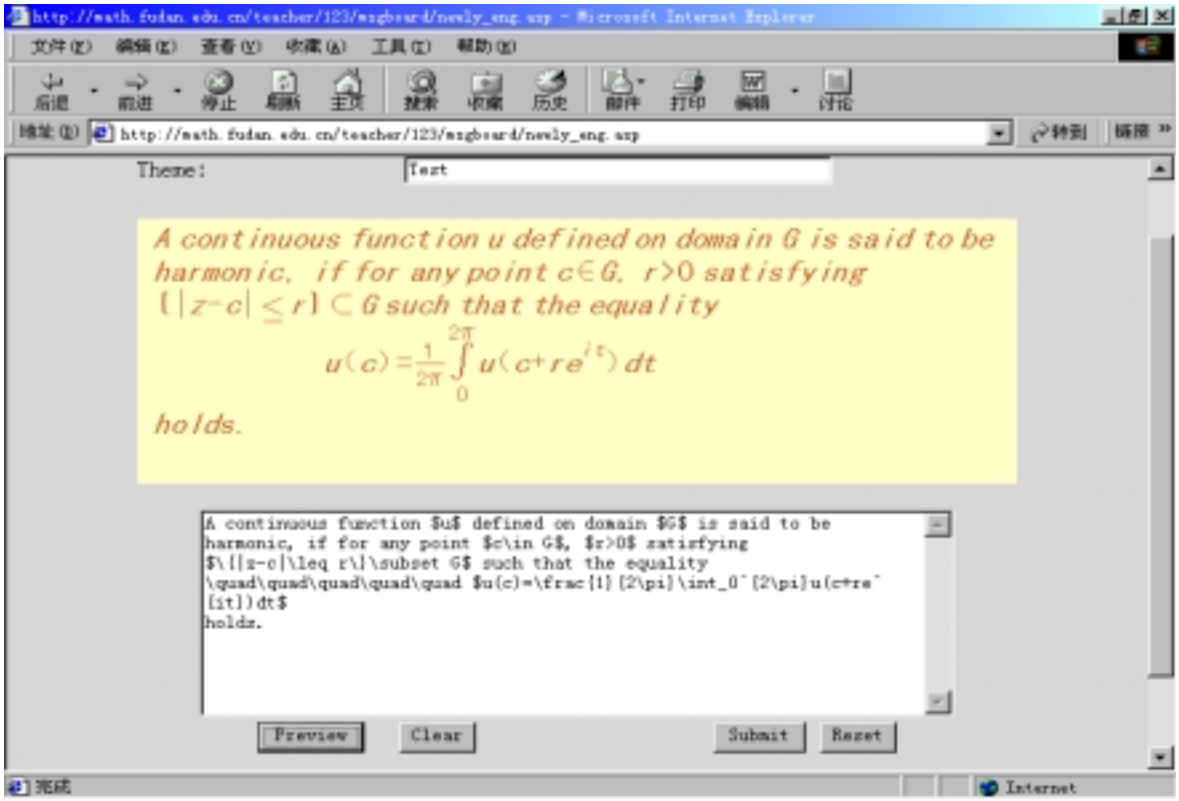

Figure 1

After submission the message will be displayed as a normal sentence(see figure 2).

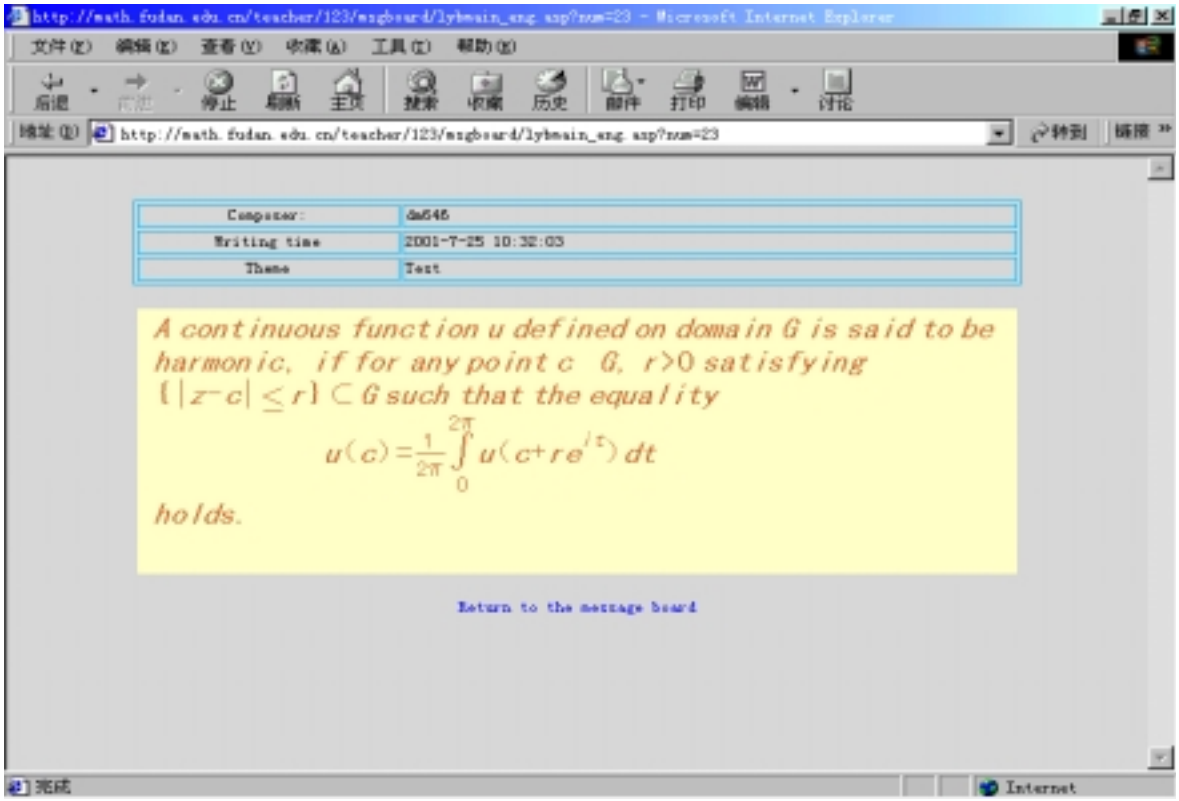

Figure 2

4 Conclusion

No perfect technologies used to put mathematical notations and formulas on Web pages. Although HotEqn has great effect on the building of our homepages, nevertheless, we can't show Chinese sentence with equations in the message board. Furthermore, the displayed equations aren't good-looking enough to meet our desire.

In pursuit of convenience for the interactive communicating Math on the Web we also expect the progress of "HTML Platform", when experts try hard to improve the embedding components, for instance, HotEqn.

Fortunately, the "HTML Platform" has made great strides in the recent years, and is finally getting to the point where it is sufficient for math and science communication. In particular, there has been substantial progress on component embedding technologies in the last two years or so. In response to the technical advances, a component architecture workshop is currently being organized at W3C to set about creating the standards necessary to insure robust, cross-platform implementation of these promising new techniques. Most veteran standards activity watchers in the math software community now agree that enough pieces of the HTML Platform are really there and

fit together well enough to start building what we have always wanted to build. In particular, MathML(Mathematical Markup Language), which the W3C Recommendation for encoding mathematics to be served, received, and processed on the Web, just as HTML has enabled this functionality for text, will have substantial influence on communicating Math on the Web.

We have known the equations displayed by WebEq[2] or Techexplorer[3], both of which support MathML, are more fine than HotEqn, but do not support Chinese characters. We also aware that MathPlayer, which is based on Microsoft's Behavior technology and will work with Internet Explorer 5.5 or later, will enable Microsoft's Internet Explorer Web browser to display MathML. These advanced technologies will definitely impact our homepages.

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