# Sao Mai Braille - Demonstration Paper at ICEB 8th General Assembly

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## About Sao Mai Braille (SMB)

SMB began development in 2018 with the goal of providing a unified solution in the Braille conversion process for text, images, mathematics, and music. We aim to assist both blind users and transcribers in producing Braille materials more quickly, effectively, and at a lower cost with this additional free tool.

This demo presentation will quickly introduce four key feature modules of the software: literature text, tactile images, mathematics, and music. It will also cover how to prepare for final Braille conversion ready for embossing or reading on a Braille display.

## Literature Text

Editing and formatting text with SMB is similar to other mainstream editors like Microsoft Word.

In this demo presentation, I am using a sample print document that includes headings of levels 1 to 3, an ordered list with 3 levels, and a data table consisting of 4 columns and 3 rows.

SMB has both print and Braille styles. The print style is applied to printed documents, while the Braille style is used for text translated into Braille. To manage Braille translation rules for styles, open the Options dialogue from the Tools menu and select the Styles page. Within this page, there are subpages to manage text styles, font attributes, table of contents, and data tables.

SMB uses the well-known LibLouis library to translate literature text into Braille with more than 150 different language translation code tables. To manage tables, open the Options dialogue and select the "Translation Tables" settings page.

To apply a table for selected text, navigate to the Tools menu, then open the "Translation Tables" submenu, and select a table. Any text not applied a table will be translated using the default Braille table.

## Mathematics

SMB supports inputting math equations, importing/exporting between LaTeX and MathML, and converting them to both Braille and speech.

SMB uses the MathCAT library to handle the speech and Braille conversion for math equations. Currently, it supports NEMETH, UEB, CMU, and Vietnamese math Braille codes.

To insert a math equation, go to the Insert menu and choose Equation, or press Alt+F9. You can directly input LaTeX code in the Expression edit field of the Equation page. Press Alt+d to search equations by name or Alt+S to search by category. Now I am going to insert a two-case equation with two variables.

To edit an existing equation, move the cursor to the equation and press Alt+Enter.

## Image

Besides inserting and displaying images in the print document, SMB fully supports the process of drawing, editing, and converting images into tactile graphics.

SMB integrates the Sao Mai Graphics (SMG), a tool for drawing and editing images. The SMG tool can also be downloaded, installed, and run as a standalone application.

By default, SMB will ignore all images when converting from print to Braille. To change the settings, go to the Tools menu, open the Options dialogue, and choose the "Tactile Graphics" settings page.

Now I am going to insert an image of the morning star, which is called "Sao Mai" in Vietnamese language. Then, from its property page, I will provide a description text. Press Alt+F10 or choose Picture from the Insert menu to insert an image. Move the cursor to the inserted image and press Alt+Enter to open its property page.

## Music Score

SMB uses the BungSang Braille music translation engine to translate scores written in MusicXML standard into Braille. Most mainstream music notation software such as Finale, Musescore, and Sibelius can export scores into MusicXML files. Additionally, there are numerous online resources available to search for MusicXML files, such as on Musescore.com.

From the print document window, press Alt+F11 or choose "Music score" from the Insert menu to insert a MusicXML file. Press Alt+Enter or choose "Score info" from the Tools menu to edit basic information of the score before translating it into Braille.

There are more than a hundred music Braille translation options, making it very flexible to meet different user needs.

Now I am going to insert a basic Piano score into this demo document, then we move to the next step to prepare and translate the whole document into Braille.

## Page Numbering

Press F2 to move to the header and footer, then choose "Page number" from the Insert menu to set the page number on either header or footer.

Select the line with the inserted page number and align it to the left (Ctrl+L), center (Ctrl+E), or the right (Ctrl+R). Press Alt+Enter to open the page number property dialogue where you can choose different number formats.

When done, press Escape to go back to the main document.

## Table Of Contents (TOC)

SMB relies on the document heading structure to generate the table of contents. Go to the Insert menu, choose "Table of contents," and then choose "Generate TOC." This will create a table of contents at the location that is set in the Options dialogue.

## Braille Paper Size

Whether you want to translate the document to read on a Braille display or emboss, you might need to set the paper size by choosing the number of Characters Per Line (CPL) and Lines Per Page (LPP). Open the Options dialogue from the Tools menu, then choose the Embosser setting page to set up. By default, we leave it with 40 CPL and 25 LPP.

## Braille Translation Table

### For text:

To change the default table, open the Options dialogue from the Tools menu, choose "Translation tables" settings page, and click the Browse button next to the "Default Braille table" to change it.

To enable more tables in the "Translation tables" submenu of the Tools menu, also from this "Translation tables" settings page, move to the "Available tables" list, and check the table you want to enable.

### For Math Braille code:

Open the Options dialogue from the Tools menu, choose the "Math equation" page, then on the Braille settings page, choose the desired Braille math code.

## Translate into Braille

Press Ctrl+T to start translating the document into Braille.

Some notes:

1. All text, math equations, and music scores are translated into Braille. However, images are only converted to black-and-white versions, not converted into Braille tactile form yet. They will convert to Braille tactile graphics when embossing or saving the document to a Braille text file like BRF.
2. You can press Alt+Enter on the image in the Braille document to open the SMG tool. From there, you can further edit the picture for better translation into tactile graphics when embossing or saving to a Braille text file.
3. Due to screen readers not supporting SMB’s rich-text editor control yet, screen reader users might not see Braille spacing shown correctly on a Braille display. However, it's actually well-formatted on the screen. To show it correctly on a Braille display, press F8 to view as BRF, or F9 to view as BRL. Press Escape to close the view.