



Nemeth code to print-math backtranslator

User Manual

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Overview of TransBraille

TransBraille is **a software** package that helps teachers **teach** mathematics to blind students. This package is developed using image processing and special language translation techniques. The prime use of this software is to help **sighted** teachers **teach** mathematics to blind students. In just a few easy steps, the teacher can convert a Braille page typed by a blind student **into “Print Form”, readable by sighted people** thereby saving a lot of time for the teacher.

Salient Features of the product :

- Takes as input, a scanned copy of the Braille sheet hand typed on a Perkins Braille **and outputs a PDF file.**
- *TransBraille* can handle slanted typed lines as well as irregularly typed lines
- Documents can contain Nemeth Code and Literary Braille. Nemeth Code expressions are automatically separated from contracted braille text
- *TransBraille* also handles spatial math:
 - Determinants
 - Matrices
 - Grade school,
 - Addition
 - Subtraction
 - Multiplication
 - Long Division, etc.
- Nemeth Code Syntax errors made by the student are detected and confined to the smallest possible area and rest of the document is translated correctly
- User has full control at every step and change / modify the document in any of the intermediate steps
- User has the choice of either do step by step conversion or do direct conversion

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1 Hardware requirements

Disk Space:

Memory: 128MB. (256MB recommended)

CPU: Pentium III or faster

Scanner: 300DPI resolution (recommended) or more

Printer: Inkjet or Laser (recommended)

2 Software requirements

Operating System: Windows XP (All variants) or higher

Adobe Acrobat Reader (Need to install this)

MiKTeX (Aspell installer is a part of *TransBraille* package. Need to install this)

ASpell (Aspell installer is a part of *TransBraille* package Need to install this)

PROLOG (Software part of *TransBraille* package)

3 Installing *TransBraille*

→ Put the CD of *TransBraille* in CD ROM

→ Install 'aspell' from the CD.

→ Install 'Miktex' from the CD

→ Add "C:\Program Files\Aspell\bin" to your windows path

→ Now run the setup for *TransBraille*.

→ Follow the instructions of the installer.

→ It will navigate you and help you throughout your installation process.

→ When installation is finished you can see shortcut of *TransBraille* on your desktop as

well as it will create a folder "C:\Program Files\Logical Software Solutions" where all the executables and supporting resources are copied

4 Using *TransBraille*

4.1 Scanning the Braille Page

→ Scan the back side of the Braille page to avoid ink marks, if any, on the front side of the Braille page. Scanning should be done at 300DPI resolution. (A sample image with staple marks and ink marks is shown in APPENDIX figure – A1) Front side of the image can also be scanned but then ink marks if any should be manually removed from the image.

→ Save the scanned Braille page on your computer in JPEG Formatⁱ

→ Proceed to Next Step. (4.2)

→ *In case of a clean Braille sheet you can move on to step 4.3*

4.2 Edit the Braille Page using MS Paint

→ Open MS Paint.

→ Open the JPEG image that you saved in previous step. (4.1)

→ Flip the image horizontally/ vertically depending on how image is scanned.

→ Delete staple marks, ink marks on the image, if any *using MS Paint eraser*.

- Select any area on the image that does not contain blobs and copy it.
- Paste the copied area on the deleted area.
- Save the image.
- Proceed to Next Step. (4.3)

4.3 Loading the Braille Page

→ Open *TransBraille*. You will see a blank window as shown in figure 1.

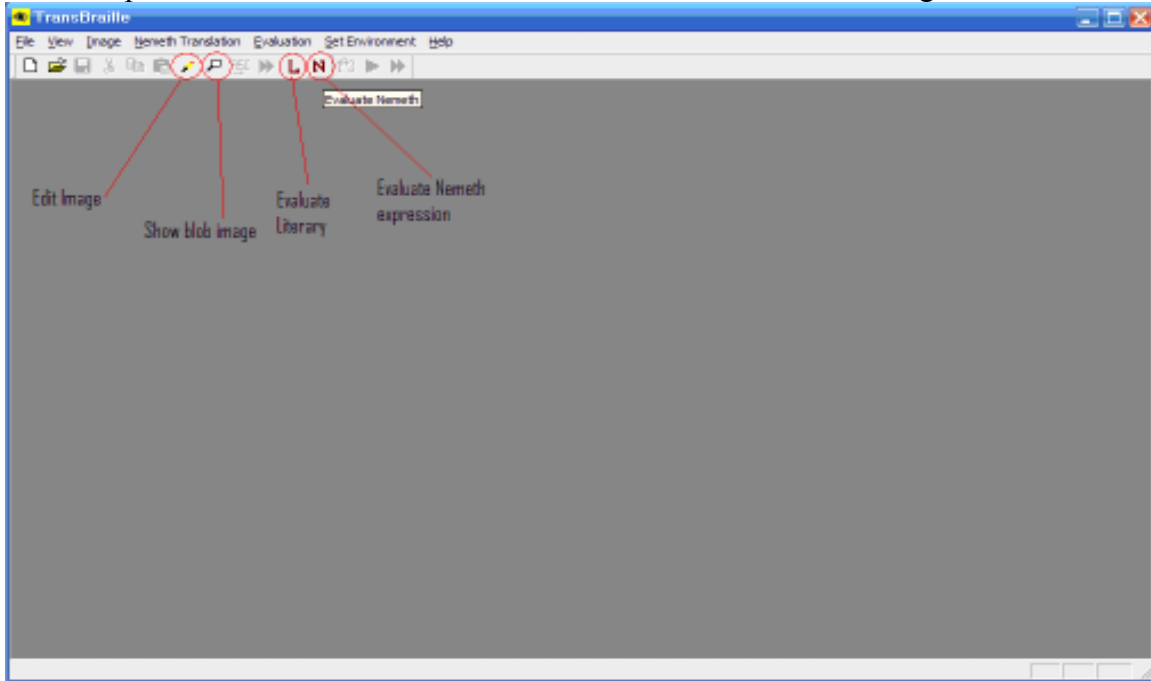


Figure - 1

→ Click on File > Open. You will see a dialog box as shown in figure 2.

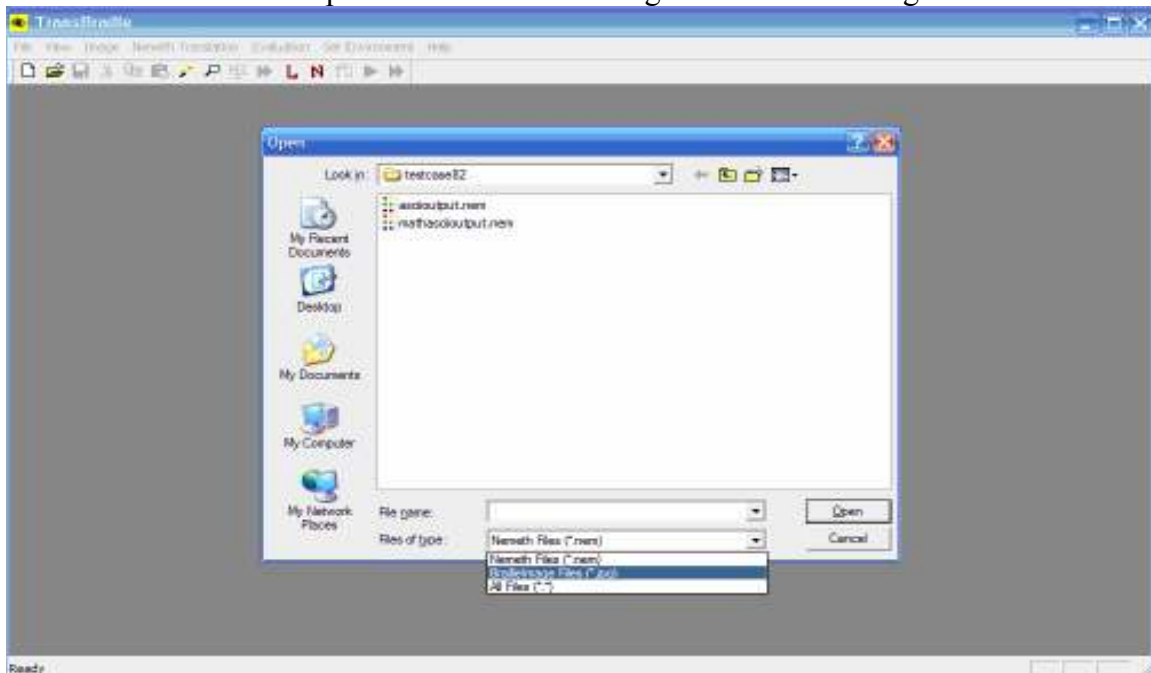


Figure – 2

- Select “BrailleImage Files (*.jpg)” from the “Files of type” drop down box.
- Select the JPEG file saved in step 4.2.
- Click Open.
- The Braille image loads into the window. The window will appear as shown in figure-3.

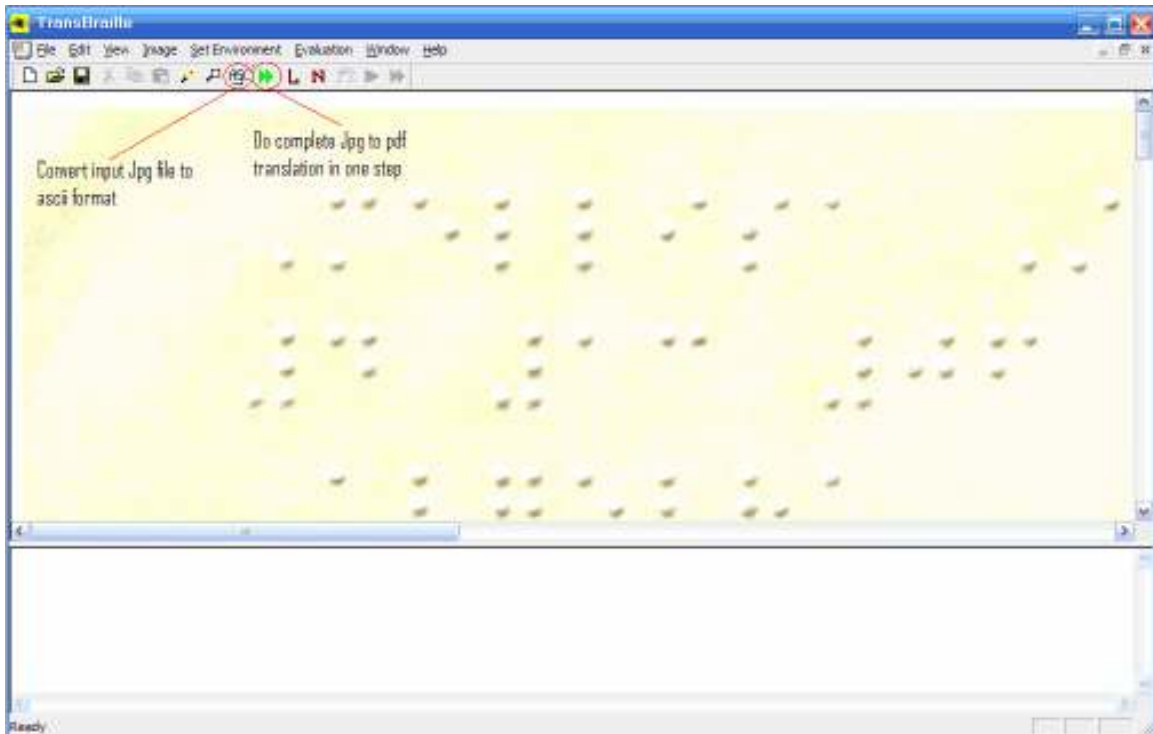


Figure -3

4.4 Converting into ASCII

- At this point there are two options, either do step by step conversion or do direct conversion
- In step by step conversion, select menu “**Image > Convert to ASCII**” or use the shortcut button on the toolbar *as shown in Figure - 3*
- A warning message will be displayed. Click OK.
- If the system is uncertain about a certain line, it asks you if the blob on a particular line belongs to left column or right column.
- Verify the same with the original Braille page and select either “LEFT_COLUMN” or “RIGHT_COLUMN”
- Press OK.
- The dialog box is shown in figure 4 below.

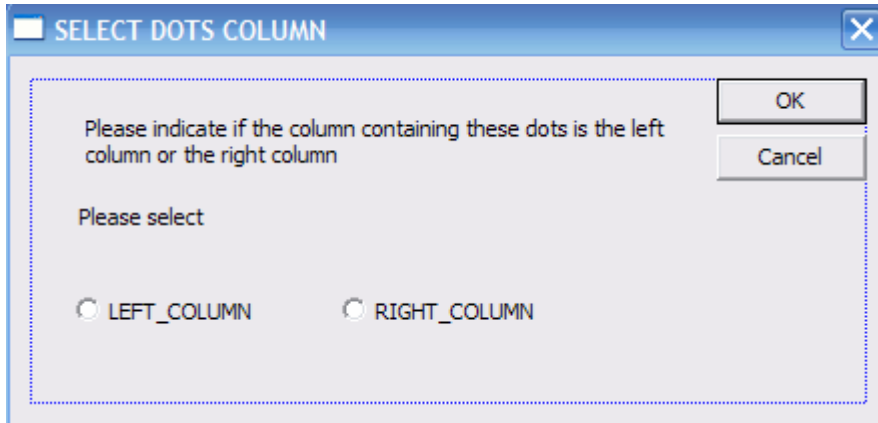


Figure - 4

- By following above steps ASCII file is opened in the document view as shown in Figure 5
- For further translation proceed to next step (4.5)
- Otherwise to avoid going through intermediate steps manually, there is an option to convert input JPG file to PDF format.
- To do it select menu “Image > Convert To PDF” or use shortcut button on the toolbar.
- It will internally do all the intermediate stages and final output in PDF format will be shown

4.5 Separating Math

- The window with Nemeth File will look like as shown in figure 5 below.

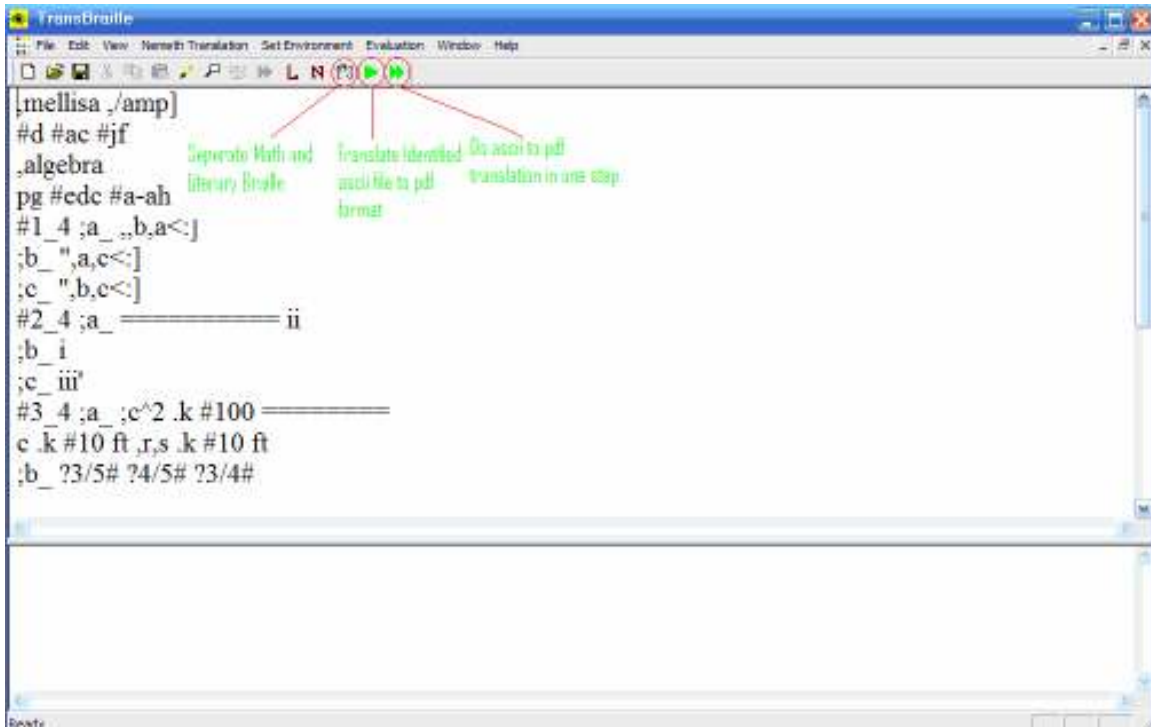


Figure – 5

- There are two options given to user.
These two options are

1. Stepwise Conversion

A. Identification of Nemeth Math and literary Braille

B. Translating delimited (identified) ASCII file to print math(PDF)

2. Do complete conversion in one step. Here user need not bother about identification of math. Identification is done internally.

- To do step wise conversion ,
- Select “Nemeth Translation > Separate Math” from the Menu or select corresponding button on toolbar as shown in figure-5
- Select “Nemeth Translation > Show MathTag” from the Menu
- The Math Tag resembles a HTML Tag. A math expression is enclosed between and
- Double click the left mouse button to insert $and double click the right mouse button to insert$
- Once the desired changes are made to the Nemeth File, click on the “save” icon on the toolbar to save the file.
- Proceed to next step. (4.6)
- For Complete conversion in one step, select ‘Nemeth Translation > Convert ASCII to PDF’ It internally does the math separation and generates *the* Latex file. Which is converted into PDF format and is opened in “acrobat reader”.
Proceed to next step (4.7)

4.6 **Converting to LaTeX**

- Click on the “Nemeth Translation > Convert separated ASCII to Latex” from the Menu or corresponding button on toolbar as *shown* in figure-5
- Once the conversion is completed, a dialog box will popup asking if you would like to view the Latex file.
- Click “Yes” to view the latex file or “NO” if you do not wish to view the Latex file.
- After your selection, the latex document will be converted to a PDF document and is saved in the same folder as your Braille Image.
- Click ‘Yes’ in the dialog box that appears to view the PDF output.
- Proceed to Next Step. (4.7)

4.7 **Printing PDF Document**

- Now that you have viewed the PDF document, you may wish to print the document by clicking “File > Print” from the Menu.

4.8 **Other Features of TransBraille**

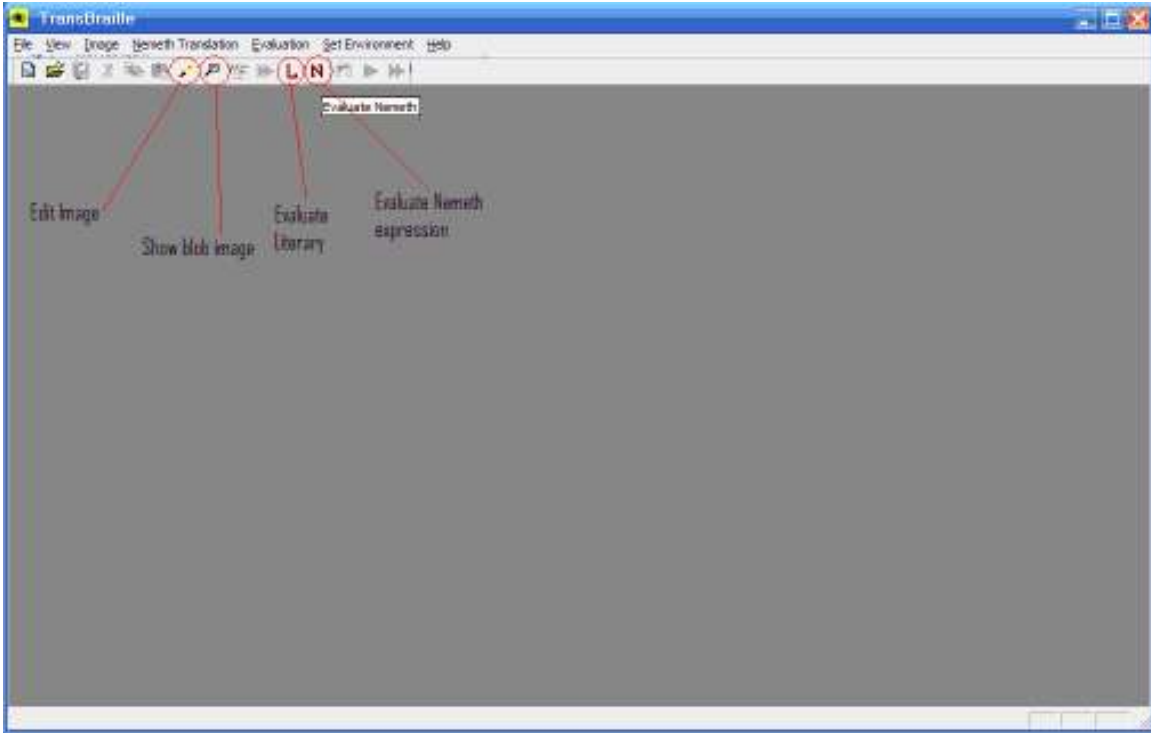


Figure - 6

1. **Edit Image** : This feature opens jpg image in MS Paint and allows user to edit the image . To use this feature, select “Image > Edit image” or select corresponding button on the toolbar as shown in the figure - 6. ***Using MS Paint eraser user can edit jpg image. After editing the image save the file.***



Figure - 7

2. **Show Blob Image** : This feature shows the blob image to user. This is very helpful feature in the scenarios where input image is not very bright and it is

difficult *to* recognize the dots. To use this feature , select “Image > Show blob image” from menu or select corresponding *button on the* toolbar as shown in the figure – 6 Blob image will *appear* as shown in figure-8

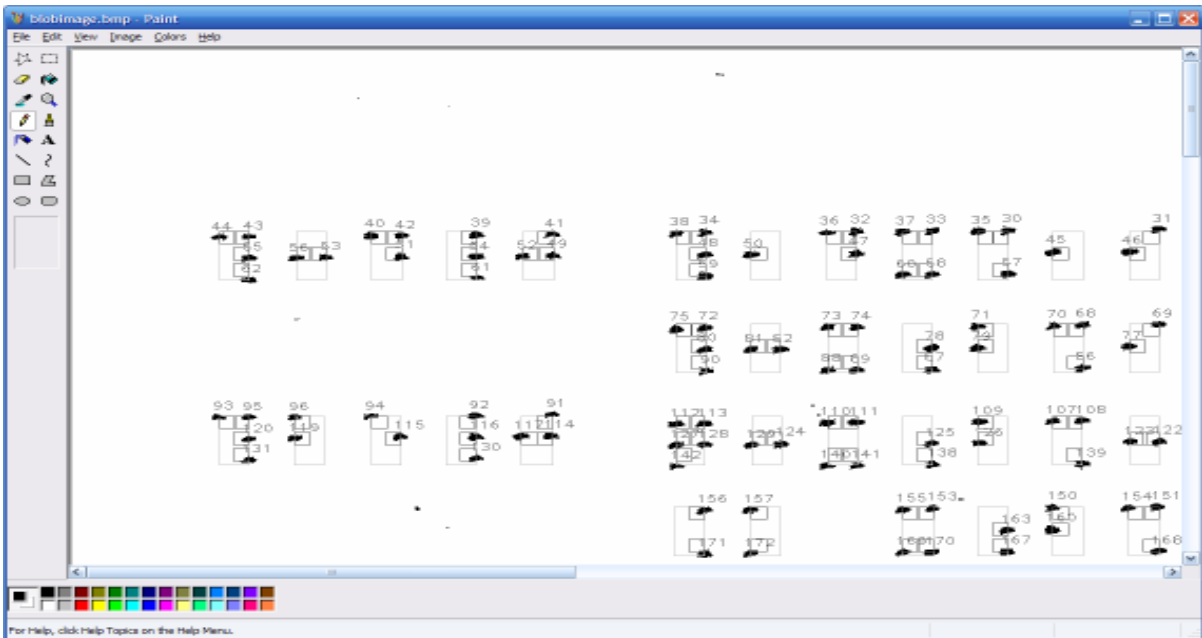


Figure - 8

3. **Translate Contracted Braille:** This feature allows user to evaluate the literary Braille.

As shown in the following figure (figure -9) user can input contracted Braille in the text box named “Enter Literary Braille Text”. After pressing button “Translate” corresponding latex expression along with error message if any, is displayed.

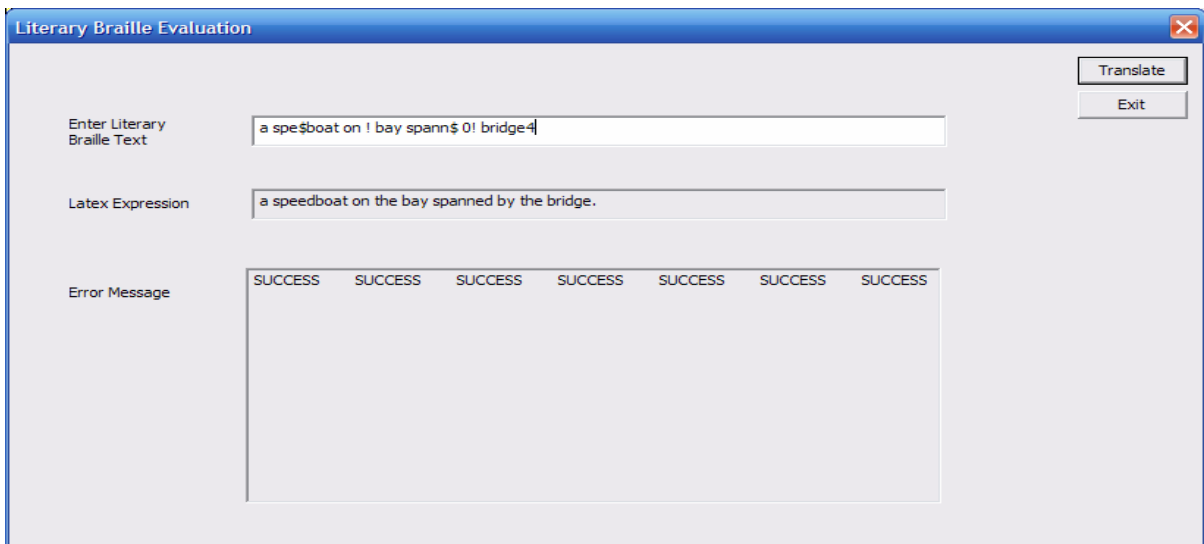


Figure - 9

4. **Translate Nemeth Expression** : This feature allows to evaluate nemeth expression.

As shown in the following figure (figure - 10) user can input Nemeth Expression in the text box named “Enter a Nemeth Math Expression”. After pressing button “Translate” corresponding latex expression along with error message if any, is displayed.

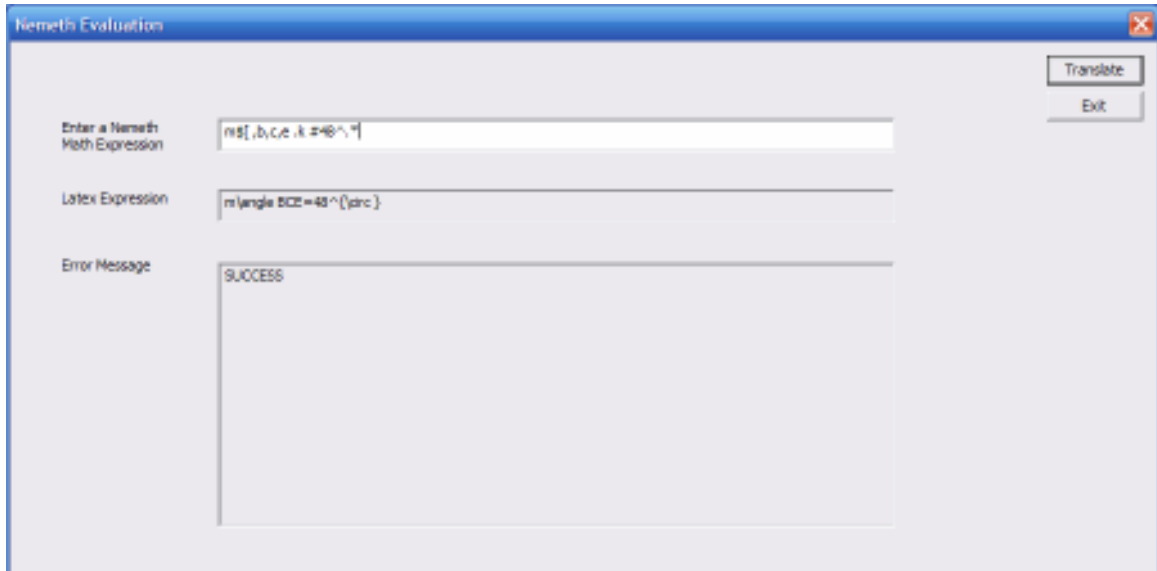


Figure – 10

5. **Set environment** : It allows to set the following environment parameters
A. Image threshold :

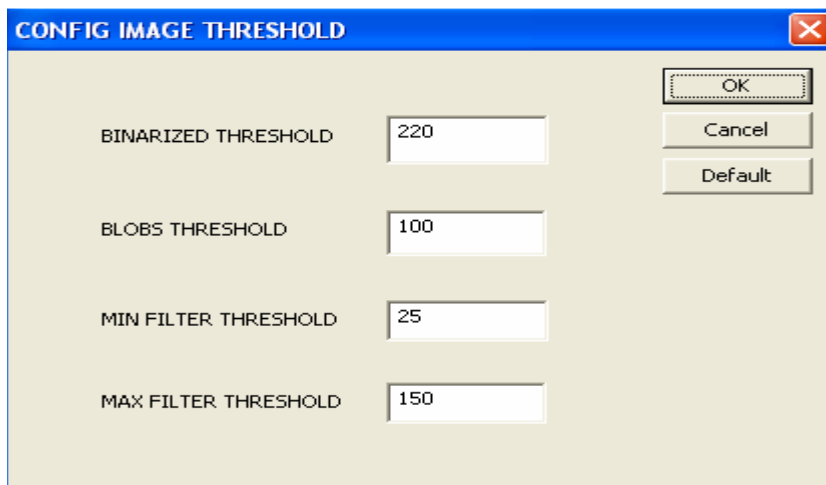


Figure – 11

As shown in figure 11, we can set four environment variables associated with Image threshold.

1. Binarized Threshold : Gray scale ,depending on which pixel will be binarized.
2. Blob Threshold : Minimum number of *continuous* pixels for a blob to be considered as a Braille dot.
3. Min Filter Threshold: TBD
4. Max Filter Threshold: TBD

B. Image File name: It sets the output files names for the image processor.

File name that can be changed are:

1. Blobs file name
2. Image filter file name
3. Mark blobs file name
4. Warning file name
5. Line Dimension file name
6. Mark CHAR file name
7. Mark DOTS file name
8. ASCII file name
9. BLOBS image file name
10. Dots and text file name

C. Nemeth FileName: This option is used to set the file names for

1. Error report file name
2. Log file name.

It also asks whether to generate PDF file or not.

5 APPENDIX

5.1 *Sample image showing staple marks and ink marks on a Braille page*

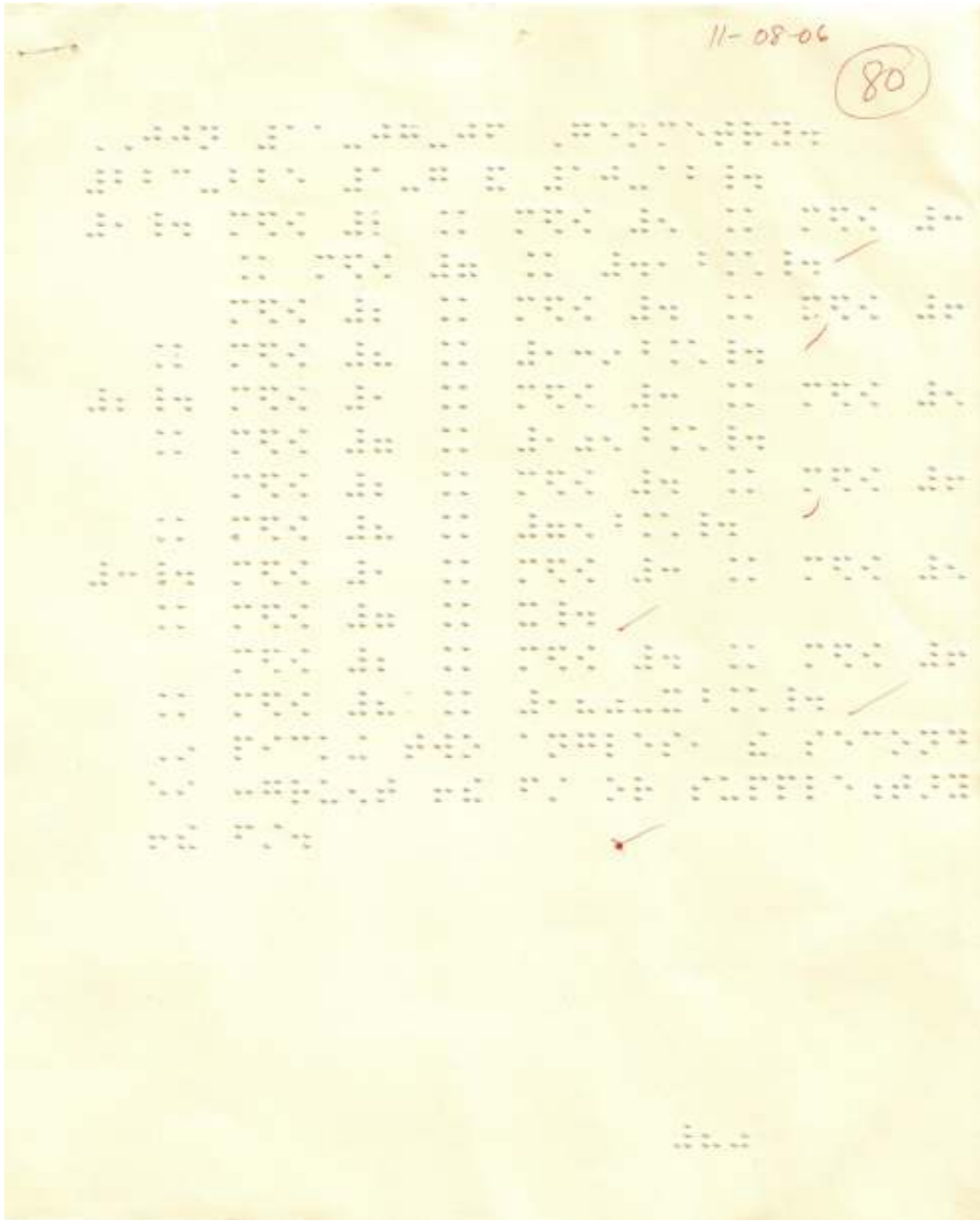
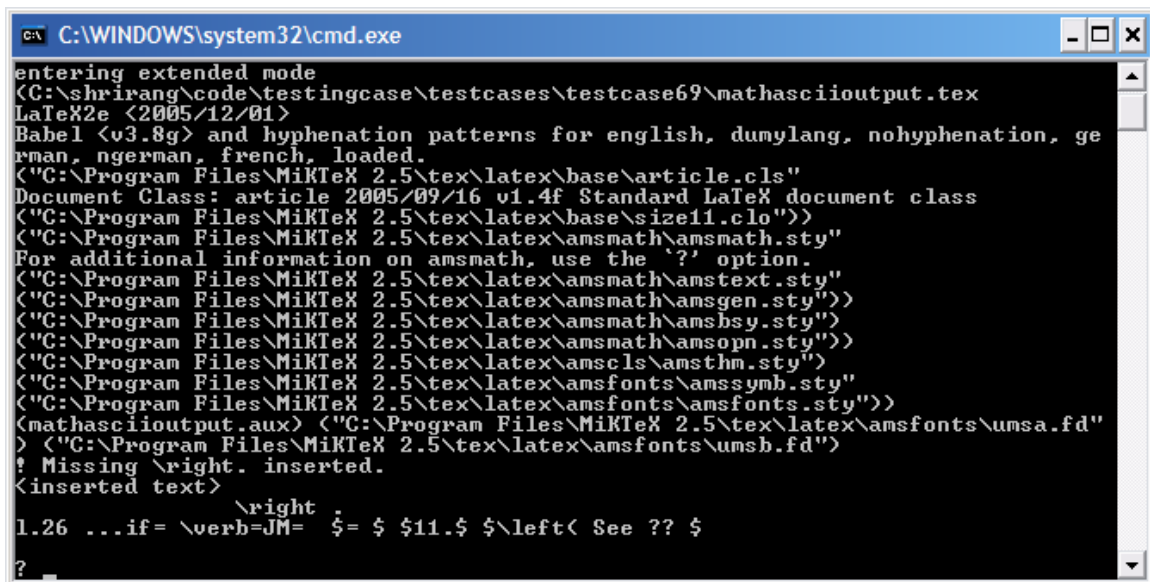


Figure – A1

6 Troubleshooting

- Scenario 1 : Nemeth file is opened and some changes are made to it and then the translator is called. But still changes are not reflected in the output file.
Solution : It is very important to note that every time you make any change in any of the open files, **that file should be explicitly saved** before using it as an input in any of the phases of the translation.
- Scenario 2 : While converting to PDF a black screen comes as shown in figure – 12 and nothing happens after this



```
C:\WINDOWS\system32\cmd.exe
entering extended mode
(C:\shrirang\code\testingcase\testcases\testcase69\mathascioutput.tex
LaTeX2e <2005/12/01>
Babel <v3.8g> and hyphenation patterns for english, dumylang, nohyphenation, ge
rman, ngerman, french, loaded.
<"C:\Program Files\MiKTeX 2.5\tex\latex\base\article.cls"
Document Class: article 2005/09/16 v1.4f Standard LaTeX document class
<"C:\Program Files\MiKTeX 2.5\tex\latex\base\size11.clo">>
<"C:\Program Files\MiKTeX 2.5\tex\latex\amsmath\amsmath.sty"
For additional information on amsmath, use the '?' option.
<"C:\Program Files\MiKTeX 2.5\tex\latex\amsmath\amstext.sty"
<"C:\Program Files\MiKTeX 2.5\tex\latex\amsmath\amsgen.sty">>
<"C:\Program Files\MiKTeX 2.5\tex\latex\amsmath\amsbsy.sty">
<"C:\Program Files\MiKTeX 2.5\tex\latex\amsmath\amsopn.sty">>
<"C:\Program Files\MiKTeX 2.5\tex\latex\amscs\amsthm.sty">
<"C:\Program Files\MiKTeX 2.5\tex\latex\amsfonts\amssymb.sty"
<"C:\Program Files\MiKTeX 2.5\tex\latex\amsfonts\amsfonts.sty">>
<mathascioutput.aux> <"C:\Program Files\MiKTeX 2.5\tex\latex\amsfonts\unsa.fd"
> <"C:\Program Files\MiKTeX 2.5\tex\latex\amsfonts\umsb.fd">
! Missing \right. inserted.
<inserted text>
\right
1.26 ...if= \verb=JM=  $= $ $11.$ $ \left< See ?? $
?
```

Figure - 12

Solution : You will encounter this if there are some errors in the input ASCII file. On the black screen it shows the error it has encountered with line number. You can either manually go and edit the input file or just hit “Enter” If you hit “Enter” it will ignore this error and will resume to give the output.

- Scenario 3 : Following error message can pop up

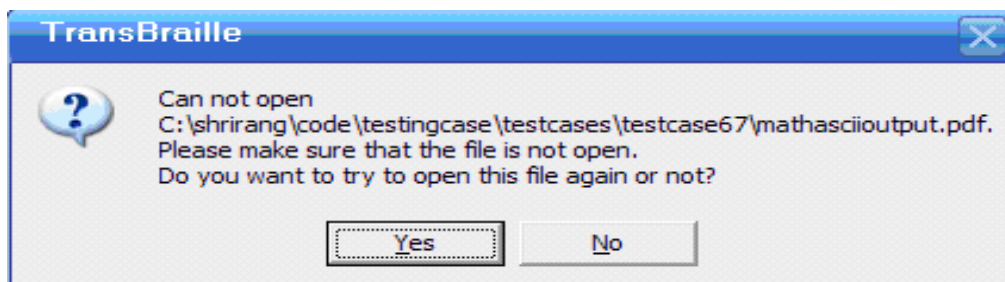


Figure - 13

Solution : Make sure that adobe acrobat reader is not open . If it is open then close it and rerun the translation.

7 Frequently Asked Questions

1. Do I need to install Aspell, prolog on my machine before using TransBraille?
 - A. You need to install Aspell on your machine but you need not install prolog. After you install Aspell, you need to add “C:\Program Files\Aspell\bin” to windows PATH.

 2. Do I need to install acrobat reader?
 - A. Yes, you need to have adobe acrobat reader installed on your machine.

 3. What if the final output is not clear?
 - A. In this scenario, do the following checks
 1. Check the blob image to find out if there is any problem in image recognition. If you see some problem, you can manually edit either image or ASCII file.
 2. If it looks like that image recognition is correct, check the Nemeth Math delimited ASCII file. If it looks like that some part is not separated perfectly you can add/remove delimiters manually.
 3. Check the error file and log file to find any specific reason of errors.
 4. After doing these checks you can re translate to Print Math format.
 5. It may be possible that user input has typing mistakes.

 4. Some times it happens that nothing happens for many seconds.
 - A. Be Patient!!! Different modules such as image processing and math recognition do extensive checking / analysis so in some cases it may take up to few minutes to get the output.
-