

# MFB (Music For the Blind) : a software able to transcribe and create musical scores into Braille and to be used by blind persons.

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**Abstract.** This article describes MFB software, able to create and transcribe musical scores, and its adaptability to blind users.

**Keywords :** Transcription, musical scores, Braille, blind persons, accessibility.

## INTRODUCTION

Our first aim was to realise a software able to transcribe musical scores in Braille automatically. It was necessary to find a « standard » musical notation common to different software having an adequate structure to rapidly obtain a Braille transcription. We will explain succinctly why NIFF<sup>1</sup>[1] was chosen, then we will present the MFB software, specially the use of its different functions. Secondly, we will describe some of the problems encountered and the solutions provided to make this software accessible to a blind user.

## I - REPRESENTATION OF MUSICAL DOCUMENTS

To exchange musical information several types of documents presently exist :

- Sounds ,
- Graphics,
- Electronics.

With sound documents there is no specific access problem for blind people. The graphical document represents the most commonly used support for musical score exchanges. A treatment to obtain the corresponding electronic document makes it accessible to blind persons.

The electronic document is obtained from :

- Editors of musical scores with a code problem (no exchange standard) and a graphical interface problem (input is generally impossible for blind persons),
- Optical character recognition software.

To adopt a code system of printed scores that we could use, a serious study of several standards of musical notation was made such as SMDL<sup>2</sup> and NIFF. We also had to study the Braille musical notation in order to make a good choice.

Because of the different problems mentioned above we decided to use the new NIFF standard. We can obtain electronic files in this format with LIME or SCORE software (which can be used by a Blind person), but also with optical musical recognition software like MIDISCAN or PIANOSCAN. Its tree structure is very interesting as it allows to navigate inside the score.

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<sup>1</sup> NIFF : Notation Interchange File Format

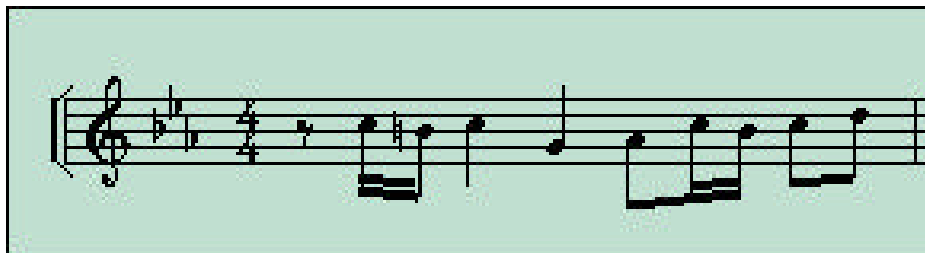
<sup>2</sup> SMDL : Standard Music Description Language

## II - MFB SOFTWARE

Thanks to this research the realisation of a specific software like MFB was possible. At the beginning, it allows a sighted person to transcribe printed scores into Braille. MFB is completed of different modules :

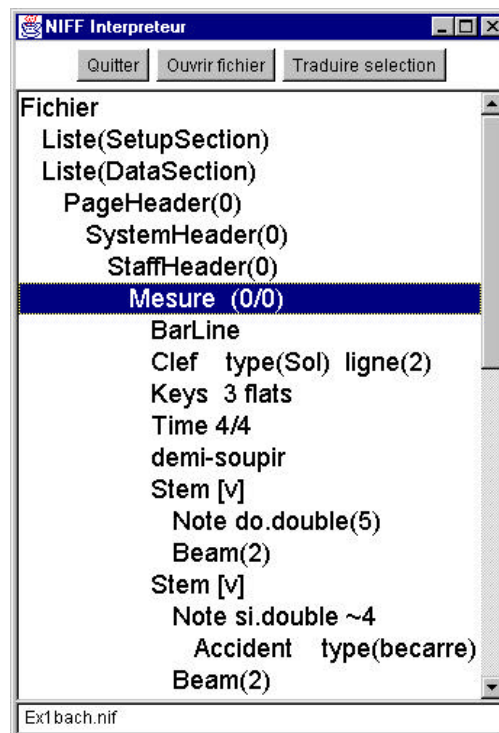
- The NIFF Interpreter,
- The Punch tool,
- The Dictionary,
- The Scanner.

In order to present the different characteristics of this software we will take a part of a score written by Bach as an example. We scanned it to obtain the corresponding NIFF file. In the following examples only the first measure will be considered.



*Fig.1 : first measure of a Bach score*

### II.1 - Textual description and navigation inside the NIFF coded score



*Fig.2 : the Niff Interpreter window*

The NIFF Interpreter allows its user to read a NIFF coded score. The NIFF file is a binary file. This tool translates the binary file in a textual file according to the tree structure of a NIFF file. The navigation strategy is based on a tree structure.

At the beginning, in this window, only the word « file », « fichier » appears once the NIFF file is opened. This word corresponds to the tree root. Then the user can develop the nodes of the tree by a double-click on the nodes. Therefore, we can see in fig.2 that the development of the file node brings up two new nodes : « setup section » and « data section ». These two nodes are the two main sections in a NIFF file. If we continue to navigate in the data section, we see that this section is divided into pages, then systems. Every system is composed of several staves, which in turn are composed of measures. The totality or only part of the tree can be transcribed.

### II.2 - Transcription of this score in Braille

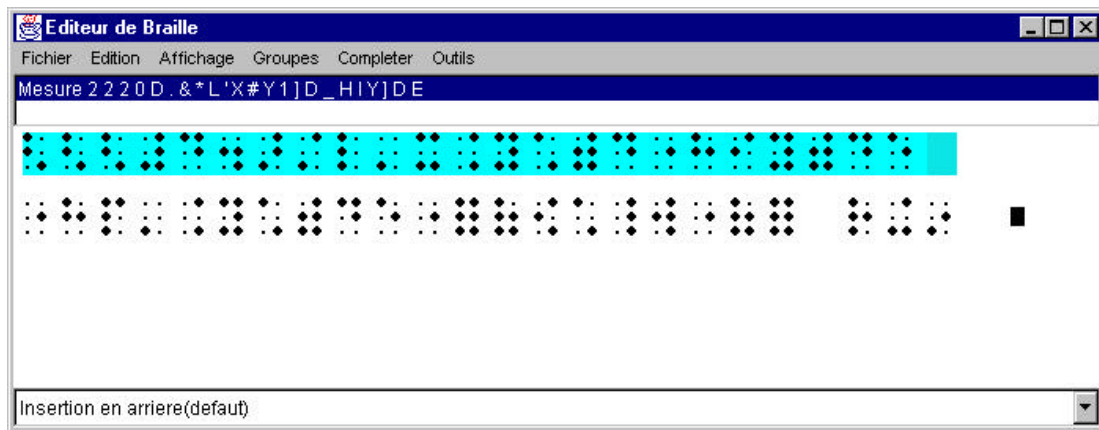


Fig.3 : the Editor window

The result of the transcription of the first measure of the score is highlighted in the Editor window. To obtain this result you just need to select the corresponding node of the first measure (in the NIFF Interpreter window) and activate the « translate selection » menu. The result of the transcription in the Editor window follows rewriting rules as described in the « New International Manual of Braille Music Notation » [2].

### II.3 - Creation of a Braille musical score with the help of specific tools (Punch tool and Dictionary)

The MFB software also allows to directly create in the Editor window Braille scores and then to print them. To do this, the user has several tools :

- **The Punch tool :**

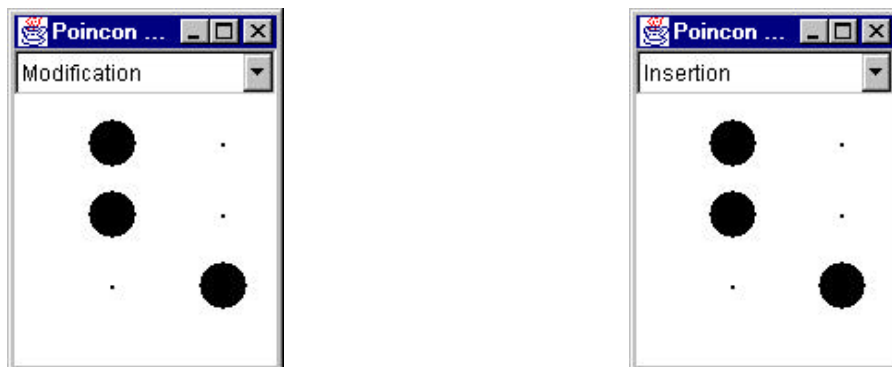
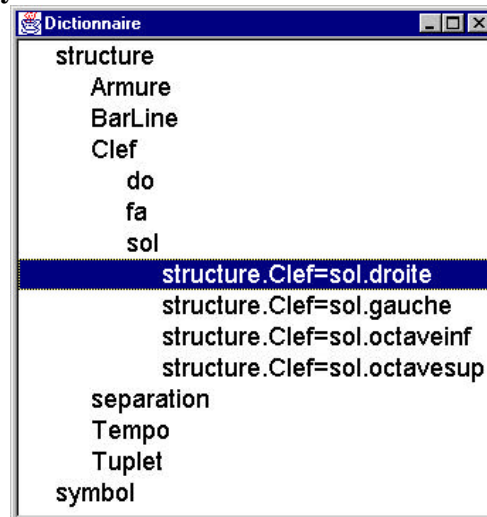


Fig.4 : The Punch tool, in modification and insertion mode

This tool was conceived, at the beginning, to represent the Punch tool used by blind people to write. Six keys on a standard keyboard correspond to the Braille six dots. This tool has been updated to

look like the Perkins keyboard (S-D-F J-K-L keys correspond to the following Braille dots 3-2-1 4-5-6). This tool allows to write a score, character by character, either in an insert mode or in a modification mode. The latter allows to change a character by erasing it and replacing it by the new typed character.

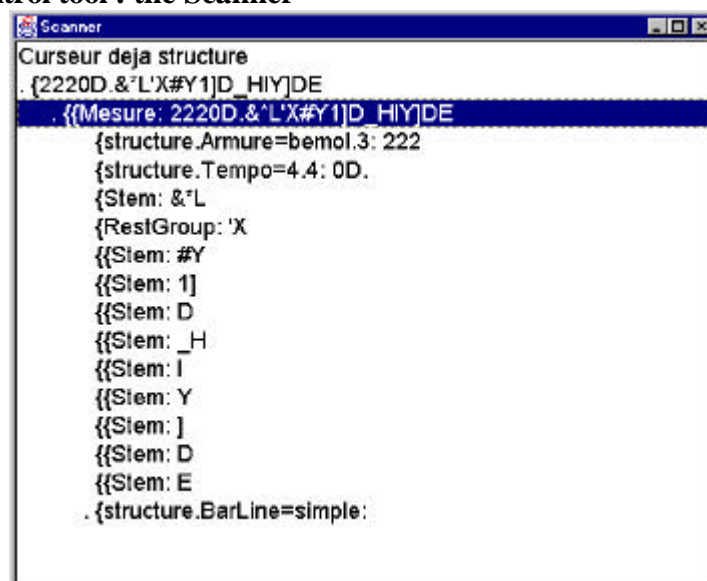
- **The Dictionary :**



*Fig.5 : the Dictionary tool*

This tool allows to create a Braille score without knowing the musical Braille notation. The Dictionary is composed of two parts : a structure section containing musical structures (key, armature) ; a symbol section containing musical symbols like notes, silences... The navigation system in the Dictionary is based on the same principle as the NIFF Interpreter. When we reach a leaf of the tree, in fig.5 right hand G key, a double-click inserts the adequate Braille symbol in the Editor window.

- **A control tool : the Scanner**



*Fig.6 : the Scanner tool*

This tool was created to allow the user to read again, in a textual form, the Braille score (transcribed or created). Thus, on fig.6, we can see for example that in order to describe the key signature

translated from the NIFF file, the text as shown in the Scanner window is as follows : « structure.Armure=bemol.3 : 222 ». It indicates that the described Braille symbol is a musical structure key signature (« armure ») composed of 3 flats and transcribed in Braille as ASCII « 222 ».

### **III - ACCESSIBILITY TO A BLIND PERSON**

We then tried to make this software accessible to a blind person. We worked with the screen reader JAWS (Henter Joyce) as well as the vocal synthesis Eloquence to analyse which modifications to bring to the software.

One of the first problems which was easy to detect was the multi-window factor. As previously seen, every tool creates its own window causing various problems on the screen reader which reads active elements in several windows. This was confusing to the Blind people. To avoid that, we have made it possible for the system to have only one active element at a time and only in an active window.

An other important problem we faced was to allow a blind person to re-read the score in the Editor window. As a matter of fact fig.3 shows that the result of the transcription in the Editor window is only graphical. Going over these characters with a cursor did not give the screen reader any information. To solve this problem we have used the same method as with the scanner tool. So we have added a new area in the Editor window, between the main window and the menu bar (see fig.3). ASCII characters match active graphical characters allowing the screen reader to read the line. The user can read again or change the score in the Editor window.

The navigation within the tree was made possible with the mouse. This tool cannot be used by a blind person ; so we have adopted a new navigation strategy with the help of 4 direction keys and the ENTER key, though one can still use the mouse. To indicate a blind user that he will navigate in the tree structure, each node is followed by the word "opened" or "closed", respectively meaning this node is developed or not yet developed.

We also wanted to facilitate the input of a score by a blind person. Like a sighted person, the user can take the Dictionary to insert Braille characters. As we did with the NIFF Interpreter we have used direction keys and an ENTER key to move around and insert the chosen character (the mouse can always be used). The user can also directly write the score with a standard keyboard, as long as he knows the keyboard pretty well. There is still one last way to do it and that is by using the Punch tool, a very handy tool for blind people who are familiar with the Perkins keyboard.

### **CONCLUSION**

Some improvements have still to be made on this software, both in the Braille transcription and the interface. Additional Braille musical notation rules should be coded to improve the output quality (on screen as well as on paper). Concerning interface problems, the combination between software, JAWS screen reader and a vocal synthesis gives good results. Additional work is required to obtain good results with tactile peripherals. Right now, when we create a configuration of the tactile peripheral as a reflection of the vocal synthesis, the results seem to be satisfactory. In the future, we would also like to create an additional tool in order to use this software for the teaching of musical Braille and include a MIDI output of the score.

## **REFERENCES :**

[1] NIFF 6.A, General Discussion, 1995. download:

<http://mistral.ere.umontreal.ca/~belkina/NIFF.doc.html>

[2] New International Manual of Braille Musical Notation, Bettye Krolick, World Blind Union, 1996.