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Automatic Production of Indexes from Schedules. The Case of Universal Decimal Classification*

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The automatic preparation of indexes from schedules causes a reduction in the total cost of a UDC edition by minimizing the keyboard operation, provided that the printing is made through computer input. The author discusses how the schedule text could be subjected to certain modifications (conforming to the TOCS principle) to facilitate the transformation of schedule entries into an index entry. In Part A the shortcomings of existing text with a view to computer processing is discussed and measures are proposed. In Part B, taking into consideration such measures, a system of processing is proposed to implement the schedule-index inversion. The Appendix gives a brief description of the concept of TOCS (term-oriented classification system) and of a few cases where it has been implemented. (Author)

One of the practically important problems in index languages is that the compilation and printing takes more time for thesauri and classification schedules. In the case of classification schedules, schedules and indexes are prepared consecutively, with the stages of schedule and index production sometimes being shifted, which may cause considerable inconvenience to users. Now the printing is closely related with computer processing if photosetting is used in printing. For the photosetting of a schedule the production of a magnetic tape file containing all that is going to be printed is essential and it is also costly. However, once such a tape is made and if the production of the index from the schedule tape can be accomplished, the index production dispenses with the costly input activity, thus permitting a great reduction in cost and a prompt production. In other words, if the production of the schedule and the index is made in a set with a single input activity, total time and cost will be appreciably reduced. Originally, the author had the production of the Japanese edition of the UDC in mind, here, however, only the case adapted for Western language editions, especially the English edition, is discussed.

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The idea in this kind of processing is mostly derived from the author's experience in the term-oriented classification system (TOCS) a short description of which is given in the Appendix.

A. Considerations in schedule-index relation

1. Structure of a schedule

A schedule is composed of classification numbers (or more generally, codes) and corresponding texts. The text of an entry is composed of a "definition phrase" and of "terms showing examples." In cases where the definition phrase is an exact term, examples can be omitted.

In some of the existing UDC schedules, this principle of distinguishing the definition phrase from the examples has been adopted, e.g. the English Abridged Edition uses a colon and the Japanese Medium Edition a semi-colon. In other cases the boundary is shown by an "i.e." or an "e.g."

Example 1.1 Case of the Abridged English Edition, 1961

642.14	Midday meal: lunch (or dinner)
642.16	Evening meal: dinner (or high tea)
642.17	Late evening meal: supper

Obviously this is better than to structure the schedule as

642.14	Lunch
642.16	Dinner (or high tea)
642.17	Supper

because the definitions of the terms, 'dinner', 'supper' etc. are not clear internationally and differ appreciably from one country or region to another[1].

Example 1.2 Case of the Abridged English Edition, 1961

621.315.617.5	Silicon containing compounds, e.g. sodium silicate, silicone (as liquid insulating material)

Example 1.3 Case of the Abridged English Edition, 1961

621.224.7	Reversible turbine, i.e. turbines which may be used also as pumps

2. Scattered definition

In many schedule entries of UDC, the definition phrase is divided and scattered into two or more entries. The scattering mostly takes place between an entry in question and its broader or parent entry whose UDC number is shorter by one direct digit. In some cases, however, the user must look for several distant entries to understand the real meaning of a schedule entry.

For instance, to understand the entry

351.811	Roads, Bridges

1 See, for instance, the same entries in the German Edition. The term associated with 642.14 is diner and that for 642.16 is dinner.

one must trace back by three steps up to

351 Governmental legislation. Public Services. Control. Regulations

This gives us difficulty, especially when planning an automatic index production system. The first measure to cope with this difficulty consists not only in inverting the classification number and text in a schedule but also in adding the broader concept (parent entry) to the index entry in question.

In the example given above, the schedule entry

351.811 Roads, Bridges (1s)

gives automatically by inversion

Roads, Bridges 351.811 (1i)

or by separating the text

Roads 351.811 (1-1i)

and

Bridges 351.811 (1-2i)

However, 351.811 does not indicate "Roads and Bridges" themselves. To prevent misunderstanding, parent entry 351.81 should be added to entries (1i), (1-1i) and 1-2i), thus to give, e.g.

Roads, Bridges 351.811
BC 351.81 Communications, Traffic, Transport (2i)

where BC stands for "broader concept", corresponding to BT in a thesaurus. As this gives still misunderstanding, further repetition of the same process is necessary until we get

351 Government legislation. Public Services. Control. Regulations (3s)

If this broader concept is satisfactory for use with 351.811, a synthesis or combination of the entry (1i), (1-1i) or 1-2i) with (3s) gives an index entry

Roads, Bridges 351.811
BC 351 Government legislation. Public services. Control Regulations (2-1i)

This kind of transfer and addition of an entry can easily be done by a man-machine editing process if a display equipment with keyboard is available.

The method given above is useful, but the index text obtained is far from satisfactory and a further improvement is necessary.

The next useful method of improvement is to provide entry 351 with supplementary phrases (SP's) following the definition phrase, at least in a master tape, if not in the schedule tape.

The example for entry 351 is

351 Governmental legislation. Public services. Control. Regulations
SP1 Government's action on, SP2 Government's policy for, SP3 Government's measure for, SP4 Laws and regulations (3-1s)

If now, in the course of combining (1i), (1-1i) or (1-2i) with (3-1s), both entries are shown on a display unit and the choice of an adequate SP (by assigning the number of SP) can be made through a lightpen or by a keyboard, a result is obtained giving a better combination form

(government's action on) Roads and bridges 351.811 (4i)

or

Roads (Government's action on) 351.811 (4-1i)

or

Bridges (Laws and regulations) 351.811 (4-2i)

By repeating this process, further improvements can be made. Hwoever, it must be remembered that the creation and insertion of SP's are necessary for each of the principal entries before an automatic inversion is made (for instance for a master tape).

3. More exact expression of example terms

In some cases the expression of example terms can not be handled independently from the preceding definition phrase. For instance, the existing texts for 621.039.8 and its subdivisions 621.039.83/.84 are

621.039.8 Isotope application and uses
621.039.83 For radiation effects on matter: therapy, food sterilization, polymerization, etc. (5s)
621.039.84 For effects of matter on radiation, e.g. non-destructive testing, thickness gauging

The definition phrases 621.039.83 and 621.039.84 are incomplete, since exact definitions can only be obtained by combining the text of 621.039.8. Even if this combination is done by the method given above, there still is the difficulty of incomplete expression of example terms.

The example terms are chosen in the light of the definition phrase. For instance, in 621.039,83, the example term "therapy" is chosen to mean "therapy by isotope irradiation," and in 621.039.84 "non-destructive-testing" for the concept "non-destructive testing based on the absorption of radiation by matter." In every case the example term is less specific because schedule users are assumed to be able to refer to the definition phrase easily.

For automatic index production, the measure to solve this difficulty are:

(i) to change the wording completely
— — this can be done but requires a great many manhours for the entire schedule,

(ii) to extract a certain word from the definition phrase and add it (them) to the existing example terms, e.g.,
a) Therapy → Therapy isotope irradiation,
b) Food sterilization → Food sterilization isotope irradiation
c) Polymerization $\xrightarrow{\text{change of wording}}$ Radiation polymerization → Radiation polymerization (Isotope)[2].

The word "Isotope" in c) is borrowed from the SP in 621.039.8 which is not yet shown in (5s), while the term "isotope irradiation" is from the definition phrase of 621.039.83. To facilitate the borrowing, it is advisable to make clear the borrowable part in the definition phrase by enclosing it by brackets (at least in the master tape). This means, if a term in a text is long and there is a possibility of frequently separating a part of term (transferable sub-term), it is better to facilitate the transfer process by assigning an adequate code (i.e. brackets in this case).

With this consideration in mind, the schedule text in the master tape should be as follows:

621.039.8 Isotope application and uses.
SP1 Isotope application,
SP2 Isotope.

621.039.83 Application of the effects of [isotope irradiation] on matter; Therapy, Food sterilization, Radiation polymerization. (5-1s)

621.039.84 Application of the effects of matter on [isotope radiation]; Non-destructive testing, Thickness gauging

This text permits the production of the following index entries after inversion, transfer of bracketed part and combination

Therapy [isotope irradiation] 621.039.83 (5-1i)
Food sterilization [isotope irradiation] 621.039.83 (5-2i)
Radiation polymerization (isotope) 621.039.83 (5-3i)
Non-destructive testing [isotope] radiation 621.039.84 (5-4i)
Thickness gauging [isotope radiation] 621.039.84 (5-5i)

4. Enumeration of examples

An entry in a schedule can be expressed in many different ways even if the concept is clear. Then the schedule text (at least in the master tape) should contain as many expressions as possible, insofar as these expressions are practically important.

Example 4.1:

The entry

678.743 Halide polymerizates (6s)
BC Monolenic polymerizates

is chemically clear and correct. However, most schedule users will need a longer text such as

678.743 Halide polymerizates. PVF. PVC (6-1s)

German Medium Ed., 1967

or

678.743 Halide playmerizates (vinyl, vinylidene, allyl): PVF, PVC, etc. Tetrahalo-olefine, polymers (6-2s)

English Abridged E., 1961

The desired index must contain all of the following entries:

Halide polymerizates	678.743	
Polyvinyl halides	678.743	
Polyvinylidene halides	678.743	
Polyvinyl chlorides	678.743	
Polyvinyl fluorides	678.743	(6i)
PVC	678.743	
PVF	678.743	
Tetra-olefine polymers	678.743	
Teflon	678.743	
Polyallyl halides	678.743	

Then the text in the master tape must be

678.743 Halide polymerizates;
BC 678.74 Monolenic polymerizates. Polyvinyl halides, Polyvinylidene halides, Polyvinyl chlorides, PVC, Polyvinyl fluorides, PVF, Tetrahalo-olefine polymers, Teflon, Polyallyl halides (6-3s)

For a non-specialist in chemistry, the enumeration of important names is much more useful than an exact definition phrase.

In certain UDC schedule entries, no adequate single term is given for the entry because the concept in problem is that of an ad hoc logical sum of elementary concepts being required for the construction of a decimal hierarchical structure.

Example 4.2:

In the entry

38 commerce. Trade. Communication (7s)

commerce and trade are almost synonyms but communication has no direct relation with "commerce or trade." These two elements are simply grouped in a class by an arbitrary choice of the classificationist who prepared the schedule. The fact is that 380/382 is assigned for commerce or trade, 383/388 is for communication and finally 389 is for metrology. Rigorously speaking class 38 should be expressed as "Commerce. Trade. Communication. Metrology." No single term can be found for the entire class 38, which should be expressed logically as

2 The change of wording in c) is made in view of the well established term "radiation polymerization."

(Commerce or Trade) + Communication + Metrology, where the plus (+) code means the logical sum, as in the case of UDC.

One important remark is that the schedule entry 38 need not be inverted, since if the following entries

Commerce	380/382
Trade	380/382
Communication	383/388
Metrology	389

appear in the index, there is no necessity to have the entry

Commerce, Trade, Communication 38 (7i)

5. Introduction of new terms

If a term corresponds to a UDC number or a compound UDC number and if this term is not mentioned in the schedule, it is important to add this term in the master tape in the nearest update occasion.

Example 5.1

The term "Disguised unemployment" is not found in UDC schedules and if it is felt necessary to add this to the UDC schedule as a subconcept to 331.6.063, some measures must be taken. In this case the existing text

331.6 Unemployment. Shortage of labour, etc. (8s)

331.6.063 Types and causes
English Abridged Ed., 1961

will be changed, in the master tape to

331.6 Unemployment, Shortage of labour-
SPl Unemployment
. .
. . (8-1s)
. .

331.9.063 Types and causes (Unemployment); incld Disguised unemployment.

Thus an index entry can be produced as given below:

Disguised unemployment 331.6.063 (8-1i)

besides

Types and causes (Unemployment) (8-2i)
331.6.063

Example 5.2

If it is agreed to express "holography" as 535.42:535.317 (this is not given in any existing UDC editions and is just a proposal), then the existing schedule

535.42 Diffraction
535.421 Diffraction of plane wave. Diffraction grating. Normal spectrum (9s)

can be changed into

535.42 Diffraction of light.
subdiv (9-1s)
535.42:535.317 Holography, Holograms.
535.421 Diffraction of plane wave, Diffraction grating, Normal spectrum.

This change will permit the production of the index entries

Holograms (Light)	535.42:535.317
Holography (Light	535.42:535.317

(9i)

Here, the term "Light" comes from an SP in 535, which is not shown here.

B. Outline of processing

6. General flow

In the case of machine handling of a UDC system, schedule and index entries are stored, of course, in schedule and index tapes respectively. As was already suggested, these two tapes are not enough to satisfactorily prepare a schedule or an index.

The simple inversion of the UDC number and the text of an entry can be done easily without human intervention. However, if an addition of word(s) not given in the schedule text is required for index preparation, this addition can only be made through a combined display-keyboard unit which works only at a low speed. Now a large amount of keyboard operations is contradictory to the original idea of automatic index production. Accordingly, a third tape, named master tape, can be advantageously used as a source of many supplementary words, terms and functional codes as well as complete schedule text.

Even if a keyboard is used in refining index text or in deleting superfluous words from the schedule text to be printed, the manipulation of the keyboard can be minimized by transferring, by a simple command, a part of the contents of the master tape to the index or schedule tape. The relation of the master tape to the schedule and index tapes is two-fold. See the general flowchart in Fig. 1.

The Master-to-Schedule transformation includes the omission of superfluous words and/or terms and functional codes contained in the master tape but not necessary in the printed-out schedule, while the Master-to-Index transformation consists in the inversion and refining processes necessary for index production.

7. Expression of texts in the Master tape

To perform efficient processing, the following changes in expression are required for the contents of the Master tape.

1. The definition phrase should be separated from the example(s) by a semi-colon, as colons are used for the coding of logical products in UDC numbers.

Example 7.1

UDC No. N Def. phrase; Expl. Term 1,
Expl. Term 2.

2. In the Master tape, whenever necessary, supplementary phrase(s) should be added. See for examples in (3-1s), (5-1s) and (8-1s).

Example 7.2

UDC No. N Def. phrase; Expl. Term 1, Expl. Term 2,

SP1 Term 3, SP2 Term 4.

3. The mentioning of examples including those with colon combination expressed by concise and practical terms is encouraged even if it seems awkward from a conventional point of view. See 4 and (6-3s).

4. Colon combinations of UDC numbers should be mentioned if the combination correspond to concise and practical terms. These combiations (e.g. UDC No. N: UDC No. N′) should appear in the schedule, as N: N′ at entry N and as N′ : N at entry N′. In an entry, colon combinations appear after the mentioning of example terms.

Example 7.3

UDC No. N Def. phrase; Expl. Term 1, Expl. Term 2,

Expl. Term 3.

Subdiv.

UDC No. N : UDC No. N′ Term 4,

UDC No. N : UDC No. N′ Term 5.

5. A text should end with a period (.), while each term in the text should be separated from other terms by a comma (,). It follows, then, that the first example term is preceded by a semi-colon and followed by a comma or a period.

6. Words enclosed by brackets can be included in a term. See example in (5-1s).

7. Other existing coding problems of a minor nature such as assignment of codes for UDC numbers and text, end-of-message codes etc. can easily be handled by software people.

To illustrate the items above, a part of the Master tape is produced for class 331.6 in Fig. 2.

8. **Master-to-Index Transformation**

This transformation contains inversion and refining processes.

a. Inversion process

The inversion is made for every term in a schedule entry. A typical case is shown below.

The schedule entry

UDC No. N Term 1 ; Term 2 , Term 3 .

Subdiv

UDC No. N : UDC No. N′ Term 4 .

is inverted into the following entries.

Term 1 UDC No. N ,

Term 2 UDC No. N ,

Term 3 UDC No. N ,

Term 4 UDC No. N : UDC No. N′.

After inversion, sorting and merging are performed.

b. Refining Process

The Refining Process contains one or more of the following actions whode adoption is decided upon by the editor-operator sitting before the display-keyboard unit for the index production.

ba. The addition of a parent or broader concept (BC) to the index text of a child concept.

bb. The addition of supplementary phrases (SP) of a parent concept to the text of a child concept,

bc. Transfer of bracketed word(s) in the definition phrase of an entry to the example terms of the same entry.

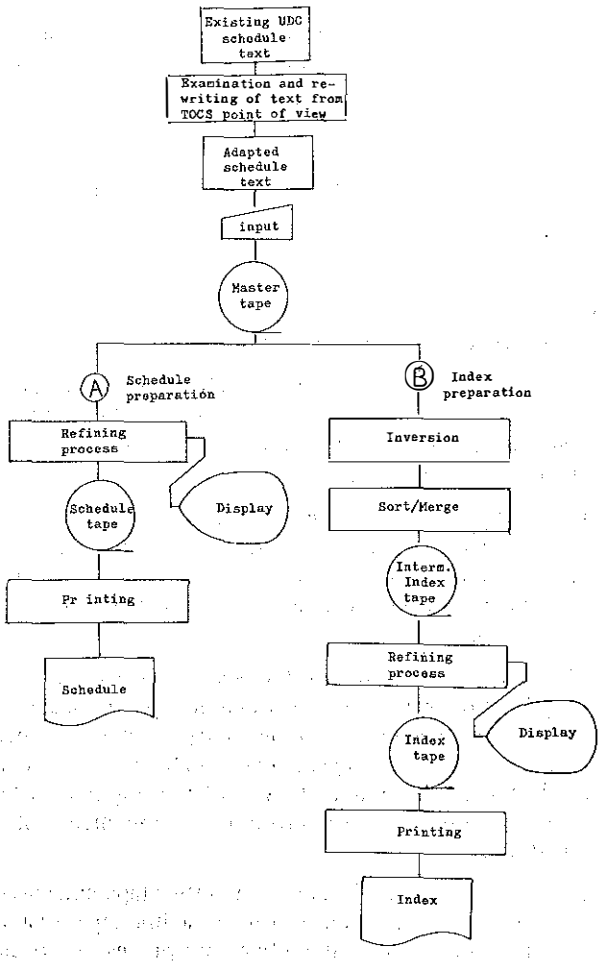

Figure 1

331.6	Labour market; Employment, Unemployment, Shortage of labour. SP1 Unemployment, SP2 Labour shortage, SP3 Employment. cf 331.96 Employment application, 368.44 Unemployment insurance.
331.6.06	Generalities on employment.
331.6.061	Structure, development and grade of employment; Full employment, Under-employment, Occupational structure, Labour supply. subdiv
331.6.061:338.92	Interindustry shift,
331.6.061:338.924	Employment development due to industrialization.
331.6.062	Degree of unemployment; Partial unemployment, Temporary unemployment, Layoff.
331.6.063	Types of unemployment. incld Structural unemployment, Disguised unemployment. subdiv
331.6.063-053.88	Unemployment of aged workers.
331.6.063-055.2	Unemployment of female workers.
331.6.063-057.113	Unemployment of temporary workers.
331.6.063.1	Incapacity to earn.
331.6.063.2	Unemployment due to mechanization and technological development; Technological unemployment.
331.6.063.3	Unemployment due to economic depression. cf 338.97 Economic fluctuations.
331.6.063.5	Seasonal unemployment cf -052.421 Seasonal workers. subdiv
331.6.063.5:631	Seasonal unemployment in agriculture.
.	
.	
.	
331.61	Measures for preventing and alleviating unemployment; Workhouses, Working hour limitation, Ovennanning, Featherbedding.
331.62	Immigrant labourers; Competition from immigrant labourers, Protection of home labour.

Figure 2
An Example of the Contents of the Master Tape

9. Master-to-schedule Transformation

This transformation does not include inversion but only refinement. A term in the Master tape should be independent of other terms; thus the expression should include some duplication.

In contrast, schedule entries appearing on a page are closely related to each other and can therefore form an "associated expression." Scattered definitions referred to in previous sections are an example of such an associated expression.

This means that the text of the Master tape should be simplified to give that of the schedule tape. Also, some of the functional codes are not necessary in schedule tape. Sometimes two or more examples can be merged into a single example by adding the word "and (logically OR)." This omission and addition form the "refinement" of schedule text.

(8-1s) shows a part of a supposed Master tape and (8-1i) the corresponding contents of the schedule tape. Example 9.1 shows the result of the refinement process performed in the same way.

Example 9.1

Contents of the Master tape

621.039.8	Isotope application and uses. SP1 Isotope application, SP2 Isotope.	
621.039.83	Application of the effects of [isotope irradiation] on matter; Therapy, Food sterilization, Radiation polymerization.	(5-1s) (bis)
621.039.84	Application of the effects of matter on [isotope radiation]; Non-destructive testing, Thickness gauging.	

Contents of the schedule tape

621.039.8	Isotope application and uses.	
.83	Effects of irradiation on matter; Therapy, Food sterilization, Radiation polymerization.	(10s)
.84	Effects of matter on radiation; Nondestructive testing, Thickness gauging.	

These examples show the omission of SP's, words (see e.g., the cases of 331.6.063.2, 331.6.063.3, etc.), and parts of UDC numbers (such as the first six digits in 621.039.83 and 621.039.84), as well as the simplification of wording. These omissions are made on the display-keyboard unit.

10. Updating process

Since the text for updating the UDC is given by the "Extensions and Corrections in UDC," this material is sent regularly to the Master tape to update the contents thereof by a customary technique. Then the updated entries in the Master tape are subjected to a transformation process, upon which the final updating of the schedule and index tapes takes place.

11. Conclusion

As shown above, the problem of the automatic inversion of schedule into index requires certain modifications in the expression of both schedule and index. Various basic techniques are devised to keep texts as near as possible to existing editions. If a fair change in the expression is permitted, the man-hours required in transformation will be reduced appreciably. This change means the complete adoption of the TOCS principle decribed briefly in the Appendix.

The Japan Documentation Society, the publishing body of the Japanese Editions of UDC, is now planning to study and develop a practical solution for the prompt editing and printing of UDC schedule and index in Japanese expressed by Chinese and Kana (phonetic) characters through photosetting. The considerations required for the start of this activity are adapted to the case of English (or other Western) language editions of UDC to show the basic elements involved. Obviously the Society and the present author are not responsible for the compilation of English Editions of UDC. The contents of this paper should be regarded as a proposal for the basic elements of a solution of automatic index production problems.

Appendix

1. What is TOCS?

TOCS does not mean a specific classification system but just a principle to decribe a facetted classification based on the use of practical terms.

The priniple contains the following characteristics:

1) It aims at an easy detection of schedule entries from practical terms by improving alphabetical index of a classification system.
2) It aims also at the possibility of automatic production of alphabetical indexes from schedules.
3) It permits an easy generic search by automatic means adopting the hierarchical structure of a classification system.
4) It expects, in information retrieval, an examination of the machine output by the human eye and brain through the checking of either printed-out products or displayed output. In either case, the use of "modifier terms" accompanying the classification numbers is found useful.

The schedule entries are arrived at by separating the definition phrase (sometimes rather long) from example terms. The mentioning of coordinated classification numbers as examples in the schedule is also encouraged in the case of well-established concepts expressed in simple terms.

These features of the schedule facilitate the preparation of an index by simple inversion plus some rather simple auxiliary means (such as mentioned in this paper for UDC).

The application of this principle may make users feel that the expression of schedule is too tedious and redundant. This disadvantage is offset by the advantage of having an extensive index which includes most of the practical terms produced automatically from the schedule. In preparing the index, if a term corresponds to two or more classification numbers (or schedule entries), then the text should be changed, generally by adding some further words and making the entries more specific and distinguishable.

2. The implementation of TOCS

This principle has been applied by the present author in several specialized classification systems in Japan. The first one is the adaptation of the general UDC system to a special library on nuclear engineering, and the next one is the Classification for Agricultural Science and Technology, CAST, within the RECRAS system for the retrieval of current research items in agricultural sciences. This system with its classification schedule has passed through its first-phase development stage and is now in use for internal purposes in the Ministry of Agriculture, Japan.

The third one is the Classification of Management and Economy Literature to be used in a document retrieval system still in development. In this latter case, the direct inversion of schedule text into index has been intended from the very beginning.

Unfortunately all these schedules are for Japanese users and have therefore been produced in Japanese only. The CAST is, however to be translated into English in coming years.

As an example of the implementation, a part of CAST is reproduced in Fig. 3. In this scheme, the separation of the definition phrase from example terms is not explicitly made by punctuation codes. For better understanding by the reader, schedule entry 3312 has been translated into English as follows:

3312 Sound nuisance and its prevention ((↔ 63)) Undesired sound and its prevention, Noise, Noise prevention, Noise prevention regulation (:3611)

In this example, 3312 is a classification number. In its text, the part preceding the "see also" reference to class 63 (Energy processing), shown by ↔ 63, is the definition phrase, while the part following the reference consists of example terms. This text contains the term "Noise pre-

vention regulations" of which the classification number is 3312: 3611, where colon means logical product and the number 3611 stands for "laws and regulations."

The alphabetical index (see lower of Fig. 3) contains *all* terms appearing in the schedule including those represented by coordinated numbers (mostly two numbers, but sometimes three or four). Though the index is produced manually in this case, the operations described in this paper for UDC are performed during index preparation.

Modifier terms used in RECRAS are free terms and are not used in machine retrieval operations, the output of which gives hit document numbers and modifier terms associated with them. These terms are found useful the last visual examination in deleting noise documents.

3300～3322

33 公害《原因が人為的なもの》とその防止，自然災害とその防止

330 公害《原因が人為的なもの》とその防止，自然災害とその防止《一般》

3300 公害《原因が人為的なもの》とその防止，自然災害とその防止《一般》

331 公害とその防止《原因が人為的なもの》

3310 公害とその防止《一般》
公害問題，環境汚染

3311 熱的公害とその防止《↦615, 63》

3312 音響公害とその防止《↦63》
雑音とその防止，騒音，騒音防止，騒音防止法（：3611）

3313 地形変化による公害とその防止《↦3324》
地盤沈下，地下水汲上げによる地盤沈下，土地の陥没

3314 大気汚染による公害とその防止《↦農薬残留，食品公害，食器による害（：3215），食品添加物による害（：4494）

3318 ゴミによる公害とその防止《↦56》
固体廃棄物，ゴミの焼却(：5422：5630)，ゴミの収集（：5620）

3319 その他
二次公害，医療公害（：2030），建築物による地域風害（：8561：4755），振動公害（：4314），電波公害（：4365），薬品公害（：2511），衣料公害（：3221），水産公害（：3811），PCB汚染（：4458），放射能汚染（：4383）

コウアレーコウケイ

	抗アレルギー剤	2244：2521
	紅安鉱	4525
コウウ	豪雨	4767
	抗ウイルス剤	2211：2526
	耕耘（農林業）	1641
	（水産）	1875
	耕耘機（農林）	1621
	耕耘用機器	1621
コウエ	公園	1617
コウオ	高温	0833
	恒温恒湿槽	4399：8534
	高温設定および保持の技術	4392
	恒温槽	4391：8534
	甲殻類	1416
コウカヒ	硬化病	1880
	交換（情報処理）（一般）	7350
	睾丸	2153
	交換機（ソフト）	7350
	（ハード）	7350：8537
	交換方式（情報処理）	7350
コウキ	後期	0742
	耕起	1641
	高気圧	4724
	公企業	3521
	高級な精神現象	2020
	鉱業	3812

Fig. 3
Schedule and Index of CAST