Interactive Education System for Learning Statistics on the Internet

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1. Introduction

Recently, it has been seen in both the academic and business world that the global abilities demanded of students and working people have begun to change with dizzying rapidly. Particularly in the social science department, the need for integrated statistical ability, data analysis and information processing has been growing intensively. On the other hand, the recent surprising coverage of computer networking technology and multimedia capabilities have brought a great impact and change on education systems over every department of university. Large demands of abilities for statistical data analysis especially in economics, commercial science, psychology, pharmacology or any other social science section having timely matched for help with these electronic situation around universities or companies have been extending the dimension of statistics education. In addition, easier getting over various kinds of data than before through computer network has carried stronger needs for this phenomena. In this paper we make a proposal concerning statistics, econometrics and statistical data analysis education of broad outlook with new smart media technology in order to help both teachers and students teach and learn the skills for these tasks effectively. Concretely we have developed the education system whose contents include the interactive texts, electronic book reading system with precise searching tools and statistical program libraries which have the interface over Microsoft Excel. We will show the concept and the outlook of those system.

2. Interactive Text for Learning Statistics

Here we show our first project of interactive statistics education system on the Internet which is abbreviated to "ITLS". This is exactly user participation typed interactive, cooperative and interdisciplinary domestic project, while another point of view over users' active movement keeping their appreciation of learning is expected. The purposes of ITLS are as follows.

- Joint development of education web sites with which practical statistics education can be done
- Majoring social science students' master of data analysis for actual practice
- Education contents' standardization with cooperative developments by teachers
- Places and chances free of learning statistics and data analysis
- Making database of browsing log file and its analysis

- Making database of question and answer contents
- Making applicable modularity of developing tools
- Widely use of computer and network literacy

Let me show the concrete categories. It contains more rich functions comparative to learning statistics with only paper texts.

- Retrieval by keywords, glossary system and linkage to referential sites including data downloading
- Introduction to Statistics and how to use Excel
- Data Analysis (descriptive statistics and inferential statistics)
- Basic theory of regression analysis
- Time series analysis and seasonal adjustment
- Lecture of multivariate analysis
- Statistical analysis with "Statistica" (common software package)

In addition, web texts contain some easy comments, colored contents, hyper linked material, images and 17 kinds of dynamic graphs with Java applets to help students who are far from printing material easily understand statistical concepts. The practical use of multimedia tools can bring chances of statistical education to the people who have weak eyes or are hard of hearing. All contents are united systematically together with high-level searching system. Figure 1,2 shows two contents of screen dealing with ITLS, the second one is an interactive example made by Java applet where students can participate and operate these online texts by their own mouse clicking action. This will bring them appreciation to learn or ability to concentration. Moreover, hence some data can be downloaded from world wide web site, user can see the newly statistical analysis as their example result. As ITLS has already introduced and mirrored widely to any university or college for statistics and data analysis education, one of our next purposes is to trace users data for analyzing effects of this system and modifying its results to projects' next version.
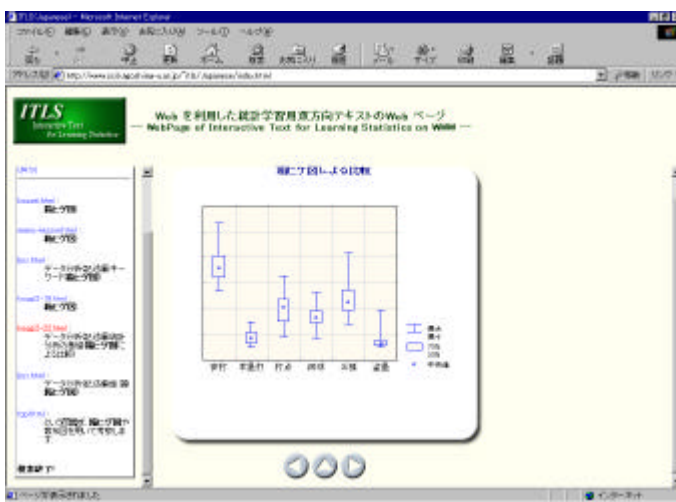

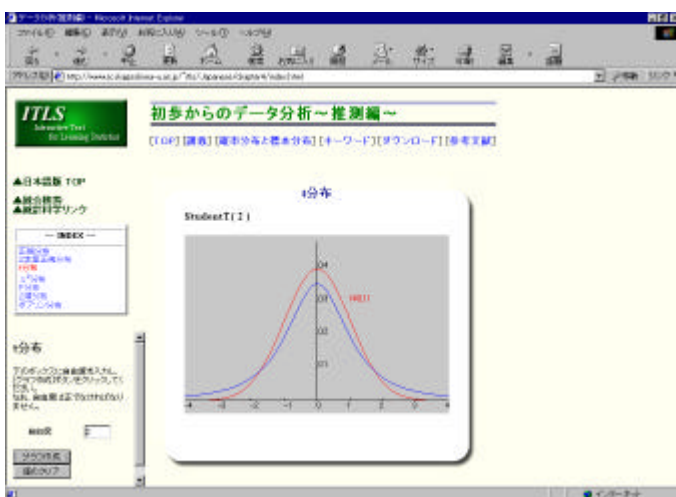**Figure 1. Example of lecture slide (box plot by group)**

Figure 2. Dynamic graph by Java applet (t distribution)

3.   EBSA

EBSA is our second project of abbreviation as "Electronic Book for Statistical Analysis". All people can read contents of books in statistics on the Internet, I will show EBSA's system here. Now we have served 16
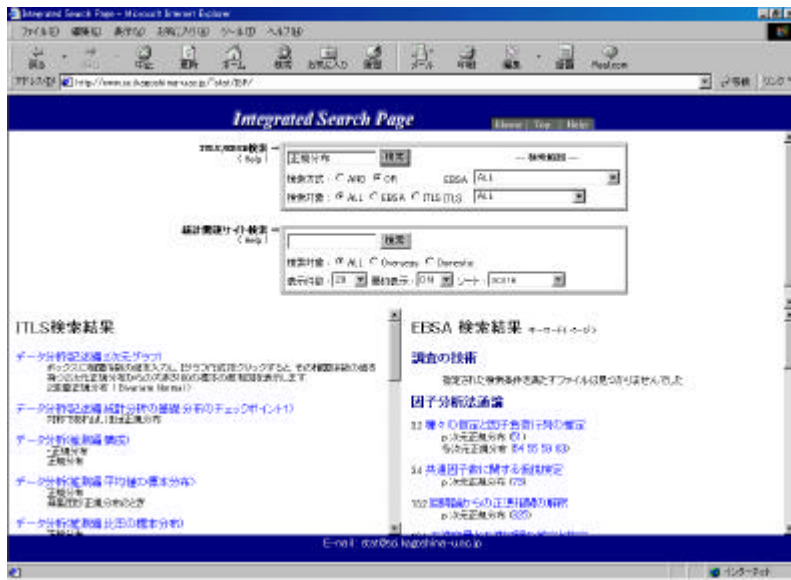
Figure 3. Integrated Searching page for ITLS and EBSA

online books in statistics which are very valuable but not so easy to get now because almost all EBSA's book are out of printing today. We have got the agreements of all authors and each publishing companies for providing resources on the Internet web as EBSA's component. All books with this system are scanning into electronic files and then modified under several imaging processes. Last files are put into PDF format and stored as database. EBSA also has precise searching system which has texts pages of input keyword list reaching to exact original PDF images. In short EBSA system has integrated index database providing searching function by keyword list. Since this unique searching system has relation with the online text ITLS and other statistical web sites, users can get glossary about 6000 words related to statistics and econometrics. Figure 3 shows the result screen of this integrated searching system.

4.   DLLSA

We also have provided dynamic link libraries of statistical analytic calculation algorithm in the Internet web as the third long-run project, abbreviated into "DLLSA". Though many statistical software has supplied useful tools for statistical analysis, its covering is not so enough for us and user. We have software resources of statistics which were developed during not so short time, this network age is much suitable for us to provide these resources in convenient usable style with Microsoft Excel interface for all over the world because of good timing and good cost effectiveness. Figure 4. shows one of the Excel interface and its result using a DLL
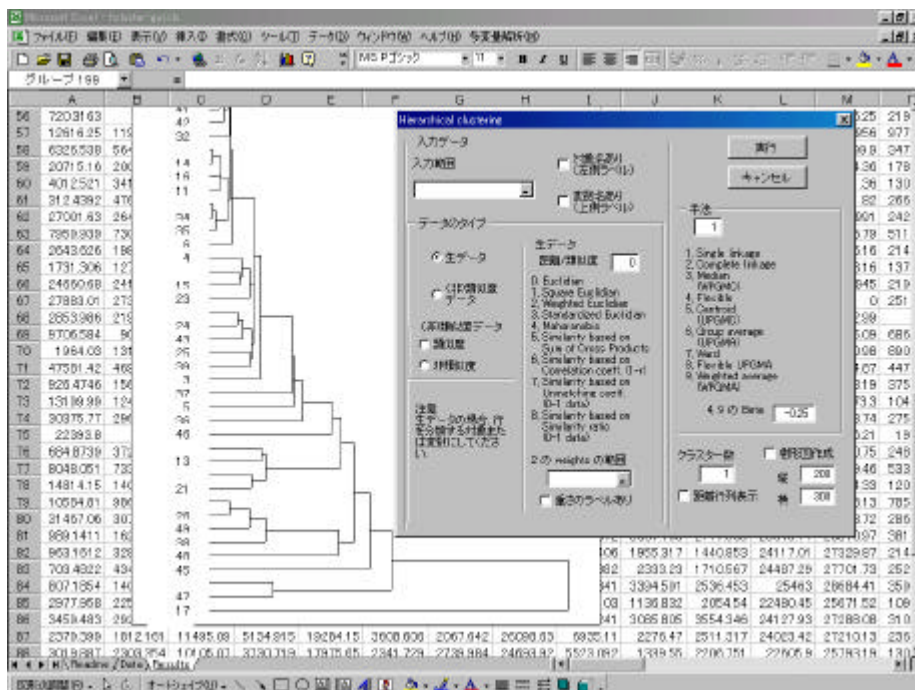

Figure 4.   An Example of Cluster analysis on Excel

provided by DLLSA mentioned above. DLLSA has four main departments as follows.

- Data Management
- Mathematical computing
- Basic Statistics
- Multivariate Analysis

Here is further information about one example of DLLSA, Multivariate Analysis.

- Principal Component Analysis
- Metric Multidimensional Scaling
- Hierarchical Cluster Analysis
- Latent Class Analysis
- Corresponding Analysis
- Discriminate Analysis

By downloading DLLs and related Excel interface, user can learn statistical tools which are not included in Excel. On the other hand teachers can change such Excel interface according to their student levels or own education schedule. Of course, any standard software on windows can call every DLLs in DLLSA system as outside DLLs. DLLSA also provides interfaces for S-plus and Statistica, and so on.

5. Conclusion

We are now looking for cooperative mechanism of researchers including overseas cases getting over the barrier of language with receiving benefit of worldwide computer network. Making common database of software, for example Java applets is one of those ideas. Our former three projects and new trial for cooperative database will have brought us and other statistician great chance of development mind and tool which will help all people in universities or business world to get into statistical data analysis. Though the grand design of broad-banded for computer network in the near future has large potential of the change in universities or other education field life, now we are still under not fair condition for network. All even computer network connection with broad-banded will bring both the big improvement and exact fair situation to all people including countryside or handicapped persons. Multimedia technology also play another important part. It will be expected that our web supported online system approach and steady, quick systematic cooperation among researchers in universities or business world and various countries will bring huge revolution to statistical education field.

Résumé

Au cours de la communication, nous nous efforcerons de vous présenter une nouvelle méthode d'utilisation informatique sur Internet qui permet aux professeurs, aux étudiants et aux utilisateurs d'acquérir les compétences nécessaires pour enseigner ou apprendre dans le domaine des statistiques, de l'économétrie et de l'analyse des données statistiques. Dans la perspective centrale, nous avons mis au point des sites pour enseignements et formations qui contiennent des documents électroniques interactifs, un système de bibliothèques équipé des fonctions de la recherche et des outils pour l'analyse des statistiques, compatibles avec Microsoft Excel. Nous proposons aussi de vous expliquer le concept et de vous donner les applications de ces sites d'Internet.

Mots clés

Manuels scolaires en ligne, média interactif pour l'enseignement, statistiques, économétrie, site d'Internet pour enseignement et formation