EXPLORING THE POTENTIAL OF THE DEDICATED XML SYNTAX FOR DIATONIC HARMONICA TABLATURES

Vladimir Tomberg  
Tallinn University  
Narva mnt. 25, Tallinn,  
Estonia  
vtomberg@tlu.ee

Eugene Ivanov  
C.A. Seydel Söhne GmbH  
Robert-Koch strasse, 1,  
Klingenthal, Germany  
jim@seydel1847.com

Mart Laanpere  
Tallinn University  
Narva mnt. 25, Tallinn,  
Estonia  
mlaap@tlu.ee

ABSTRACT
This paper examines the need for and possibilities of developing XML syntax for describing harmonica tablature. Harmonica is a cheap and popular musical instrument, and it is often learned without any theoretical background or systemic instruction. Most amateurs don’t have formal musical education, and cannot read notes. For that reason, harmonica players widely use the tablature or so-called “tabs” — a method of describing music in terms of blow and draw holes played versus the standard notation. There are many websites and manuals offering various harmonica tablatures, but due to the lack of a unified format, they are often not compatible with each other. In this paper we discuss the peculiarities of different styles for tablature visualisation and examine the need of creating a unified syntax standard called HarpTab. We provide use cases for this syntax, with emphasis on creating reusable learning materials for novice harmonica players.

1. INTRODUCTION
The harmonica (also called mouth organ or harp) is a unique musical instrument in many aspects. From the physiological point of view, it is the only wind instrument that is played both inhaling and exhaling. This gives the instrument a unique intonation. In the 20th century, the instrument has undergone significant improvements, and new playing techniques have extended its musical potential. Those new techniques require a special form of visualisation. And tablature serves this purpose, because it was designed specifically for the harmonica. We are researching the potential of using tablatures online for learning purposes.

2. TABLATURE
Tablatures (or simply tabs) are an alternative method of describing music that is used for different types of instruments. The oldest sources mention tablatures for lute, and modern use includes guitar, bass, drum tablatures, and more. There are also tablatures for exotic instruments, such as concertinas, or diatonic accordions [1]. In contrast to standard sheet music, tablatures are not built around any exact keys or notes. Tablatures describe music using strings and frets, holes, knobs, etc. Changing the key of the musical piece usually has no effect on tablature, because the tuning of the instrument can be altered, or the instrument is made in different keys. This makes it easy to play in different keys by learning the song only once. Tablatures are very simple and strictly instrument-oriented, so they can be used at the novice level without any special preparation.

2.1. Layout and Playing
Because most melodies are written for one specific key and scale (e.g. C min, D maj etc.), they mostly utilize the notes that constitute that scale. For example, a C major scale uses 7 notes: CDEFGAB, leaving out five intermediate notes.

Diatonic harmonicas were initially designed to be played in several keys and scales only. For this reason, harmonicas are made in different keys. The key of the instrument comprises two terms: the pitch of the root note in the tonic chord (i.e. C, D, E), and the tuning (i.e. major, minor).

A common diatonic harmonica has 10 holes (Figure 1), though there are rare variations with 4, 6, 12, or 14 holes. Each hole has two reeds – one vibrates on inhaling (draw), another on exhaling (blow). This allows getting 20 notes from 10 holes (certain holes may give the same note). A full octave constitutes 12 notes. If they were arranged in a sequential chromatic order, the whole 10-hole harmonica would have only 1.5 octaves. For that reason, the scale is compressed to enable 3 octaves from the same 10 holes. The tonality of holes varies depending on the tuning.

Figure 1. Diatonic harmonica with 10 numbered holes.  
Part of the picture from ‘Building Harmonica Technique’ [2]

2.1.1. Harmonica Tuning
Unlike instruments with fixed tuning (e.g. the piano), diatonic harmonicas can have alternative tunings. There are hundreds of various tunings besides the standard “Richter Tuning”. These tunings were created to compensate the limits of the standard tuning — logical,
stylistic, and technological. In general, alternative tunings are designed to achieve the following goals:
- easy playing, and more expressiveness in a specific style or scale;
- chromatic playing without using overbends (there are playing techniques that allow smarter use of the compressed note arrangement, giving 37 notes from 10 holes on the standard major tuning (3 full octaves + one note on top). These techniques are called bending and overbending (thus, the notes produced using that technique are named bends and overbends);
- adding more chords and intervals.

Pat Missin [3] lists 220 alternative tunings for diatonic harmonicas, classifying them into 14 major tunings, 17 minor tunings, 29 antipodean tunings, 24 12/14-hole tunings, 21 spiral tunings, 8 Spanish and related tunings, 35 magic dick tunings, 4 Joe Filisko tunings, 10 Kraus tuning, 4 modal rearrangements, and 54 oddities.

2.2. Tablatures’ Visualization

Analysis of 40 existing harmonica playing books shows that all authors use tablatures, sometimes in conjunction with notes, sometimes without it. This approach has more reasons than just traditions. The main peculiarity of tablatures — they don't reflect musical notes and are not tied to any specific sound pitch. Instead, they describe hole numbers, direction of airflow (blow or draw), and special techniques (bends, overbends, etc.). These peculiarities are typical only for diatonic harmonicas, making harmonica tablatures unique relative to other instruments.

To illustrate the variety of visualization approaches below, we provide examples of 9 harmonica tablatures as they are shown in books of different authors. In the first example (Figure 2), very simple tablature is shown; where B stands for “blow”, D for “draw”, and Db marks a draw bend.

![Figure 2. Tablatures from ‘Beginner Blues Harmonica’ [4]](image)

Figure 3 shows another notation used by Ball [5]: numbers denote holes, straight arrows show direction of airflow, curved arrows show bends.

![Figure 3. Tablatures from ‘Sourcebook of Little Walter/Big Walter Licks for Blues Harmonica’ [5]](image)

The same author uses a little different notation in another book. Figure 4 illustrates the same above approach with difference in visualization. The length of arrows indicates duration of sound.

![Figure 4. Tablatures from ‘The Sourcebook of Sonny Terry Licks for Harmonica’ by Tom Ball [6]](image)

In Figure 5, different numbers denote holes and rhythm count, notes show duration of sound, and B indicates bends.

![Figure 5. Tablatures from ‘Teach Yourself Blues Harmonica - 10 Easy Lessons’ [7]](image)

Figure 6 uses notes doubled with peculiar geometric shapes to distinguish bends, and V marks direction of airflow. Regular notes used in parallel.

![Figure 6. Tablatures from ‘All-American Harp’ by Charlie McCoy [8]](image)

Figure 7 also uses geometric shapes distinguish bends; arrows show duration and effects, such as vibrato and glissando. Regular notes used in parallel.

![Figure 7. Tablatures from ‘Blues Harp for Diatonic and Chromatic Harmonicas’ [9]](image)

Figure 8 is a tablature example from B. Power. Numbers indicate holes, and plus and minus signs distinguish direction of airflow. Regular notes used in parallel also. In later editions Power uses triangles to show direction of airflow.

![Figure 8. Tablatures from ‘Play Irish Music on the Blues Harp’ [10]](image)
In Figure 9, colored circles are used to indicate air direction. Black circles show draw notes, white – blow. Arrows show bends. This tablature is also used together with notes.

Figure 9. Tablatures from ‘Rock Blues Country Harp’ [11]

Examples above demonstrate lack of a universal standard both in data structure, and visualization methods. It is evident that such variety does not improve interoperability.

2.3. Pros of Using Tablatures
The main advantage of tablatures is their simplicity. Unlike notes that require formal musical education, tablatures are very easy to learn, even for children. Besides, most diatonic harmonicas have hole numbers engraved on the cover plate, and all tablatures have numbers as well, making learning songs intuitive.

Another important advantage is unambiguous description of the method of playing. Meaning, on a C major diatonic, tablature will show which one of the two G notes is played — 2 draw, or 3 blow (G is doubled in Richter tuning). Unlike notes, tablatures can describe specific harmonica techniques. Almost all tab visualizations have methods of describing bends.

2.4. Cons of Using Tablatures
In spite of the advantages, opponents of tablature use emphasize several its shortcomings, such as:

- No description of exact notes. Tablatures do not develop note logic;
- There are too many variants of visualization. This makes it hard to parse tablatures in programs;
- No easy way to exchange graphical tablatures. Special symbols (arrows, etc) are hard to type digitally;
- No known visualization for overbends. The technique is quite advanced, and is usually not available for amateur player. Meanwhile, tablatures are generally used at an early learning stage.

Despite the fact that tablatures were designed specifically for harmonicas, they fail to describe all playing techniques, e.g. overbends or articulation. Overbends began to be widely used in the 70’s, so old books can't have any mentions of it.

3. REQUIREMENTS FOR CREATING A SYNTAX FOR TABLATURES
The MIDI standard has been created in 1982. The main confusion is that MIDI was mainly designed as a protocol transmitting data about key pressing. MIDI was not designed for music notation, and before keystrokes are transformed into notes, interpreting should be done [12]. “MIDI doesn't have any sense of beams, stems, ties, or other staples of music notation, it can't be used to move the score from one application to another.” [13]. Nowadays, it is obvious that MIDI is getting outdated. At the hardware level, it is getting replaced with OSC, mLAN and HD Protocol. At the software level, the most popular alternative is MusicXML.

MusicXML is an XML-based notation format that is designed to avoid known drawbacks of MIDI. MusicXML developers were aiming at making an interoperable and open format.

We also suggest using XML syntax for harmonica tablatures because XML is easy to understand both for a machine, and for a human. Let’s call this XML syntax HarpTab. Creating XML schemes would allow standardizing the tablature format, and easily extending it on demand in the future. One of the advantages of using XML is the ability to use XSLT to interpret and visualize tablatures at any difficulty level. It means that same tablatures can be visualized as plain HTML or as rich SVG graphics (Figure 10). This possibility is especially useful for harmonica tablatures, because different musicians use various visual interpretations for tablatures.

![Diagram of HarpTab XML XSLT process]

We assume that a universal harmonica tab format must increase the number of teaching material written, and urge the popularity of the instrument itself.

4. TARGET GOALS AND EXAMPLES
Our main goal is to create a simple interoperable language to write tablatures, designed specifically for diatonic harmonicas, and not burdened with excessive functions like universal notation languages. Unlike MusicXML, our format does not imply any specific visualization method, and interpreting is delegated to software that uses the tablature data.

The Internet contains a lot of learning materials with tabs, written and supported by harmonica enthusiasts. The absence of metadata and the mixture of
 incompatible formats don't allow to index and analyze those tabs electronically. A musician who interprets a song is always writing his own tabbed version, and most of the songs have different tablatures made by different people. Indexing would allow quickly finding all tab versions of the same song, analyzing, and comparing them. The simplicity of syntax will assist its faster adaptation by software used by the harmonica community.

We plan to use only the most necessary metadata. Common metadata can be shared with existing syntaxes such as Dublin Core, or MusicXML.

Modern file formats show superiority of open data formats over proprietary. It is absolutely clear for us that tablature format should use free open source licensing to allow the developers quickly adapt it to their needs.

4.1. Use Cases

We propose various basic examples of using harmonica tablatures syntax (Figure 11), such as:

- Storing, indexing, and search tablatures. Special repositories with metadata indexing can be developed;
- Visualization of tablatures. Reading tabs on screen of different devices (computer, e-book, mobile devices etc.), printing tabs as music scores;
- Playing tabs with a special player. There are various possibilities for rendering of sound available. Learners can play tabs by parts, with metronome, with and without visualization of harmonica etc.;
- Export and import from and to other formats, e.g. MIDI, MusicXML. Tools for such task can be useful for teachers who create harmonica tablatures.

5. CONCLUSION

This paper explored the needs for creating a minimalistic syntax for harmonica tablature. Our analysis shows that tabs are often used by novice musicians for learning purposes, and are not standardized. It is obvious that a universal tablature format combined with the power of online services that can utilize it will support the popularity of the instrument among amateur musicians. After completing the tab format, we are planning to develop services that provide basic functionality: a tab repository, several web front-ends to it, a tablature converter from/to MIDI and other formats, visualizers, and tablature players.

6. REFERENCES