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NEW HORIZONS IN AGRICULTURAL INFORMATION MANAGEMENT

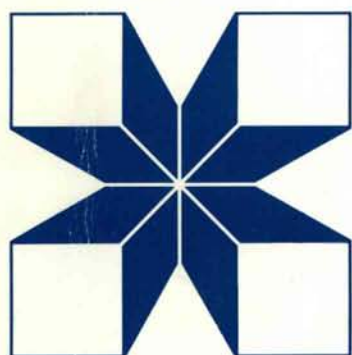
PROCEEDINGS

OF AN INTERNATIONAL SYMPOSIUM

MARCH 13-16, 1991

BEIJING, CHINA

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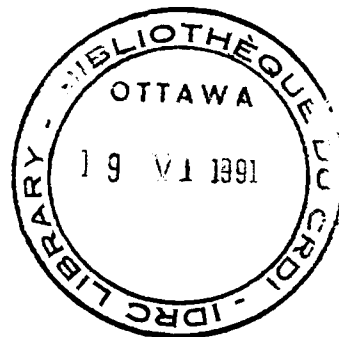
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Program for Automatic Creation of Subject Indexes by Computer

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Abstract

There are subject indexes for most of the reference books in China. But all the indexes are edited and sorted manually. The database software of CDS/ISIS for microcomputer doesn't have a computer-assisted indexing capability. We have developed software which uses nine indexing function symbols to aid in automatically creating indexes on a microcomputer. We have developed a computer-assisted indexing system which enables the index entries to be formed automatically and edits the indexes. It can control the logical relationship among descriptors and the layout of access points through indexing function symbols. Manual intervention is not needed. The work efficiency has been enhanced and the quality of publications improved by using the indexing system.

1. Subject Indexes of Chinese Agricultural Information Materials

Indexes of documentation sources in various subjects are inevitable tools for research and study. Since the 1980s, we have gradually added subject indexes to most of the Chinese reference materials. Those indexes are mainly edited, classified, arranged and printed by traditional methods. Following wide use of computer technology, the Chinese subject indexes can be edited partially by computers. Librarians choose and decide entries for the subject index, and use a computer to arrange its order by vocabulary and compose the printed form. By doing so, it has saved much labor, standardized documentation indexing rules and enhanced efficiency and quality.

There are two types of subject indexes for agricultural materials: computer-formed and pre-computer-formed subject indexes. The advantages of the former type are simple arrangement, less artificial results, and the small size of the index body. The disadvantage to the concept is its limited description of subjects. The advantages and disadvantages of the latter type are opposite of the former. This type of subject index raises higher requirements for index editors for its huge amount of indexing. However, computers may help them to automatically produce subject indexes with accurate subject concepts. There are special and distributed modes in the pre-permuted-formed type of subject indexes. We use descriptive words in which we put a hyphen between words and change the hyphen to a blank when printing.

2. Subject Index Edited by Computers

The computer assisted subject index is a combination of both humans and the computer edited subject index system. It requires the indexing librarian to use the nine tags of the system to do the indexing first, then, computer technicians will input the data into the bibliographic database of agricultural documentation. The database includes 33 fields. The subject index terms are in the subject field of the database. The system automatically erases the functional tags of indexing and sends subject terms to the field as well as to the subject index. Because of this automatic production of subject index and subject terms, it can greatly decrease the indexing librarians' work load, avoid duplication and make the subject terms and indexes more standard.

(1) Function Tags Automatically Given in Subject Index Field

The function tags include: ; ! ? @ = - \) *. These tags are inserted following each key word.

Meaning of the function tags:

1. ; (**semicolon**) The key word in front of a semicolon means that it is the auto-given guiding term of a paper of the subject index entry. In each subject index entry, the guiding word must be in the title or sub-heading of the paper. This kind of key word is called a semicolon key word.

2. ! (**exclamation mark**) The key word followed by an exclamation mark is not a guiding term, however, it can be used in rotation with a semicolon key word to form two index entries. When it is put in front of the semicolon key word, it becomes the main heading. When it is put after the semicolon key word, it becomes the secondary subject term.

Example: Prawn Breeding and Market

key words and function tags: prawn; breeding! market!

subject terms: prawn
breeding
market

subject index entry: prawn - breeding
prawn - market
breeding - prawn
market - prawn

3. ? (**Question Mark**) The key word before ? is a restrictive term which can only be used as a component part of the semicolon key word. It can not be rotated with other words and must always be put after the semicolon key word for limitation. It also can be used as a subject heading, i.e., the secondary subject. Such key words are called question mark key words.

Example: Survey of Extrinsic Agriculture in Shenzhen

key words and function tags: extrinsic agriculture; Shenzhen! survey?

subject terms: extrinsic agriculture
 Shenzhen
 survey
 subject index entry: extrinsic agriculture - Shenzhen
 Shenzhen - extrinsic agriculture
 extrinsic agriculture - survey

From the example, we can see that the question mark term "survey" may only limit the semicolon key word "extrinsic agriculture," it cannot be a component part of the exclamation mark key word "Shenzhen" and rotated with other words.

4. @ (Copyright Mark) The key word before the copyright mark should be put in front of the semicolon key word only. As a main subject heading, it can not be put after any key word or rotated. This key word is the copyright key word.

Example: Development Precautions of developing agriculture in Mountain Areas
 key word and function tags: developing agriculture; mountain areas! development
 precaution? agriculture@
 key words: developing agriculture
 mountain areas
 development precaution
 agriculture
 subject index entry: developing agriculture -mountain areas
 mountain areas - developing agriculture
 developing agriculture development precaution
 agriculture - developing agriculture

5. = (Equal Sign) The key word after the equal sign is a part or description of the key word before the equal sign. The equal sign key word can not be rotated. However, when the question mark together with the key words before and after it appear as one series, it can organize a compound semicolon key word, compound exclamation key word, compound question mark key word and compound copyright key word. It may form the triple and fourth level subject term.

Example: An Announcement of the Ministry of Agriculture on Methods of Economic
 Auditing of Village and Town Factories
 key words and function tags: Ministry of Agriculture = announcement;
 village and town factory = economy!
 audit = method?
 subject terms: Ministry of Agriculture
 announcement
 village and town factory
 economy
 audit
 method

subject index entry:

Ministry of Agriculture - announcement- village and town factory - economy
village and town factory - economy - Ministry of Agriculture - announcement
Ministry of Agriculture - announcement - audit - method

The compound key word's functions are determined by the function tag following it.

6. - **(Dash)** This tag means that the key word after it is a part or description of the key word before it. Its functions are basically the same as the equal sign key word. The difference is that the key words following dash are normally common key words used to form a subject index entry. Within subject fields, the key words following the dash may be not kept.

Example: History, Present Status and Outlook of Research in Ecological Agriculture

key words and function tags: Ecological agriculture;
agricultural history!
research - present status - outlook?

subjects: ecological agriculture
agricultural history
research

subject index entry: ecological agriculture - agricultural history
agricultural history - ecological agriculture
ecological agriculture - research - present status -
outlook

"present status" and "outlook" are common words which are not kept in the subject term field.

7. \ **(Converse Slant)** Converse slant means that the word it follows is an independent word representing the full concept of a paper. There is no need for it to be combined with other words.

Example: Cattle Rearing

key words and function tag: cattle rearing \
subject: cattle rearing
subject index entry: cattle rearing

A converse slant key word is one full meaning word which can be combined with equal sign key words and dash key words to form compound key words.

8.) **(Half Bracket)** When one paper contains multiple subject concepts, we use a half bracket as a separation mark to avoid false composition and confusion of concepts.

Example: Research of Radiative and Stable Isotope Tracer P³²: Behavior and End-result of Roundup in Soils and Mechanism as well as its influence of phosphorylase isoenzyme on rice and wheat.

key words and function tags: roundup = behavior = endresult;
 soil!) phosphorylase isoenzyme;
 rice! wheat!) P³²;
 isotope = stability = radioaction! herbicide -
 metabolism!) chemical herbicide;
 mieshengxing! weed = physiology!)*

subject terms: roundup
 behavior
 endresult
 soil
 phosphorylase isoenzyme
 rice
 wheat
 P³²
 isotope
 stability
 radioaction
 herbicide
 chemical herbicide
 mieshengxing
 weed physiology

subject index entry: roundup - behavior - endresult - soil
 soil - roundup - behavior - endresult
 phosphorylase isoenzyme - rice
 phosphorylase isoenzyme - wheat
 rice - phosphorylase isoenzyme
 wheat - phosphorylase isoenzyme
 P³² - isotope - stability - radioaction
 isotope - stability - radioaction - P³²
 P³² - herbicide - metabolism
 herbicide - metabolism - P³²
 chemical herbicide - mieshengxing
 mieshengxing - chemical herbicide
 chemical herbicide - weed - physiology
 weed - physiology - chemical herbicide

9. * (asterisk) The asterisk and the half bracket can be used in coordination. In processing papers with multiple subjects, we add the asterisk following the last separation mark (half bracket) to show the end of the multiple subjects (see example above).

(2) Technical Problems in Auto Forming an Index Entry

The bibliographic database of agricultural documentation was set up by using CDS/ISIS software which was transformed into Chinese. For dealing with problems of duplication in indexing and inputting of subject terms, we programmed to produce the subject index entry in two ways:

a) Use an advanced programming language to write a program for data file management. Input the bibliographic data for the agricultural documentation database into the file management system together with the key words and function tags corresponding to fields for auto-assigned subject terms and subject index entries, then, store each record in sequence in ISO 2709 format and through the transforming controller of ISO 2709 send the data to the main database. In this way, we may input all data into the main database in one transforming process. However, there is still a problem when technicians input data because of the lack of a full screen display for editing.

b) After inputting the data into a file in ISO 2709 format, we may use our program to send automatically-generated subject terms and indexes as well as other data fields to form a new ISO 2709 data file. Then, through the CDS/ISIS controller to transfer the data to the main database by CDS/ISIS. In this way, we need to transform the data twice. However, technicians may use the CDS/ISIS full screen editing function, which they feel is efficient and helpful. The technical problems in these two methods have been dealt with by the author of this paper. At present, we use the second method for construction of our databases. The transforming program has the capability of error testing for input grammar. If technicians should input by way of angle brackets for Chinese characters, but he/she uses ; ! ? or @ in ASCII instead, the program will flag all the record numbers which have errors for editing.

3. Record Control Numbers Given by Computers and Automatic Forming of the Chinese Subject Indexes

There are two ways to search the Chinese agricultural documentation database. One is to search by computer and the other is by printed materials such as author and subject indexes, searching concepts indexes, and subject scope tags indexes. For manual searching, there must be a record control number. Each record control number is assigned according to the classification sequence of the documentation. As data for the Chinese agricultural documentation database is accumulated by the National AGRIS Center and the seven subcenters, the automatic assignment of record numbers makes it easier to form the subject, author, and subject concepts indexes as well as the scope tags indexes.

4. System Evaluation

The Chinese agricultural documentation database now contains over 30,000 records which have automatically formed subject index entries. After many tests, the computer edited subject indexes seem reasonable and standardized. The average indexing depth is 4.05. This technique has been introduced at all seven regional subcenters and they feel that this technique is helpful in promoting indexing efficiency and quality.

The characteristics of the system are as follows:

1. The system takes advantages of CDS/ISIS software and uses the program to create subject terms and indexes to make up for shortcomings of CDS/ISIS.

2. The system uses nine function tags which are easy to use. It includes all types of subjects and forms reasonable and standardized subject indexes and subject terms. Also, it will not influence data in other fields.
3. The record control number assigned by computer can save labor and time as well as ensure record quality.
4. At present, the key words and function tags of the system are still assigned by librarians. On the basis of the present system, if we continue to develop it and try to have the function tags be combined with a key words automatic distribution system, it could be very helpful to have automatic indexing and editing of subject terms and indexes within the indexing process.

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