The Science and Engineering Division and National Association of Blind Students Joint Science Technology Engineering and Math Phone Conference Minutes for February 23, 2020

The National Federation of the Blind's Science and Engineering Division (SED) and the National Federation of the Blind's National Association of Blind Students (NABS) held a joint phone conference on Science Technology Engineering and Math (STEM) on Sunday, February 23, 2020.

The meeting was called to order by Kathryn Webster, president of NABS, at 8 P.M. Eastern Standard Time (EST).

President Webster said that this is the annual joint conference between NABS and SED on how blind individuals are succeeding in Science Technology Engineering and Mathematics (STEM) fields. She introduced John Miller, president of SED, who will be the moderator for the evening. President Webster said that we are working to break down the stereotypes that blind people can't succeed in STEM fields.

SED president, John Miller, thanked the speakers for presenting at this event. He invited the listeners to join the SED and subscribe to the SED e-mail list at "Nfbnet.org". He reminded the attendees that the SED would have its division meeting during the NFB convention. The SED Division meeting will likely occur the evening of July 16, 2020. Watch the NFB website for the convention meeting time. He asked that any questions to the speakers be sent through him at "Johnmillerphd@hotmail.com".

A summary of the presentations follows.

**Title: Creating Accessible PDF from LaTeX**

Speaker: Cristian Bernareggi (Turin university - Mathematics Department - Polin Lab)

Question: What is the name of your product, and what does it do?

Answer: "Axessibility" is a package which allows LaTeX to create pdf files with mathematical formulas accessible by assistive technologies for visually impaired people and people with special educational needs.

Question: Is "Axessibility" publicly available?

Answer: Yes it is publicly available at

"https://github.com/integr-abile/axessibility".

Question: Does the product have publicly available documentation?

Answer: Yes. The documentation can be found at:

"<https://github.com/integr-abile/axessibility>",

"http://www.integr-abile.unito.it/en/axessibility/":", and at

"<https://ctan.org/pkg/axessibility>".

Question: Does it have a cost?

Answer: It is open source free software.

Question: What are your plans for your product?

Answer: To be available in all Latex distributions.

Add-ons and scripts for screen readers to transform LaTeX in pdf into natural language as well as different national braille codes for mathematics such as Marburg code, Nemeth code, etc. are planned.

The following summary is taken from

"http://www.integr-abile.unito.it/en/axessibility/".

Math Accessibility

People with visual impairments can access textual information using assistive technologies such as screen readers and Braille displays. However,

unlike text, mathematical formulas, tables and graphs are not limited to a linear representation. Hence, they are hard to render and access non visually.

This makes the access to scientific content very difficult, limiting the possibility of visually impaired people to learn and work.

Alternative Content

To enable the access to mathematical content, alternative text can be provided. However, such text is usually a high-level description and may not provide

as much details as the original content. Furthermore, alternative text usually must be added manually, which may be tedious for the authors. Very often,

accessible content is not provided at all as most authors are not aware of the needs of people with visual impairments.

Our Project

"Axessibility" aims to make scientific PDF documents, made using LaTeX, accessible for people with visual impairments. This is achieved without

requiring any extra effort from the author, by just adding "Axessibility" among the included packages in the LaTeX project. "Axessibility" is a project of

the Laboratory "S. Polin" "http://www.integr-abile.unito.it/en/".

Features

"Axessibility" is a LaTeX package that creates PDF documents in which the formulas can be read with assistive technologies for people with visual Impairments.

Automated

"Axessibility" automatically generates comments in the PDF document (with the /ActualText attribute) in correspondence to each formula.

Transparent to the Author

The generated comments contain the original LaTeX code of the corresponding formulas, without the need to manually insert them.

Supports Accessibility

These comments are not visible on the screen, but screen readers and braille displays read them when formulas are selected.

Easy to Use

To use "Axessibility", the authors simply need to download and add the package in the preamble of the LaTex project.

**Title: Independence and Least Restrictive Learning Environment in the Undergraduate Science Course**

Speaker: Alfred D'Agostino

Dr. D’Agostino commented on how to prepare for/ engage in a major in the sciences. His comments were categorized in three areas:

1) Use of Technology

2) Problem-solving and Advocacy

3) Independent Work in the Least Restrictive Learning Environment

An outline of his comments:

* Proficiently use slate/stylus, Braille notetaker/ display
* Utilize smart-mobile phone technology
* Proficiently use NBDA, JAWS, voiceOver, other screen readers
* Know word processing, spreadsheets, presentation software in Windows and/or OSX environments
* Have OCR technology available for document reading
* Have access to tactile graphics/ Braille output
* Use 3-D models when available

Be familiar with internet navigation, academic library website and Learning management System (LMS) using more than two different browsers

* Be prepared to do technology/ general problem solving
* Familiarize yourself in advance about your intended course of study – what courses for your major?
* Contact disability support services early – clearly express your needs (for Braille output, tactile drawings, assistant or reader, lab aide)
* Check course syllabus and meet with faculty – describe explicitly how you work/learn (demonstrate your tools) – make contact early
* Indicate that detailed descriptions of board-work would be helpful
* Attend office hours with your best skills and ability- come with a raised-line drawing tool
* Check on course resources and their accessibility [images (Alt Text), videos (transcripts of notes), files] – know how to negotiate the LMS
* Familiarize yourself with text and equation editors (consider MathType/MathPlayer and LaTeX)
* Request accessible textbooks (other resources) through the college/university – do this months ahead if possible
* Have alternate sources of textbooks
* Visit the laboratory ahead of time to familiarize yourself with spatial arrangements and safety features (wear safety goggles)
* Meet with teaching assistant or laboratory aide prior to each experiment – have knowledge of protocol/ procedure/ equipment
* Set up your work area – assure others that you need to sense equipment
* Your expectation is to fully participate in groups and/ or work independently
* Establish a rapport with your lab aide – you should direct the aide to make observations when needed at your request – you will accomplish manipulations on your own and ask questions
* visit a lab session ahead of time to ‘observe’
* Become familiar with teaching/ learning tools – tactile/ speech-enabled equipment – Braille and QR code labeled items – be inventive
* – Request additional time for the lab if necessary
* Network with other students and students via NABS regarding problems and specific courses

**Title: Math in BrailleBlaster**

Speaker: William Freeman

Mr. Freeman was unable to join our conference. He sent the following information.

BrailleBlaster is a braille transcription program developed by the American Printing house for the Blind to help transcribers provide blind students with braille textbooks on time

"<https://brailleblaster.org/>".

There are two ways to make math in BrailleBlaster: ASCII Math and Spatial Math. Our Spatial Math Editor is the simpler of the two. It involves using our dialog, filling out some text boxes and selecting a few options from drop downs to create vertically arranged math equations, number lines, or matrices.

It’s a great tool for creating worksheets and smaller documents that only require dozens of equations. It’s not ideal for creating hundreds of equations.

That’s where ASCII Math comes in.

ASCII Math is sort of like a simplified version of LaTeX and is a keyboard accessible way to make math. We take the ASCII Math that the user creates, convert

it to MathML, send that MathML to LibLouis and get translated braille. The best thing about this system is that it is code agnostic, so if you need Nemeth,

we can do that and if you want to change it to UEB, we can do that too. We also convert MathML from NIMAS XML documents and LaTeX from Pandoc-supported

documents to ASCII Math when those file types are opened.

**Title: Solving tech problems in unique ways**

Speaker: Doug Lee

Summary: Doug writes: "Have an urge for resourcefulness: Consider a problem, consider what you have, then consider what you can do with it". He describes: "How I got braille diagrams and figures out of readers with less than five minutes of training". And A way to detect what technology is doing without speech or a screen reader.

Doug Lee is a long-time NFB member, frequent National Convention attendee, and Software Engineer, who has been writing JAWS scripts and other accessibility-related

software for 20 years. Prior to that, he taught the computer class at BLIND, Inc. in Minnesota. His first use of a computer was in 1983, about when speech

synthesis reached the public via Apple II computers with Echo cards.

His points were:

1. Necessity is the mother of invention.
2. Use available resources. He described (as he was shown in 1991 by Jan Lee) how to measure the fluid going into a syringe by making notches on a popsicle stick that he would hold against the syringe. This would give him the precise position of the syringe's plunger; thus, letting him know how much fluid was in the syringe.
3. He would represent the components of a circuit diagram on a Braille writer. He could then dictate his circuit diagram to a sighted individual if that was necessary. He uses Braille letters (usually corresponding to appropriate unit measures) to stand for circuit components, along with a few home-grown symbols for specific components, such as diodes.
4. If he needs to access a print diagram, he gets a sighted person to scratch out the diagram on a piece of Braille paper, scaled up to page size if needed, using a safety pin; then rolls the paper into a Brailler and places labels as directed by the reader.
5. He uses a telephone pickup coil, and an amplifier, to determine the state of electronic equipment. By holding the coil near a computer, he can hear when power is applied to the computer. He can also know what state is in by listening to his coil sound output. He demonstrated this by placing his coil near an iPhone as it was powering on, as a solution to the known iPhone 11 problem of occasionally not responding timely to a hold-down of its power button.

**Title: Non-Visual Access to Quantitative Analysis, Statistics and Data Visualization**

Speaker: Ed Summers

Summary: "Mr. Summer discussed non-visual access to quantitative analysis, statistics, and data visualization. The talk describes the tools that he personally uses to analyze data. These tools are available for students at no cost and they are being used at more than 80,000 potential places of employment. Check out this story about a course that SAS (Statistical Analysis System) created for college-bound students with visual impairments in North Carolina

"<https://blogs.sas.com/content/sascom/2019/08/23/college-bound-students-with-visual-impairments-learn-to-independently-analyze-data/>".

**Mr. Summers has been a blind computer scientist for 30 years. He says that it is important to have tools that can allow the blind to visualize data. He uses a Sensational Blackboard** <https://sensationalbooks.com/> to make quick drawings for his own use, and for interacting with blind and sighted colleagues. He also uses Braille graphic printers and 3D printers. It is important to have tools that you can use independently.

Mr Summers uses SAS products for data visualization. SAS has developed technology that makes data visualizations like charts, graphs and maps accessible to all.

SAS Graphics Accelerator is a browser extension that enables alternative presentations of data visualizations. By using sound in addition to sight, the

accelerator enables people with visual impairments to access data visualizations, including graphs. If you open a web page with graphs produced by SAS products, The Accelerator emits a chime. The Accelerator attaches a button to each graph. If you hit that button, you are taken to a "description view" which reads a graphic description which is automatically generated. Also, the (X, Y) coordinates of the points on the graphic are placed in a table which the user can read. This (X, Y) data can be downloaded into a "comma-separated value" (CSV) formatted file, so that the data can be explored in other programs. You can also access a "sonification view", which, as the user uses the left and right arrows to scan the graph, emits tones of varying frequencies depending upon the value of the Y-coordinate. In this mode, data on the left part of the X-axis is played in the left ear, and data on the right side of the x-axis is played in the right ear. These tones vary from left to right continuously as you traverse the graph.

SAS Studio is a web-based development environment. SAS Studio is included with any SAS platform and supports a powerful set of keyboard commands, customizable visual settings, and compatibility, with assistive technologies, such as screen readers.

Combine SAS Studio with SAS Graphics Accelerator to create access to data science for users with visual impairments.

The accessibility of SAS products is discussed at:

<http://www.sas.com/accessibility>

and

<http://support.sas.com/misc/accessibility/>.

The next SAS accessibility webinar will be held from 3 to 4 PM EST on April 15, 2020. During this webinar, you will learn how to explore data visualizations using sonification and other non-visual methods

**"**<http://support.sas.com/misc/accessibility/>".

**Conclusions**

Studying STEM is fun, exciting, and profitable.

Organization, advanced preparation, and hard work are the keys to success.

**Adjournment**

The conference ended at 9:10 PM EST.

**Questions and Corrections**

If there are any questions concerning the Science and Engineering Division, please contact John Miller (Phone: 858-774-9286, Johnmillerphd@hotmail.com).

If there are any corrections for the minutes, please contact Louis Maher (713-444-7838, [ljmaher03@outlook.com](mailto:ljmaher03@outlook.com)).

Minutes submitted by Louis Maher