

A Comparison of Phonology Tools

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Some necessary history

Recently, I received a short email message: “I have had a couple of questions about the relative merits of [Speech Manager](#), [FindPhone](#), and [PhoneBox](#). Assuming that FindPhone is the best for analysis, could you give a summary of how the other two match up?” Previously, I had also been asked why I recommended PhoneBox and hadn’t paid much attention to Speech Manager. I decided that I needed to look at the whole issue in more detail.

The Language Software Board (LSB) in its Terms of Reference (TOR) is instructed to establish corporate guidelines as to which software tools are recommended for various situations. Although such guidelines have not yet been released, in November of 1999 the LSB did review a short document, “Recommendations by Task,” produced by Larry Hayashi. It included a rough analysis and comparison of a number of language programs. Four phonology programs were compared: Speech Manager 1.5 test version, [Shoebox](#) 4.x, LinguaLinks Workshops prototype phonology tool, and FindPhone, probably version 6.

Speech Manager (SM) was developed at JAARS by Terry Gibbs and his team; SM 2.0, a 32-bit Windows program, has now been released. The overview of SM states, “Speech Manager is designed to assist linguists in the analysis of spoken languages, providing an easy-to-use method of organizing phonetic texts using the International Phonetic Alphabet (IPA) characters. Users can either key in phonetic text via the keyboard or retrieve the IPA text in a recording that has been edited by Speech Analyzer.” Notice that the phonological features of the program are not mentioned. Neither the name of the program nor its overview reveals what it can do for the phonologist.

Shoebox was developed by John Wimbish in Indonesia. It was originally an MS-DOS program, but was later enhanced by Alan Buseman and others to be a Windows/Mac program. It is a general-purpose and very flexible database program that can handle many scripts and has abilities such as interlinearisation that are particularly useful to the linguist.

I once saw a demo of the LinguaLinks Workshops prototype phonology tool and was impressed, but it never became anything more than a prototype [see [SIL FieldWorks](#)].

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FindPhone was originally written by Geoffrey Hunt in late 1984 for the Field Methods course at British SIL. Several years later David Bevan rewrote it. But it was always an MS-DOS program only, which restricted it to run in 640 KB RAM, if you were lucky enough to have that much in its early days.

Larry Hayashi's 1999 analysis of the suitability of these four programs to analyse and describe phonology is indicated in the following table. (I have added the last two columns).

Table 1. Larry Hayashi's comparison

Program	Suitability for task	Docs. for task	Usability	Reliability	Total	Comments
Speech Manager 1.5 test	4/5	1/5	3/5	2/5	10/20	v. 2.0 now available
Shoebox 4.x	2/5	2/5	3/5	5/5	12/20	v. 5.0 available
LinguaLinks Workshops prototype phonology tool	3/5	3/5	3/5	2/5	11/20	Never officially released
FindPhone (v 6.0)	5/5	5/5	3/5	5/5	18/20	MS-DOS only

Not too much importance should be accorded to these results, because no detailed analysis had been done. But it is clear that FindPhone was far ahead of the others.

But FindPhone has three drawbacks, which have been pointed out many times. First, it is an MS-DOS program. Students coming to learn linguistics usually know Windows but not DOS, so to use FindPhone they have to be taught something about DOS. Second, the DOS fonts that FindPhone uses are not compatible with the SIL Windows IPA fonts, so FindPhone data cannot be easily transferred back and forth to Shoebox, another program that often needs to be taught. Third, FindPhone's user interface is different from the user interface of a Windows program, and, although it is fairly easy to learn, is another thing that has to be learnt. These drawbacks seriously impinge on the real usability of FindPhone.

Because of these drawbacks, staff at the Seminar für Sprachmethodik (SSM, the German part of the SIL European Training Programme (ETP)) decided that teaching FindPhone was too difficult and that they needed an alternative. Hannes Hirzel, a lecturer at the University of Zurich, proposed a solution. He proposed an add-in for Shoebox that would enable it to search for data in a way optimised for phonologists. Hans-Christian Knöppler was the programmer who turned it into a reality. I came across this Shoebox add-in during October 2001, when I was visiting SSM for other reasons. The add-in was later enhanced and renamed *PhoneBox*. It can be downloaded from <http://www.sil.org/computing/phonebox/download.htm> (accessed July 2008).

Today's software tools for phonological analysis

Since beginning this paper, I have heard of two more phonology programs. Rod Casali wrote to me about a phonology program that is being developed in Africa.¹ However, it is specific to a particular language family and at the present time is only a demo. I shall not consider it further here.

¹ We are designing a Bantu-specific phonological search tool for use in the Africa Area's Bantu Initiative project. We currently have a very early demo. It is not currently set up to allow the user complete flexibility in deciding what searches to carry out (though I have also intended to eventually develop a stand-alone module that would be rather like a Windows version of

Mike Cahill wrote about a new phonology program, Phonalys, written by John Alsop. I have looked in detail at Phonalys and even spent time with John Alsop discussing usability issues. I concluded that Phonalys is not yet ready for widespread use, but may be important in the future.

So, for the benefit of today's phonologist, I will compare three programs: FindPhone (FF), Shoebox with the PhoneBox add-in (PB), and Speech Manager (SM). I will use the following table to help me be objective. The final column (Max) is the maximum possible score for the three preceding columns.

Table 2. Comparison of three phonology programs

Feature	Weight	FF	PB	SM	Max
Compatibility with Windows	5	1	4	4	4
Ease of installation	1	3	1	3	4
Ease of learning	4	3	2	4	4
Ease of use	3	3	2	4	4
Freedom from bugs	5	4	3	3	4
Tutorial & printable docs	2	3	2	3	4
Online documentation	3	1	1	3	4
Access to acoustic phonetics	4	0	1	3	4
Use of Unicode encoding	4	0	0	0	4
Handles uncertain data	5	4	3	0	4
Classes (C, V, etc.)	3	4	4	4	4
Feature sets of phones	1	0	0	4	4
Counts & lists of phones	4	4	4	4	4
Charts of counts, examples, etc.	4	3	2	4	4
Searching for examples	4	4	4	4	4
Searching for pitch patterns	1	4	4	0	4
Sorting by phonetic features	2	4	4	4	4
Totals:		146	140	165	220

Getting this table reasonably accurate has been the most difficult part of my research for this article. The values in the four columns "FF," "PB," "SM," and "Max" are multiplied by the "Weight" assigned to each row and then added to give the totals at the bottom of the five columns. I have considered this table many times, trying to be as objective as possible. Let me now discuss the features.

Windows compatibility is a topic I have already discussed and FindPhone does badly. However, FindPhone can run in a DOS window, automatically using the correct fonts, even in Windows XP.

Ease of installation, ease of learning, and ease of use are very important features for any software. The combined weight is eight.

FindPhone, though perhaps with some Bantu-specific features). Rather, it executes a large list of predetermined searches and analytical tasks (bearing, ideally, on all of the standard kinds of questions one would want to answer in investigating the phonology of a Bantu language) and outputs the results to a formatted Word document with various tables, lists, and hyperlinks. (It carries out the searches on an input file in Shoebox format.) For example, it charts all of the consonant and vowel sounds found in the language and allows the user to open separate Word documents (by clicking on hyperlinks or accessing menu choices) containing all examples of each sound, sorted by word position. It also creates tables showing cooccurrence restrictions and allows the user to call up all examples illustrating attested patterns.

Ease of installation only has a weight of one, because a potential user can get someone else to help with this. All the programs are themselves easy to install, but each one requires special fonts and keyboarding, and in the case of PhoneBox an ancillary program, Shoebox. FindPhone installs keyboard and fonts automatically, but any shortcut icons have to be installed manually, so it does not get full marks. For PhoneBox there has to be separate installations for Shoebox, the PhoneBox program itself, the IPA fonts and [Keyman](#); this reduces its score for installation to 1. Speech Manager gets automatically installed with the Speech Tools package, and it will automatically install everything that is required. There is a problem, though, that it offers to install Keyman 3.2, whereas users should now be using Keyman 6.0.

If a program is difficult to learn, you are going to have far fewer users. I would have argued that FindPhone is difficult to learn, because you also have to learn something about DOS, but once I had installed it and created a shortcut icon, I could start it without knowing anything about DOS. And even though its menus are not like those in Windows, it is straightforward to use. To work with PhoneBox you have to learn Shoebox first and then how to make use of the PhoneBox add-in. I already knew Shoebox well, and I wrote a tutorial for PhoneBox, but even with this tutorial, I think users will struggle to learn the program. Speech Manager, on the other hand, is both easy to learn and easy to use. Access via the menus is sometimes clumsy, but there are keyboard shortcuts, so I did not reduce the score for ease of use.

Bugs in any program are a pain at best, so “Freedom from bugs” has a weight of five. FindPhone has been through 6 versions, so is unlikely to have any significant bugs. I have been pleasantly surprised by PhoneBox’s lack of bugs, but some of its error messages are less than helpful, so it has not achieved the maximum score. I imported my PhoneBox data into Speech Manager and immediately ran into some problems; none of them caused a loss of data, and one was because Speech Manager was designed to import from FindPhone and didn’t know how to deal with inline tone markers. One of the bugs, however, was serious, it caused some IPA characters, such as the bridge that joins labio-velar consonants, to display incorrectly. This bug has now been fixed, but the version of the program with the fix has not yet been released. Nevertheless, I have adjusted the rating for “Freedom from bugs” in the expectation of its release.

I divided the documentation into two categories and weighted the online documentation more heavily than the combined tutorial and printable documentation, because I think that is how users prefer to work. FindPhone has superb printable documentation that took David Bevan years to write, but it is no longer available in printed form, only as a Word Document on the [JAARS Software Library](#) CD-ROM. This is far less convenient, for who will bother to print out the 226 pages? And FindPhone’s online documentation is very limited. PhoneBox has a fairly complete tutorial, but because it is an add-in to Shoebox, the only online documentation is limited to Shoebox help files and a few dialogue boxes and error messages that PhoneBox displays during its progress (the error messages could be much improved). Speech Manager has a slick computer-based training CD-ROM (which I don’t have access to at the present time), an online “tutorial,” and good online help. The computer-based training CD-ROM is what I consider to be a tutorial; the online “tutorial” is where the phonologist will find help about the phonological features of Speech Manager—I think it should be renamed “Help for phonology.”

FindPhone cannot directly provide access to acoustic phonetics’ programs. Shoebox will allow a file reference to a .WAV file, which can be played from Shoebox. Speech Manager can easily get at all the features of Speech Analyzer for any audio file in its list.

Reference to the “Use of Unicode encoding” is included because this is a feature that any new phonology program must include. Only then will the user have a full version of IPA and its regional variants, each with correctly stacking diacritics.

“Handles uncertain data” has a weight of five. It is a rare phonetician who can always transcribe his data correctly the first time. Most of us need to be able to mark uncertainties in our transcriptions and to search these at a later date, particularly to compare with similar transcriptions that we are certain about. Speech Manager makes no provision for this, but the other two programs do.

Provision of predefined classes is important and the user should also be able to define further classes to facilitate his or her research. Predefined classes should include classes for consonants and vowels, but could include, for example, a class of labials or a class of fricatives. Speech Manager has a long list of predefined classes, but all the programs allow users to define their own classes, so all programs scored full marks.

“Feature sets of phones” is not an essential component of a phonology tool, therefore it has a low weighting, but it is undoubtedly useful. Speech Manager provides both articulatory and binary feature sets, allowing redefinition to match the language being studied.

“Counts and lists of phones” refers to counts of phones and lists of words containing certain phones. All programs do well at these.

“Charts of counts, examples, etc.” refers to the ability to derive data for charts and present data in chart format. PhoneBox can only derive the data necessary for a chart and cannot display it as a chart; Shoebox’s browse view with sorted and filtered data is the best it can do. Speech Manager² allows the user to click on a phone in a chart and automatically bring up a list of all utterances that have that phone. Each program is able to display these utterances with the phone of interest in the centre, making it much easier for the researcher to examine the contexts before and after the phone.

All programs do well at searching for phones in definable environments. Speech Manager has an easy-to-use mouse-driven interface for defining queries. Both FindPhone and Speech Manager have quick mechanisms for finding minimal pairs or contrasts in analogous environments.

When it comes to searching for pitch patterns, FindPhone is best equipped, but PhoneBox can also manage it. However, I would not use this method for analysing pitch variations because there are too many possibilities for errors, so it only has a weight of one in the table. I would always use Speech Analyzer and recorded data to analyse pitch variations.

All programs do well at sorting by various phonetic features, such as place of articulation.

Conclusions

Any language software that is developed in SIL, but not by the main software International development teams at Dallas-Waxhaw and Calgary, is classified as entrepreneurial software. The fact that there are three present attempts to develop entrepreneurial phonology programs³ for Windows is indicative of a real need in this area.

² And the LinguaLinks phonology prototype.

³ Phonebox, Phonalsys, and the Bantu phonological search tool.

FindPhone was written over a period of ten years and has a very thorough manual, so I suppose that it is not entirely surprising that it has been able to hold its own, despite the limitations imposed by DOS. I have even had an email from a field situation telling of two people that are presently using FindPhone “because there is nothing better (in spite of all the DOS problems).”

PhoneBox does not score quite as highly as FindPhone, despite the 15-point advantage gained from being a Windows program. However, I am sure that German SIL will not be going back to FindPhone; perhaps I have incorrectly weighted my table. PhoneBox can get at much of the data that the phonologist needs, but it is not such an easy program to learn or use, and it cannot display charts.

I must confess to some surprise that Speech Manager did so well. I had not previously looked at it in such detail, but had spent a lot of time working with its sister program, Speech Analyzer, helping the developers to get rid of bugs and to improve the usability. Speech Manager is easy to learn and use, and that counts heavily in its favour. Its bugs are now being dealt with, but it cannot handle uncertain data. I think I know a way whereby the program could be modified to handle uncertain data, at least to the level that PhoneBox does, but there is no programmer available to do this.

One additional problem with Speech Manager is that it has the wrong name! It should be called something like Phonology Assistant,⁴ then linguists would understand something of what it can do. I suspect this problem has arisen because nonlinguists developed a program to organise speech utterances produced by Speech Analyzer and later added most of FindPhone’s features.

Future software tools for phonological analysis

During the late 1990s some of SIL’s expert phonologists had a lively email discussion about the design of the next generation of phonology software. The initial idea was that the software should be knowledgeable about some theory of phonology and so help the phonologists in far more detail than a program like FindPhone could. Unfortunately, these phonologists could neither agree on which phonological theory should be exemplified, nor the way it could be implemented. In the end there was a strong level of opinion that it would be better simply to produce a Windows program with features similar to FindPhone. It would be optimised to perform the functions necessary for the study of phonology, allowing the linguist to write up his or her findings according to whichever theory suited either data or personal inclinations. Any such program would still have the potential to be far better than FindPhone, which was limited so severely by DOS.

When will such a program be available? Well, eventually one would expect a phonology program to be part of the FieldWorks suite of integrated linguistics tools, but there are no plans for this at present. The best hope for the near term lies with Speech Manager. If it could be enhanced to handle uncertain data and phonetic data in full Unicode form, it would be a powerful tool.⁵ ■

⁴ I sent out early drafts of this paper, and the name of Speech Manager (SM) is now being changed to Phonology Assistant (PA).

⁵ [July 2008 update: Phonology Assistant can load and analyze data from SFM files or FieldWorks databases. Go to http://www.sil.org/computing/catalog/show_software_catalog.asp?by=sil&name=Supported for the latest updates.]