

## **PRODUCTION OF A DIALECT MAP UTILIZING MAP MAKER**

Deokho KIM

Kyungpook National University

idhkim@knu.ac.kr

### **Abstract**

Technology for producing linguistic maps has undergone rapid development in recent years. Accordingly, new state-of-the-art maps have been introduced, from maps displaying regional dialects with symbols to ones attaching voice data, and others using geographic information systems (GIS) to create a linkage between geographic information. Such dazzling progress realized hitherto in cartographic technology for dialect maps has been made possible by high-tech computer technology. Against this backdrop, the present study demonstrates the usage and efficiency of our newly developed tool: the MAP MAKER. As a tool for creating dialect maps, the MAP MAKER represents data with symbols and has the following characteristics. First, users can easily create maps with the help of a graphic user interface. Additionally, when making a series of separate lexical maps with the same background map, the MAP MAKER enable users to minimize time in creating maps by avoiding the repetition of identical processes, thanks to the newly-developed function of user defined preference. Second, users can easily analyze and interpret regional dialect data via the sort and computation function. In detail, map creators can sort dialect data by order of the alphabet or of frequency, and enjoy a bird's eye view of what types of regional dialect branches there are and how frequently they appear. Third, the MAP MAKER offers automatic coordination, aiding users in creating maps with various outlines, which is why the MAP MAKER is deemed as one the most effective tools for creating dialect maps.

### **Keywords**

Dialectology, Geolinguistics, Map maker, Linguistic map

### **1. Range of the discussion**

In the last few years, the field of linguistics (dialectology) seems to have come across to various difficulties. Not only has the following scholars' participation in the

study decreased but also the directions of the study itself have not been pluralized at all. As it is hard to collect the data through fieldwork, which should first be implemented for the dialect study, there are even some critics who complain about the reason and the purpose of the dialectology. However, it seems that the scholars' intellectual poverty is more at issue than changes of field environment or the difficulties attended with changes of field environment. Despite the need for discussions of the mission and possibilities of the modern dialectology and the reconstruction of the research subject, no such atmosphere is detected at all.

Recently, few disciplinary collaborations have been found (B. Lee: 1976, I. Lee: 1976) with geography, sociology, folklore or history, which are adjacent to the field of dialectology. Still, the studies of dialect discussing the systemization of the phoneme and the grammar of a dialect do not show any further advance. This situation of affairs is due to frustration reached before the end of research due to the difficulties following data collection, even though the data collection must be settled first for a systematic study of a dialect's phoneme, grammar and vocabulary.

However, by being thought of in a different way, dialectology can enter a completely new phase. From now on, dialectology should expand its domain to socio-dialectology, which researches language differences among social strata and systemizes discourse grammar by investigating discourse or oral statements. Studies in the management of dialect data utilizing computers, which briefly appeared and disappeared in 1980's (e.g. Kim-Hong-Kim-Soh (1991)), must be resumed for the future of dialectology.

This article introduces directions for MAP MAKER and its usefulness, as developed by the author as a tool for producing dialect maps, and also presents the process of effort undergone for the computerization of the manner in which dialect maps are produced. These efforts are expected to contribute to the arousal of a new atmosphere in dialect studies

## **2. Collection and management of dialect data**

### *2.1. Collection of digital phonetic data*

For in-field collection of data for dialect research, both the recording environment and recording equipment are important factors for the collection of good quality phonetic data. Thus, an understanding of the on-the-spot recording environment and the directions for the useful recording equipment is first needed.

#### **2.1.1. Recording environment**

A major problem with recording data on-the-spot is the matter of how to minimize the problems caused on the recording environment. That is, care must be taken to minimize the burden of the microphone on informants and to pay close attention to other noises such as the chirrups of insects, the sound of cultivators passing by, the sound of turning fans, and so on, as these are factors that may interfere with recording good quality phonetic data. On the other hand, it is also imperative not to record researcher's and informant's speech at the same time, (e.g. Conversation overlap such as: "Yes, yes, right." from the researcher). Moreover, researching speed must also be considered because the segmentation of phonetic data during analysis is facilitated by the occurrence of appropriate pauses between questions and answers.

#### **2.1.2. Recording equipment**

The time has passed when the analog recorder is used in field work. Recently, most recordings are usually done utilizing a MD or DAT type digital recorder, because there are problems of changes in sound quality and preservation over 10 years and a limit in obtaining good quality phonetic data when using a tape. Even though an IC recorder type digital recorder has many benefits in recording time, simplicity of handling, direct share with computers, still the DAT type digital recorder is the most

generally used equipment, as it has improved sound quality from an IC recorder.<sup>1</sup>

For good quality sound recording, the function and performance of a microphone is a very important factor. Microphones can be classified in various ways, according to 1) manner of change, 2) direction, and 3) form and use. It is recommended to seek advice from professional phonetic researchers or labs such as SITEC as to which type of equipment to choose. For example, when the DAT SONY TCD-D100 is utilized, it is favorable to adjust phonetic input environment as monophonic to obtain good quality data. Also, standard frequency should be fixed at standard mode SP 48Khz, and sound input volume level should be 5-7. To record good quality phonetic data, the performance of a microphone is an exceedingly crucial factor.

## *2.2. Treatment and transcription of phonetic data*

An essential part of the treatment and transcription of phonetic data is to choose and utilize good software for the storage, management, description, expression and analysis of dialectal phonetic data. Described here is only prior knowledge and information on the program required to efficiently treat, transcribe, and manage a phonetic data after it is collected and loaded on a computer.

### *2.2.1. Analysis and treatment of phonetic data*

As for programs for phonetic data analysis and management, the most generally used are CSL (Computer Speech Lab) (Ladefoged: 2003), SIL and CECLIL(for phoneme research), Signalyxe, FindPhone, etc. Additionally, WaveSurfer,<sup>2</sup> Praat,<sup>3</sup> GoldWave and Cooledit Pro are used. As an editing tool for phonetic data recording, a strong sound editing program like Gold Wave or Cooledit Pro is favorable. In addition,

---

<sup>1</sup> DAT SONY TCD-D100 is being used in the local language research project of The National Institute of The Korean Language.

<sup>2</sup> WaveSurfer is a sound analysis program which is developed and released as an Open Source tool by Centre for Speech Technology in the department of Speech, Music and Hearing, Royal Institute of Technology in Sweden.

<sup>3</sup> Praat, by Paul Boersma & David Weenink in University of Amsterdam, is a program package for phonetic analysis and modification. Praat can be downloaded for free at [http://www.fon.hum.uva.nl/praat/download\\_win.html](http://www.fon.hum.uva.nl/praat/download_win.html). Praat does not need additional hardware as CSL of Elemetrics, nor a key as XQuirer (PCQuirer and McQuirer) of UCLA for the reason of copyright. It is available under normal PC environment with a soundcard. Praat contains not only nearly all the analysis function that the other phonetic analysis programs including CSL and XQuirer contain but also various functions and phonetic synthesizing capacity that other programs do not contain.

there are useful software programs for dialectal data management such as Shoebox, askSam, HyperCard, Xbas, and Lingual-Linker (Lawler & Aristar Dry 1998: 178). Shoebox is a database program which manages vocabulary data and text data. askSam is a software capable of formatting and printing reports of dialectal data collected on the spot, and because askSam supports graphics, electronic publishing is possible. HyperCard is able to manage text, data, sound and graphic data and constructs the collected data in forms of stack, which is a valuable program that can specially produce symbol dialect maps. Xbas and Lingual-Linker are professional software managing field dialect data. Lingual-Linker consists of a data management tool (CELLAR) and a data explaining library. No exclusive software for dialect data management, which can connect and manage vocabulary and phonetic data, has been developed yet in Korea.

A program for digital sound editing may be selected from GoldWave, Cowon JetAudio and Cool Edit Pro, however Cool Edit Pro is most preferable in terms of visual effects. GoldWave needs to set up recording time but Cool Edit Pro shows the wave of range without setting up recording time. However, these three programs do not differ in substance.

As a program for switching DAT data collected on the spot to digital sound data, GoldWave<sup>4</sup> or Cool Edit Pro are useful.

### 2.2.2. Tools for transcription

Transcription is the process of transferring segmented phonetic data to corresponding characters. First, the voice section is segmented, then transcription corresponding to the segmented section is done and data is saved as a file. Transcription is normally accomplished with editing tools, the segmented section being listened to repeatedly. There are tools for transcription such as Trans maker developed in North Korea, Praat, Wave surfer, etc., and lately, Transcriber 1.4 is being used most.

Transcriber 1.4 is capable of GUI (Graphic User Interface). In Transcriber 1.4 transcription and section segmentation is easy, and it is possible to combine sound file (wav.) and transcription file (trans.) that are segmented in sections into an XML

---

<sup>4</sup> GoldWave is being used for file transformation in local language research project of The National Institute of The Korean Language

document and manage the combined XML document. Now multilingual transcription is available when using Transcriber 1.4; however, there exists an inconvenience in that the code does not correspond to the Hangul (한글) keyboard. Even though a following supplement for the automatic deletion of noise or mute sections is needed, Transcriber 1.4 is still an outstanding program.



Figure 1.

At Options in Transcriber 1.4, Encoding in General options should be set for Unicode (UTF\_8) and Language be Korean. This setup effect must be saved and completed at Save configuration in Options. When transcription is being done, to listen to the sections undergone Segmentation, PlayBack mode of Signal should be set for Loop on the segment or selection after a pause. The adjustment of range and wave can be set by Vertical zoom in Control Panel. In the process of transcription, it is more convenient to use the Tab keys for start and stop, Shift + Backspace for section combination and keys ↓,↑ rather than a computer mouse for moving up and down in a section. In <Figure 1>, an example of transcription done utilizing Transcriber 1.4 is shown.

An overall management system must be established which saves sound and segmented transcription files in a portable CD-Rom or DVD-Rom, or which saves and manages the files in a massive terabyte server. In addition, studies are needed on the

following treatment process for the management of the FTP server and the file server to which a system that plans and searches a data structure is added.

### 2.2.3. LineExtract

LineExtract, recently developed by Sanggyu Lee (2005), is a tool which automatically extracts transcription data alone in sentences, along with the numbers of title item in transcription text documents in the form of XML. In text files transcribed through Transcriber 1.4, there are various information and mute sections, as is shown in Figure 2, which can be eliminated automatically by LineExtract, making it more convenient to publish a printed form of transcription data. Moreover, LineExtract has merits in that it can easily find all sorts of errors cropped out during the process of transcription, and correcting and proofreading of the errors is simple.

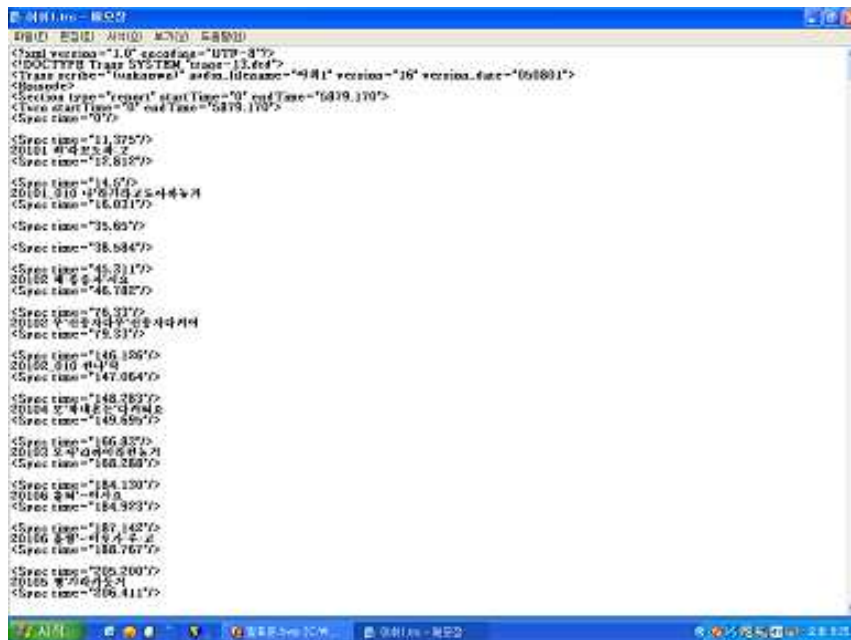


Figure 2.

Hereafter the performance of LineExtract will be improved in order to be put to use in the construction of a database in which transcription data and sound data make a one-to-one correspondence.

Like this, inputting and computerizing research is very useful for the following treatments. By computerizing the data many advantages arise, such as possibilities for

the result of dialectal research to be used in various applied software programs, efficient treatment of a sum, possibilities in statistical analysis, etc. Moreover, data can be preserved semi-permanently by inputting the data in an auxiliary unit like DVD.

### 3. Making tools for a dialect map

Currently there is great interest in the development of dialect maps, as the database construction of phonetic data is promoted actively with the growth of computerization of languages.<sup>5</sup> Recent dialect research is based on the assumptions that transcribed data of good quality phonetic recording is constructed as a database, is searchable and printable on web pages utilizing diverse visual effects, and is able to be transformed into a language atlas. In Korea, Transcriber 1.4 is being used for segmenting and transcribing by the local language research project of The National Institute of The Korean Language.

The manners of language atlas production are growing rapidly. That is, from a symbol map on which dialectal forms are directly written or switched to symbols (mark, numbers, colors etc.) up to offering informants' collective phonetic data.<sup>6</sup> On the other hand, three-dimensional topographical maps are also utilized where dialectal distribution is described over various geographical conditions such as rivers and mountain ranges and so on (Ambrose 1980). Moreover, the manners of language atlas description by GIS (Geographic Information System) are developing into the world of three-dimension and up to the level where a virtual language-geographical environment is directed by compounding space and time or simulating space-time of the future and the past.

The production of dialect maps is also developing, as a symbol map of dialect forms by using computers, a voice language atlas to which phonetic data is attached and as a representation in which diverse geographical information through GIS is exhibited

---

<sup>5</sup> Kishie Shinsuke (岸江信介), Kibe Nobuko (木部暢子), Ishida Yuuko (石田佑子) (2002) 「声の言語地図」『日本語学』9月号. By connecting phonetic data on a language atlas, this article introduces a program that offers language atlases with informants' vivid phonetic data. In addition, the phonetic language atlas is opened to the public in the homepage of 徳島大 schools 岸江言語研究所.

<sup>6</sup> Though phonetic corpus construction for is actively in progress for phonetic data and its research thanks to the development of language information, phonetic corpus construction and phonetic language atlases have a separate character of their own.



in relation to dialectal distribution.

World-wide analysis tools for field language research are introduced (Thomas 1980) and recently image tools and Excel-based tools for making various language atlases have also been introduced. The author has introduced KSeal to Korea but many limits have been found because SEAL is a program developed in Japan.<sup>7</sup> Thus this article is mainly dealing with Map Maker, the most developed among symbol maps programs at present.

### *3.1. An introduction of Map Maker*

#### *3.1.1. Features of the program*

Map Maker as a tool to produce a symbol language atlas has several strong points .

Firstly, it is easy to make a language atlas using a Windows environment. Users can complete a map by simply following the procedure the program offers users as it guides them through the approach to the data needed for making a map, opening pop-up windows. Additionally, Map Maker has a setup function that saves the time spent in making a map. If File → Setup change is clicked, users can establish a setup about the use of a blank map, basic coordinates and random symbols. These setups are useful in making various vocabulary maps, so that establishing those setups allows users to save time making a map; otherwise users repeat the same procedure every time when producing new maps.

Secondly, through the calculating and sorting function Map Maker has, it is easy to analyze and interpret dialectal data. Namely, it has a function that sorts dialectal forms in order of alphabet or frequency so that users can grasp the types of dialect differentiation and frequency at a single glance. As well users can be helped to choose entry words for dictionaries.

Thirdly, users can produce a map as they want, utilizing the coordinates automatic setup function. In the case that a user wants to make a map based on a blank map, normally the user has to construct coordinates of the blank map one by one using image tools after scanning a ground map. Map Maker, however, is equipped with a function

---

<sup>7</sup> 이상규(2005), “방언 자료의 처리와 언어지도”, *방언학* 창간호, 한국방언학회.

which automatically creates coordinates data, thus users can easily produce a map. This function will be fully explained in section 3.2.

### 3.1.2. Program Menu

#### ① New map file formation

To create a new map, this menu opens a blank map, coordinates data and vocabulary data in order.

#### ② Open a saved file

This menu opens a map file already made, to complete an unfinished map or to modify a finished map.

#### ③ Print a map

This menu prints out the image of dialect map produced.

#### ④ Setup change

This menu designates or changes the use of a basic map, coordinates, random symbols and basic font. Designation of basic maps in Figure 3 is useful in making many vocabulary maps with the same blank map. Once the choices of the use of a basic map and basic coordinates is designated, users can directly produce maps with a basic blank map and a ground map of its coordinates without having pop-up windows for open blank map and coordinates designation. Thus, if those functions are fully utilized, it will minimize the time required to make maps in printed form.



Figure 3.

Symbol setup is for designation or changing the use of symbols. In Figure 4, if a random symbol is checked as always applied, the program completes the map with symbols randomly given without a procedure of designation for symbols. If “asking” is selected as is in the Figure, the program asks users whether to use random symbols every time a new map is drawn.



Figure 4.

If “Not applied” is selected, the program always opens the windows for symbols after all the files needed are opened and has users designate symbols by themselves.

⑤ Close

This menu closes the program.

⑥ New coordinates data creation.

This menu opens a window that automatically creates coordinates for making a new ground map.

### 3.2. Construction of data for map making

To produce a language atlas, blank map as a foundation, a coordinates data in which the blank map's point coordinates are established and a vocabulary data are needed. In this section the way those data are constructed before producing a map and file format is described.

#### 3.2.1. Blank map

Users are able to make language atlases using any map in the form of an image file. Users can also utilize a blank map given by the program (Figure 5). A blank map can be saved as a form of a file after scanning.



Figure 5.

### 3.2.2. Coordinates data



Figure 6.

Coordinates data are the representation in which users' designated symbols are exhibited. In Figure 6 the coordinates which correspond to the basic blank map of Map Maker presented in Figure 5 are shown. These coordinate data should be constituted as the same order of countries' names in the data (countryname.txt).

In coordinates data x coordinate at the fore and y coordinate are presented at the rear and usually a pair of coordinates of the scanned relevant blank map is constructed one by one utilizing image tools. How to automatically construct coordinates data of a new blank map is shown below.

Select Coordinates → New coordinates creation in the menu as is shown in Figure 7.



Figure 7.

When a window of open a file pops up as Figure 8, users find and select a blank map file in which coordinates will be created.



Figure 8.

Next, when a window for selection of a county name file (Figure 9), users write a list of counties where symbols should appear in a blank map (Figure 10) and save the file as a text file.



Figure 9.



Figure 10.

In a pop up window of open a county name file (Figure 9), if this county name file is selected and opened, then a window for coordinates designation appears as shown in Figure 11. At this time, if the relevant spot is clicked on the map, the x and y coordinates of the selected spot are automatically created. In this manner, all the coordinates of the relevant spot are created and the coordinates file is given a name and saved by clicking file → coordinates data save. Now by clicking file → close, the coordinates data of the relevant blank map are automatically constructed.



Figure 11.

### 3.2.3. Vocabulary data

Vocabulary data is created in a form shown in Figure 12.

172 in the first column indicates the number of vocabulary and after the number, “Durumagi” indicates the representative form (standard form). From the second column until the last, the dialectal forms should be recorded in the identical order of the countries’ order, which is the same as the coordinates data. In addition, if there are more than two dialectal forms for one county, they can be arranged and divided by a comma. For example, if the first county of the coordinates data is Chorom in Gangwondo, the dialectal forms of “Durumagi” in Chorom are “Hurumak, Hurumaegi, Durumagi”. This vocabulary data is written in Excel or Wordpad and then saved with the extension of \*\*\*.dbs.

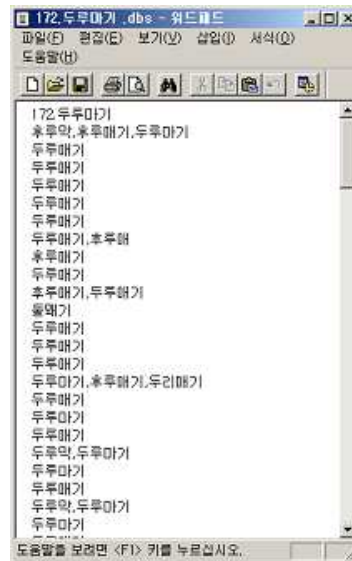


Figure 12.

### 3.3 Map making method

#### 3.3.1. Program execution

##### ① File copying

First, copy a MAPMaker folder containing a program execution file (MAPMaker.exe) and font file (Test.ttf) into the user's computer. Copy font file (Test.ttf) from MAPMaker folder and paste it in C:\WINDOWS\Fonts.

##### ② Program execution

To execute the present program, users should move to the folder where the program is copied and double click MAPMaker.exe file (Figure13).





Figure13.

When the program starts to execute, a window like Figure 14 shows.

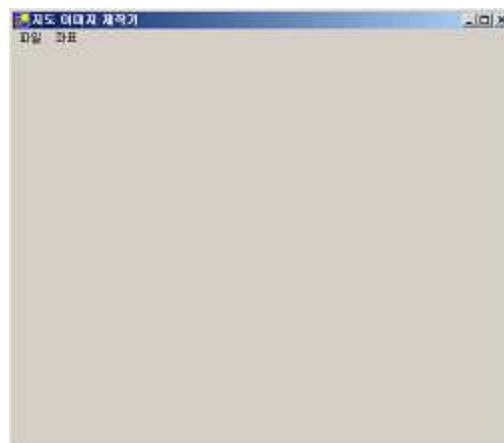


Figure 14.

Because this program is executed on Microsoft.NET Framework, Microsoft.NET Framework must be already installed on the user's PC. Thus, if a message like Figure 15 pops up after the execution file has been double-clicked, the user has to install the Microsoft.NET framework version 1.1 or better for the program to operate.



Figure 15.

Microsoft.NET framework 1.1 is available at  
<http://www.microsoft.com/downloads/> to be downloaded and installed (Figure 16).



Figure 16.

### 3.3.2. Map making process

#### ① New map file creation

To make a map, file → New map file creation is clicked (Figure 17).



Figure 17.

② Open a ground map

First, a window for selection of a ground map pops up. At this time, users find and select a blank map that is going to be a ground map for a map which users want to finally make



Figure 18.

③ Open coordinates data

After a blank map is opened, a window for selection of coordinates data pops up. Users find and select coordinates that correspond to the blank data opened before and then click the open button (Figure 19).



Figure 19.

③ Open vocabulary data

After the coordinates data is selected, a window for selection of vocabulary data pops up. Like the preceding, select a vocabulary file which shall be presented in the map and click the open button. Figure 20 below shows the case that the database file of 'Durumagi' is selected for the purpose of making a dialect map of 'Durumagi' (Figure 20).



Figure 20.

### ⑤ Symbol designation

#### a. Random symbols

After the vocabulary file is opened, in the case of the selection of ‘always applied’ at ‘File → Setup change → Symbol’, as in Figure 21, the program directly designates random symbols for vocabulary data so the completed map appears.

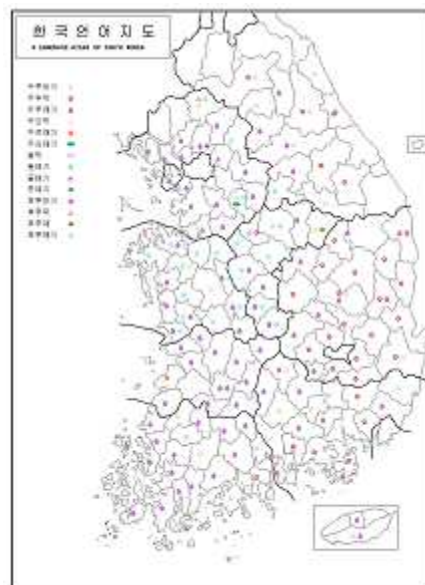


Figure 21.

In the case of the selection of ‘Asking’ at ‘File→Setup change→Symbol’, a window pops up and shows a message saying ‘Are you going to use random symbols?’ as is shown in Figure 22.

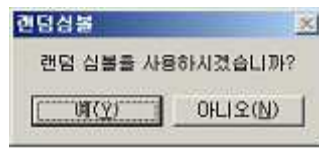


Figure 22.

At this time, if a user intends to use the symbols automatically designated by the program as they are, click 'yes'. Then, like the preceding, a map is completed in which the program has designated random symbols in accordance with the vocabulary data, as is shown in Figure 21.

#### b. User designated symbols

In the case where the user intends to directly designate symbols and express them on a map, Random symbols 'Not applied' or 'Asking' at 'File → Setup change → Symbol' must be selected earlier (what previous section is this information in?). In case of Random symbols, 'Asking' is selected and answered as 'No' by clicking 'No' button (Figure 22), or in case of Random symbols 'Not applied' is selected in Setup change, a window for selection of symbols comes to pop up, as Figure 23.

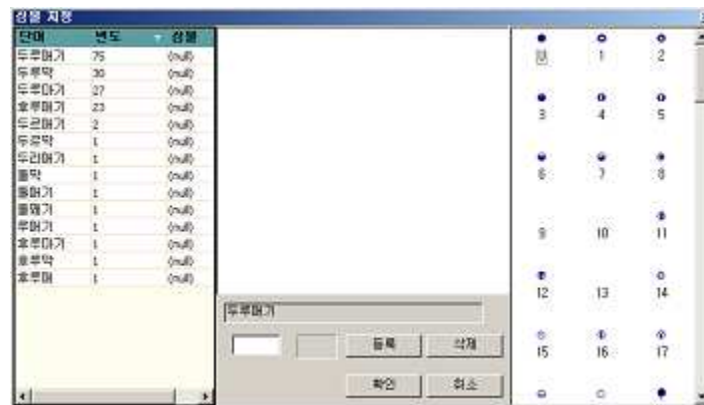


Figure 23.

On the left side of the window dialectal forms of a vocabulary and their frequency appear. When "Vocabulary" at the blue bar is clicked, dialectal forms become sorted in ascending and descending alphabetical order (Figure 24). When the "Frequency" is clicked, they are sorted in ascending and descending frequency (Figure 25).

단어	빈도	상호
두루마기	27	(null)
두루막	30	(null)
두루매기	75	(null)
두르막	1	(null)
두르매기	2	(null)
두리매기	1	(null)
둘막	1	(null)
둘매기	1	(null)
둘원기	1	(null)
루매기	1	(null)
후루마기	1	(null)
후루막	1	(null)
후루매	1	(null)
후루매기	23	(null)

Figure 24.

단어	빈도	상호
두루매기	75	(null)
두루막	30	(null)
두루마기	27	(null)
후루매기	23	(null)
두르매기	2	(null)
두르막	1	(null)
두리매기	1	(null)
둘막	1	(null)
둘매기	1	(null)
둘원기	1	(null)
루매기	1	(null)
후루마기	1	(null)
후루막	1	(null)
후루매	1	(null)

Figure 25.

After selecting dialect forms of a vocabulary, if symbols are selected from the right side of the window as the user would like, then in the middle part of the window the selected symbol appears. If the symbol is selected, the user can assign a color for the symbol (Figure 26).



Figure 26.

If register is clicked after the form and color of a symbol is chosen, then a symbol for the relevant dialect form is designated. In this manner, symbols for all the dialect forms are designated and the map is completed by clicking 'confirmation'. At this time, in the screen of completed map like Figure 27, by using menu, the size of symbols or the font of legends can be switched or designated.

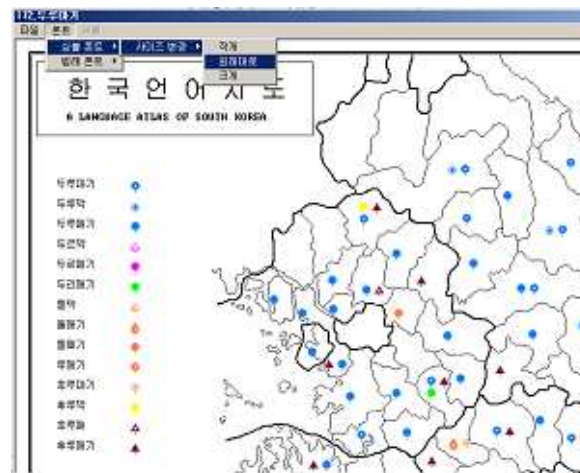


Figure 27.

The user saves the map by clicking ‘File → Map file’ save and closes the program by clicking ‘File → Close’. Through the completed map as Figure 28 that is drawn by this dialect Map Maker, it is easy to grasp the phase of the regional dialectal differentiation of ‘Durumagi’

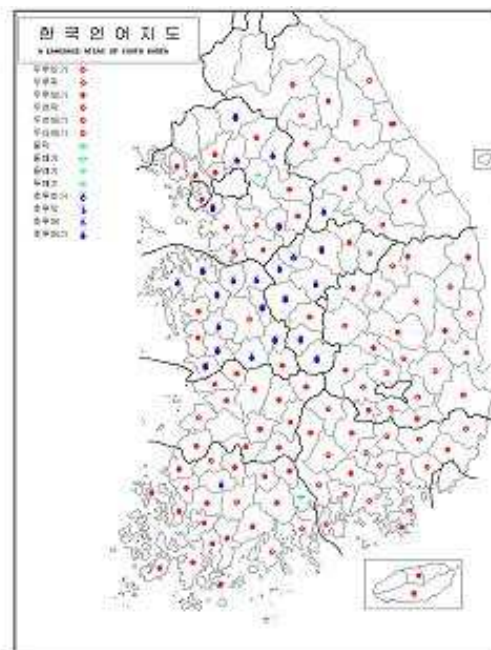


Figure 28. Linguistic-map of ‘Durumagi’

#### 4. Conclusion

As stated above, the result of dialect research is constructing a database with phonetic and transcribed data, and the language atlas production is evolving to the level where computers are utilized. However, because there are limitations of efficiency and connectedness of various softwares already developed and introduced, development of an exclusive program for field dialect research needs to be carried out.

For example, since each researcher uses different software to construct various dialect data and produce a language map, it is difficult for researchers to share data or maps. Consequently, development of a universal system, which manages dialect data through the joint researches among researchers, must be promoted.

In this way, the time and expense that each researcher invests in the construction of dialect data and map making system can be reduced. Furthermore, the issue that dialect data respectively constructed by each researcher are not available for mutual utilization can be overcome. In addition, the matter of inefficiency caused by the differences of transcription signs, symbols, colors, etc. between each researcher, is not a simple one. From now on, international standardization of the field research data management and language map production should be attempted.

#### 5. References

- 김덕호 (2002), *경북방언의 지리언어학*, 월인.
- 김택구 (1991), “경상남도 방언의 지리적 분화에 관한 연구”, 건국대 박사논문.
- 소강춘 (1994), “방언 자료의 전산처리에 대하여-음운론적 현상과 언어 지도 작성방안-”, *정신문화연구* 56.
- 두길수, 안동언 (2002), “한국방언검색 프로그램 개발”, *한국어와 정보화*, 태학사.
- 이기갑 (1994), “언어지도 작성 방법”, *인문과학* 10, 경북대 인문과학연구소.
- 이상규 (1995), “조선어연구부편-방언집 검토”, *방언집*, 모산학술연구소.
- \_\_\_\_\_ (1996), “언어지도의 상징부호에 대하여”, 대구언어학회.
- \_\_\_\_\_ (1997), “준대형태소 ‘-시-’의 두 가지 기능”, *어문론총* 31, 경북어문학회.
- \_\_\_\_\_ (1998), “계열어의 방언 분화 양상”, *추상과 의미의 실재*, 박이정.
- \_\_\_\_\_ (1998), “동남 방언”, *새국어생활* 84, 국립국어연구원.



- \_\_\_\_\_ (1991), “경북 방언의 경어법”, *새국어생활* 13, 국립국어연구원.
- \_\_\_\_\_ (2004), “컴퓨터 언어지리학의 방법과 실천”, 경북대학교 언어지도 연구실.
- 이익섭 (1979), “강원도 영서지방의 언어분화”, *진단학보* 48, 진단학회.
- 최학근 (1958), “언어지리학의 방법과 성질”, *동덕학보* 1, 동덕여대.
- \_\_\_\_\_ (1958), *국어방언학서설*, 동학사.

- 岸江信介, 中井精一, 鳥谷善史, 石田佑子 (2000) エクセルファイルとファイルメーカーを利用した言語地図の作成: 徳島県言語地図, (大阪樟蔭女子大学日本語研究センター報告)
- 岸江信介, 中井精一, 鳥谷善史 (2001), *大阪府言語地図* (近畿方言研究会).
- 國立國語研究所 (2002), *方言文法全國地圖*, 第5集 (財務省印刷局).
- 徳川宗賢 (1993), “電子計算器の‘言語地圖’への作成適用”, *方言地理學の展開* (ひつじ書房).
- 富山大學人文學部日本語學研究室 (2001), *富山言語動態地圖*.
- 中井精一, 坂口直樹 (2000) データベースソフトによる富山県言語動態地図の製作について (富山大学人文学部紀要).
- 富山大學人文學部GIS研究會 (2003), “人文科學とGIS”, 富山大學人文學部GIS研究會.
- 中村和郎, 寄藤昂, 村山祐司 (1998), *地理情報システムを學ぶ* (古今書院).
- 福嶋秩子, 福嶋祐介 (2001), *パソコンによる言語地理學その方法と實踐 SEAL ユザズテムの世界* (ニュートンプレス).

AMBROSE, John (1980) “Micro-scale language mapping: An experiment in Wales and Brittany,” *Discussion Papers in Geolinguistics* 2, Stafford: North Staffordshire Polytechnic, Department of Geography.

FUKUSHIMA, Chitsuko (1983a) “Pasokon niyoru Gengo-chirigaku eno Apuroochi (An Approach to Linguistic Geography Assisted by a Personal Computer), (SEAL User’s Manual)”, Private edition.

FUKUSHIMA, Chitsuko (1983b) “Izumo ni okeru kaion-rui no bumpu to sono soogooka: Pasokon niyoru Gengo-chirigaku no ichire tosite (Geographical Distribution of the Forms Related to the Old Vowel [au] and Its Synthesization: An Example of Linguistic Geography Assisted by a Personal Computer)”, *Tokyo University Linguistic Papers*, 4, 103-110.

- FUKUSHIMA, Chitsuko (1995) "Tokunoshima ni okeru shinzoku-meisho (Kinship Term in Tokunoshima)", *Tokyo University Linguistic Papers*, 14: 339-357.
- FUKUSHIMA, Chitsuko (1997) "Standardization in England Based on the Morphological Data of CLAE", in: VIERECK, Wolfgang and Heinrich RAMISCH, *The Computer Developed Linguistic Atlas of England 2*, Tübingen: Max Niemeyer Verlag, 51-56.
- LAWLER, John & Helen ARISTAR DRY (ed.) (1998) *Using Computers in Linguistics. A practical guide*, London & New York: Routledge Kegan Paul.
- LADEFOGED, Peter (2003) *Phonetic Data Analysis. An Introduction to Fieldwork and Instrumental Techniques*, Malden, MA: Blackwell Publishing.
- THOMAS, Alan R. (1980) *Areal Analysis of Dialect Data by Computer*, Cardiff: Univ. of Wales Press.
- VIERECK, Wolfgang, in collaboration with Heinrich RAMISCH (1991) *The Computer Developed Linguistic Atlas of England 1*, Tübingen: Max Niemeyer Verlag.
- VIERECK, Wolfgang and Heinrich RAMISCH (1997) *The Computer Developed Linguistic Atlas of England 2*, Tübingen: Max Niemeyer Verlag.