

## Fieldworker and Computer : An End User's View of Computer Ethnology

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## Fieldworker and Computer: An End User's View of Computer Ethnology

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### INTRODUCTION

As a fieldworker in African oral literature, I have been interested in the application of computer in my research. I am a so-called *end user*. Although I lack knowledge of computer mechanisms and programming, I can still benefit from modern technology, thanks to the National Museum of Ethnology's *joint research* system between the computer specialists and myself.<sup>1)</sup> For several years, I have been accumulating texts and dictionary information of the Fulfulde language of West Africa, in cooperation with Prof. S. Sugita. Through this process I have thought about the possibility of *computer ethnology* and coexistence with modern tools. I feel a need to recognize the concepts of researchers in order to make full use of computer. In this paper I would like to show what I feel about *machines* and *men*, and suggest the possibility of new research methods.

### OBSERVATIONS ON MARGINAL PROBLEMS

#### Printing Out

There are a number of terminals which are connected to the main computer system in the museum. This means the main system is accessible from almost everywhere, a very satisfactory situation. The type and use of these terminals, however, is not completely satisfactory. Of course each terminal is furnished with a printer, but the quality of print-out is not very good. High quality printing out must be directed to the laser beam printers located on the third floor.<sup>2)</sup>

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1) The National Museum of Ethnology is a joint research facility primarily for anthropologists and ethnologists in the national universities. Each researcher in the museum has a budget to organize a joint research unit to invite researchers necessary for his joint research. The museum encourages all kinds of joint research. In the research section there are four region-oriented research departments: Asian, Oceanian, American, African and European, and a cross-cultural department comprising music, art, linguistics and *computer ethnology*. Each researcher belongs to one of these departments. Many researchers are carrying out joint research with cross-cultural specialists.

2) The third floor of the museum is a place to store and process all kinds of information in the form of books, records, films, magnetic tapes, etc. The main system and accompanying machines, including high speed laser beam printers, are kept on this floor.

Masks and Social Organization among the Bakwele People of Western Equatorial Africa, Siroto, Leon.

Krisen und Konflikt im Tschad, Soulas de Russel, Dominique.

Figure 1. An Example Typewritten by Ordinary Typewriter

These laser beam printers in the computer room can print out a large amount of documents. They are quite satisfactory for printing out ordinary alphabets and some simple Chinese characters, but they cannot print out other scripts of the world. A researcher has to design the font patterns of new letters each time they are needed.<sup>3)</sup> They cannot print out all titles of books in the original language.<sup>4)</sup> We must make further efforts to provide common non-alphabet characters, such as Tibetan, Arabic, Hebrew, etc., and uncommon but frequently used International Phonetic Symbols, or International African Institute Alphabets.

Due to historical reasons, most terminals at present are designed for only major West European languages and, here, Japanese.

### Aesthetically Beautiful Letters and Characters

There is a great conceptual difference between computer specialists and non-specialist ethnologists concerning the value of letters. Letters are not only tools which convey information, but also objects of aesthetic beauty. It is a pity that few printers can print out letters as attractive as those produced by an ordinary typewriter. (See Fig. 1) Some printing machines can print out excellent letters, but cannot be used as a printer of the main system. The frustration on our side comes mainly from our misunderstanding of the capacity of each machine. But still I believe this is a human problem. The technicians and computer specialists ought to provide more possibilities.

### Wasting Paper

From the standpoint of an ordinary consumer, it appears that a great deal of paper is wasted for printing out. The very fast printing machines connected to the big computer are adapted to large size paper, a situation which sometimes leads to waste of paper. Should the concept of economy be forgotten in this field? I do not think so. It is a problem of ethics and aesthetics as well. Buying cheap pulp from the third world causes the destruction of beautiful rain forests in Southeast Asia. I cannot stand this as a fieldworker.

3) Prof. S. Sugita and several Thai specialists have experience in printing out a huge amount of Thai texts by creating fonts of Thai alphabets.

4) There are 123 kinds of languages according to the Library of Congress classification. The museum can print out languages written in Roman, Greek, and Cyril alphabets, Japanese syllabics, and traditional Chinese characters. At present the simplified Chinese characters, *jiǎn tǐ zǐ*, cannot be printed. Other scripts may be printed in transcribed forms.

TEXT PROCESSING AND DICTIONARY MAKING

Computer for Text Processing

As a specialist in the oral literature of the Fulfulde-speaking people in West Africa, I have been dealing with text information. I input the text into the computer, then correct it. I prepare the ordinary and reversed KWIC's (Key Word

Table showing KWIC (Key Word In Context) for Togolese Fulfulde. It consists of three columns of text with corresponding line numbers on the left. The text includes various words and phrases in Fulfulde, such as 'jollooru', 'saambo', 'janni', 'yaji', etc.

Figure 2. An Example of KWIC of Togolese Fulfulde

Table showing Reversed KWIC (Key Word In Context) for Togolese Fulfulde. It consists of three columns of text with corresponding line numbers on the left. The text is a reverse-ordered version of the text in Figure 2, used for dictionary creation.

Figure 3. An Example of Reversed KWIC of Togolese Fulfulde

In Context), and the frequency list of words. In the reversed KWIC, sorting of key words in alphabetical order is performed by scanning their letters from tail to head, as shown in Fig. 3, whereas in the ordinary KWIC from head to tail as shown in Fig. 2.

Sometimes I input the dictionary of words. I have tried to make both linguistic and ethnographic dictionaries. In every case the computer was a great help.

I used both KWIC's before establishing the right texts. I have not established a mechanical checking procedure for unexpected and ungrammatical forms. I check the irregular forms by using these KWIC's. In Fulfulde, word formation is done by means of suffixation. So the reversed KWIC can serve for checking the irregular grammatical forms, namely, the wrong suffixes.

In case of the texts of a newly described dialect of the same language, one may easily extract the list of all the suffixes. Thus it enables the establishment of the grammar.

12	<i>palar</i>	18	<i>maaki</i>	28	<i>njamndi</i>
13	<i>huri</i>	18	<i>mbonnga</i>	28	<i>rimi</i>
13	<i>henndu</i>	18	<i>ngada</i>	29	<i>hadi</i>
13	<i>maygari</i>	18	<i>rusngum</i>	29	<i>mbi'i</i>
13	<i>mbabattu</i>	18	<i>tokka</i>	31	<i>wi'i</i>
13	<i>mbi'-moo-mi</i>	18	<i>wuro</i>	31	<i>worbe</i>
13	<i>moo-mi</i>	19	<i>alaji</i>	33	<i>dume</i>
13	<i>njidda</i>	19	<i>arngaawo</i>	33	<i>yaaya</i>
13	<i>nyaama</i>	19	<i>bilaa</i>	35	<i>maa</i>
13	<i>tanni</i>	19	<i>ngam</i>	36	<i>ndi</i>
13	<i>yoo</i>	19	<i>ta</i>	37	<i>dow</i>
14	<i>ma</i>	20	<i>hoolaare</i>	38	<i>ngool</i>
14	<i>ndanyi</i>	20	<i>subaabe</i>	40	<i>bello</i>
14	<i>ndu</i>	20	<i>waawi</i>	41	<i>bee</i>
14	<i>paapaarambe</i>	21	<i>beldi</i>	41	<i>duuniya</i>
14	<i>rufa</i>	21	<i>bi'do</i>	43	<i>wadi</i>
14	<i>sey</i>	21	<i>habaruuji</i>	44	<i>ndee</i>
14	<i>woodaa</i>	21	<i>oon</i>	44	<i>woni</i>
15	<i>ba</i>	21	<i>sembe</i>	46	<i>nder</i>
15	<i>cakki</i>	21	<i>yaabi</i>	47	<i>dum</i>
15	<i>haala</i>	21	<i>yottine</i>	48	<i>cakaawa</i>
15	<i>ittaay</i>	22	<i>haadi</i>	48	<i>gala</i>
15	<i>koo</i>	22	<i>kooli</i>	49	<i>biyye</i>
15	<i>maaroori</i>	22	<i>kusulu</i>	49	<i>nyaamo</i>
15	<i>maayo</i>	22	<i>laamiido</i>	52	<i>nano</i>
15	<i>mbi'-mi</i>	22	<i>njoobaari</i>	53	<i>belngol</i>
16	<i>gooro</i>	22	<i>yerima</i>	53	<i>biriji</i>
16	<i>hakkunde</i>	23	<i>dumo</i>	53	<i>kam</i>
16	<i>hamman</i>	23	<i>hiraande</i>	55	<i>wi'ete</i>
16	<i>maagani</i>	23	<i>jaabe</i>	56	<i>duudndi</i>
16	<i>nagge</i>	23	<i>kasala</i>	56	<i>woodi</i>

Figure 4. An Example of Frequency List

The frequency list serves for teaching of the language in the daily situation. The frequency list, as shown in Fig. 4, produced from the ordinary texts such as folktales, daily conversation and so forth, suggests the order of importance in the daily situation. I selected about fifty words according to their frequency, and used them in the classroom. In this way the students were able to learn a natural language in the daily situation.

### **The Techniques of Intellectual Creativity<sup>5)</sup>**

It is generally believed that a computer can treat a large amount of texts. It accepts them, but it is human beings who input the data. When one feeds a large amount of texts into a computer, one is obliged to check them to obtain correct texts. Those texts which have already undergone many corrections before being inputted should be fed in with an optical character reader.<sup>6)</sup> In so doing we may be able to avoid wasting time for correction.<sup>7)</sup>

In the same manner, manuscripts prepared with computer or word-processor ought to be sent to the printing machine in the form of diskette or magnetic tape.<sup>8)</sup> This will reduce printing time and cost, and guarantee the correct printing. In Japan this system has not yet been widely adopted. The administration still works with the printer in the traditional way. It seems that it will take a long time before the above-mentioned method becomes popular. This is a problem of human concept on the utilization of computer.

### **Ordinary KWIC and Dictionary Making**

Since the stems and roots of words are followed by suffixes, ordinary KWIC can be used to find out the right head words. The reason why we use KWIC very frequently is that the meaning of each word should be defined only in context. Whenever new texts are prepared, their KWIC is produced. Then I choose the right head words to be included in the main dictionary corpus.

Right now we are thinking of listing the words which are already found in the main corpus. The words which are grammatical rather than lexical should also be listed and eliminated from the KWIC. We would like to use a KWIC which has undergone such filtering.

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5) This is the direct translation of a best seller book with the same title [UMESAO 1969], in which Dr. T. Umesao teaches the method to express one's creative idea in the simplest and most effective way.

6) According to Dr. M. McIntosh, who checked the Fulfulde texts kept in the Oxford Concordance Library, a huge amount of time was spent correcting the texts inputted by optical character reader. She had to inspect the whole texts several times (Personal communication).

7) At present, probably due to commercial factors, spelling check programs are available only for some Western European languages. For other languages a researcher has to make his own spelling check program.

8) Some printing companies accept only diskettes prepared with certain word-processors.

The production of head words in the KWIC of the Fulfulde texts causes somewhat complicated problems. The initials of all the words change morphophonemically. For example:

Singular	Plural	Meaning
<i>waandu</i>	<i>baadi</i>	monkey
<i>fowru</i>	<i>pobbi</i>	hyena
<i>rawaandu</i>	<i>dawaaɗi</i>	dog
<i>sawru</i>	<i>cabbi</i>	stick

There is a rule for the alternation of consonants. The fricatives and continuants (*w, r, y, w*) change into plosives and affricates (*b, d, j, g*), and into nasal compounds (*mb, nd, nj, ng*). The fricatives (*f, s, h*) change into plosives and affricates (*p, c, k*). The nasal consonants (*m, n, ny, ŋ*), the glottalized consonants (*ʔ, ɓ, ɗ, ɣ*) and a few others, (*t* and *l*) do not change. In order to put the words with different initial consonants but of the same root and stem together, we have been using manual change and sort commands, instead of writing the formula for transformation, for the time being. We change the initials which are arranged in the same column into a combination of numerals and consonants. For example *b, d, j, g*, into *1w, 1r, 1y, 2w*. We then sort them into the same column, and change them into the original letters.

I feel the need for automatic transformation, that is, the process to introduce the expected forms automatically, according to the purpose. Before I begin doing this, we need the list of words which will not alternate the initial consonants.

In the dictionary each word appears in the form of a head word. We think it would be very convenient to derive the head word automatically from any given form. If a word selected from the KWIC for the main corpus can obtain its dictionary form automatically, it can save an enormous amount of time. Here we need to set rules for this procedure.

Dictionary making by means of KWIC is a test case here. We have to prepare different tactics for different purposes. There is an apparent need for the various usages of KWIC.

### Automatic Translation

Although it depends on the size and purpose of the dictionary, in most cases, the dictionary of Fulfulde should be at least trilingual, namely, with English and French, since it is spoken in various countries of West and Central Africa. At present we have an international project with English and French speaking researchers. Although we are supposed to give the translation in English and French, the question of whether we should give the translation in Japanese is secondary, since the above-mentioned Western European languages were adopted by the African governments as national or official languages. Now, nobody knows the exact linguistic situation in Guinea Bissau.<sup>9)</sup> According to the traditional source, the majority of people

9) According to [DE TRESSAN 1935] and [DALBY 1977], this area is supposed to be a Fulfulde speaking area.

there speak Fulfulde. When they start thinking of utilizing our dictionary, automatic translation into Portuguese will be necessary. The researchers just give the translation in their mother tongue or the preferred language. Since we are dreaming of a cultural dictionary with a vocabulary of several hundreds of thousands words, the manual translation will not catch up with the production of the information.

For the time being I wonder whether magnetic tapes of bilingual and trilingual dictionaries are commercially available. We feel the necessity of collaboration between institutions of different specialities.

### **The Cloth Patterns of the Ewe Tribe**

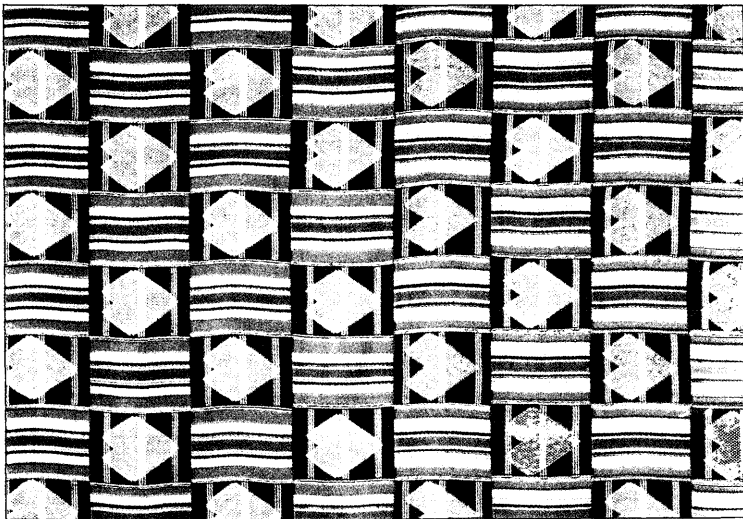
Besides texts there are ethnological materials awaiting computer processing, which might be closely related to the text data. Textile designs probably belong to this category. The number of wefts and warps, the color of the strings, the inserted designs can be interpreted in terms almost like a linguistic grammar. This grammar differs according to the ethnicity or tradition. Typical examples of such textile are found in so-called *kente* cloth in West Africa. Fig. 5 shows a *kente* cloth woven by the Ewe tribe. An experimental study of the Ewe cloth from a linguistic approach is planned.

### **Musical Research and the Computer**

It is well known that a certain tune represents a certain tradition. It may be possible for this ethnicity or distinct feature of music to be defined quantitatively.

### **The Preparation of Motif Index**

The database of the motifs used for the description of all kinds of folktales in



**Figure 5.** Ewe Kente Cloth Woven in Azahoun, Togo



the world should be prepared. Stith Thompson's Motif-Index [THOMPSON 1975] is too inconvenient for researchers to handle. It is too heavy. Besides the weight there are so many changes of numbers and signs. By using the computer these demerits will be overcome. Probably errors and irregularities will be found by means of KWIC and other processing. This database will contribute greatly to folklore research.

## COMPUTER-ASSISTED FIELD WORK

### Computer in the Field

As a field researcher I am looking for the possibility of introducing a new computer method which would combine the field and home laboratory. At present, a researcher goes to the field and makes field notes, returns home, and rewrites the contents of the field notes into *inputtable* forms. He then inputs the data and analyzes the result.

Traditional field work required only notebooks, pencils, and a few other tools, such as a camera, a tape measure, etc. If one can use a handy computer terminal, and input the information in analyzable form, it will not take long before the publication of the result back at home. In our case dictionary and text information can be easily treated in this way.<sup>10)</sup>

At present, slides and negative films cannot be easily organized after a long period of field research. By introducing an electronic camera and a minicomputer to keep such information as date, place, title and notes on each shot, organization and data retrieval will be much easier.

### Computer for Data Retrieval

Thanks to the development of communication, even from the interior Africa one can telephone anywhere in the world, instantly through satellite. This has increased the possibility for a fieldworker to communicate with the host computer at home. He can easily refer to the data already collected.

Again I would like to mention the necessity of collaboration between computer scientists at home and fieldworkers. If there is prior discussion on the object of the field work, and the format to be prepared in the field, the already processed data can be retrieved without much trouble.

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10) For ten months in 1984, 1985, and 1986 I tried to experiment in field work without paper by using an ordinary commercial handheld computer NEC PC-8201 in the dusty savanna of West Africa. It was very successful and proved very useful. The only trouble I had at the end was the bad contact between the keyboard and inner circuit. A few characters disappeared, and I was not able to input the texts. I understand it was caused by almost invisible dusts which blew from the Sahara during the wintertime. This may be prevented by using a plastic cover. After coming home all the data were transferred into the main system, and then processed. For transferring data from the handheld computer to the main system, an interface had to be developed. This again was solved very easily by the help of the *computer ethnologists* and computer specialists of the museum.

## HUMAN INTERFACE AND JOINT RESEARCH<sup>1,2)</sup>

### Human Interface

The Computer Ethnology division of the National Museum of Ethnology has established the following principles of how the staff members of this division contribute in the field of ethnology:

- (1) They should be the *human interface* between the computer and the researchers.
- (2) They create the field called *computer ethnology*.

The researchers in this division are all specialists on hardware and can handle all the machines in the museum. They know the usage. On the contrary most of the researchers in the museum do not have the knowledge to make full use of the machines, although they are interested in the use of computer for research. At the same time, the computer specialists do not have a comprehensive knowledge of ethnology or ethnography. At present, materials for analysis for their experiments are limited mostly to those inside the museum. The best solution to this situation is cooperation between the computer specialists and fieldworkers.

The researcher, who brings back materials from the field, supplies the fresh information on his ethnic group. He then discuss all the possibilities of computer application for the analysis. The computer specialists present the possibility.

### The Need for Joint Research

Thus, this situation creates the need for a *human interface* between the fieldworkers and the computer specialists. Close cooperation will open the way to *computer ethnology*.

Of course the results of the research should be published in the names of both the researchers in both specialities. Sometimes a single paper might list several authors.

There has been a tendency for researchers to carry out their research without assistance or cooperation. They have to change their mentality.

The existence of such joint research helps ordinary ethnology researchers economize on the huge amount of time spent on learning computer programming and understanding the nature of different useful machines.

### Routine Work and Menus

Although we need the establishment of *human interface*, it may be possible to deal with most of the operations required by researchers from the computer using ready-made programs.<sup>1,2)</sup> There should be easy access to all these programs.

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11) The idea of *human interface* was proposed by Prof. S. Sugita [SUGITA 1983]. According to his definition *human interface* means those who know computer systems very well and can understand the need of other researchers' in processing their data.

12) The preparation of the KWIC's of any proposed texts became almost a routine work. A researcher may propose any material for computer input. If the computer committee authorizes it, it will be inputted and processed according to the researcher's plan. One of the routine kinds of processing is KWIC.

Of course we may assume that each case requires some modification. Either someone from *human interface* or a well-trained technician would be sufficient for program modification.

So-called *end users* require guidance and program manuals with which they can study the possibility of introducing computer into their study, and solve their problems. This manual should consist of two parts; menu and remedy.

## CONCLUSION

Text and linguistic data, and other similar data are materials which can be treated with computer. Although we mentioned some possibilities of utilization of the computer, ordinary researchers need not know the complicated programming and the mechanism of computers and the machines surrounding the host computer. Collaboration between computer specialists and fieldworkers will increase the productivity of *computer ethnology*. The introduction of a computer in one's research is not a problem of knowledge of computer or programming, but rather a *social* problem of whether there is adequate research organization.

The new science of *computer ethnology* will be developed through joint research between people in two different fields. This again is a human problem of how these people can collaborate with each other. From this point of view *computer ethnology* will have great possibilities in the future if people can discard traditional ideas, and, above all, their selfishness or *closedness* in the shelter of the ivory tower.

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