

The Promise of Haptics for Teaching Math to the Blind

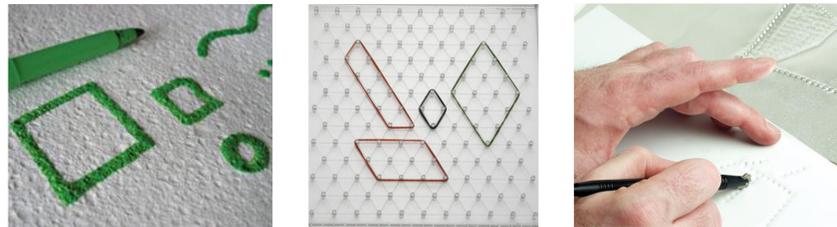
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Motivation

- Blind students “see” math through touch.



- Often, teachers work individually with blind students and manually construct images for them.

What is Haptics?

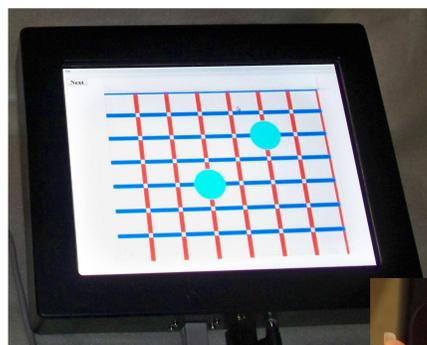
- Haptics:** Sense of touch; enables a user to “feel” objects.

- Simple Example:** A button on a touchscreen cell phone vibrates when pressed.



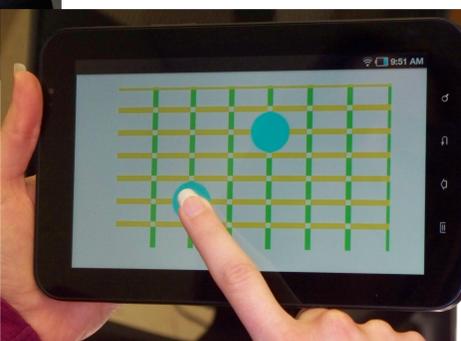
Approach: Haptic Touchscreen

- Touchscreens that can vibrate and play sounds could help blind students learn math.



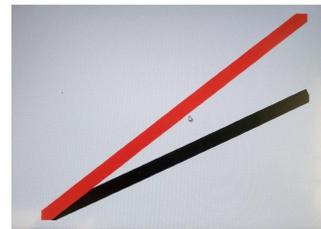
Samsung Galaxy Tab

Immersion TouchSense Demonstrator



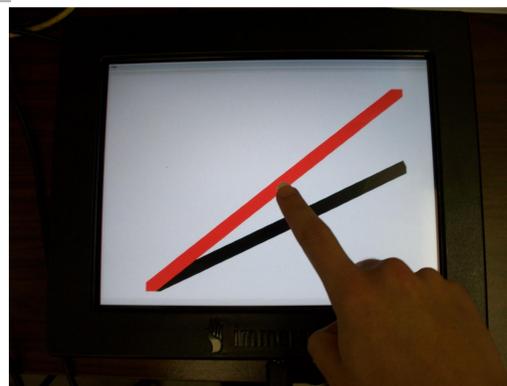
How would this work in a classroom?

- Each student has a touchscreen in class.



- The teacher draws a picture on an input device (e.g. laptop).

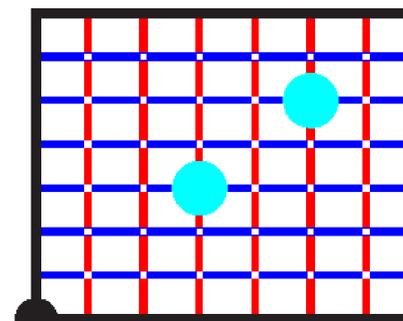
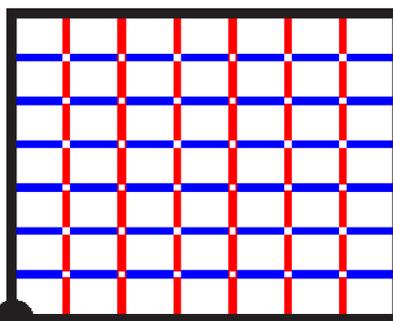
- The image immediately appears on students’ touchscreens, and they can explore it using vibrations/sounds.



- Students can draw on the images to answer questions from the teacher.

Grid/Point Study with Blind Students

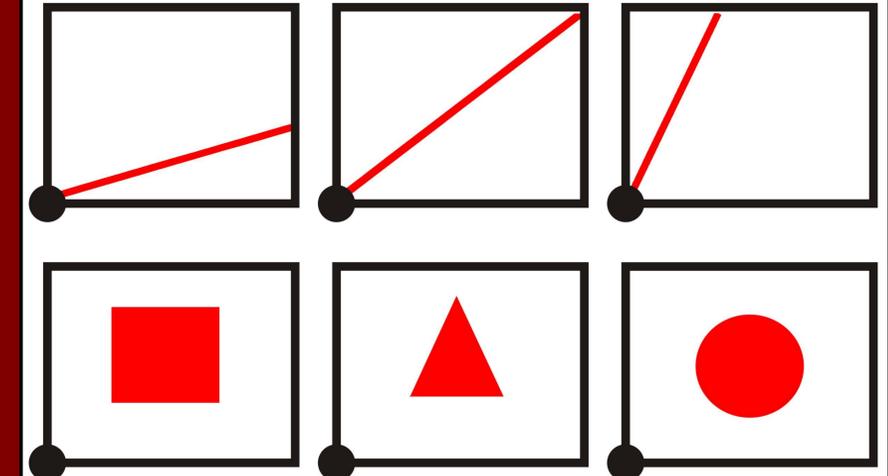
- First Visual Math Concepts:** Shapes, lines, & points
- Can students use a grid? Can they find points on it?



- All students found 100% of displayed points.
- Every student correctly identified all point locations using vibration and/or sound.

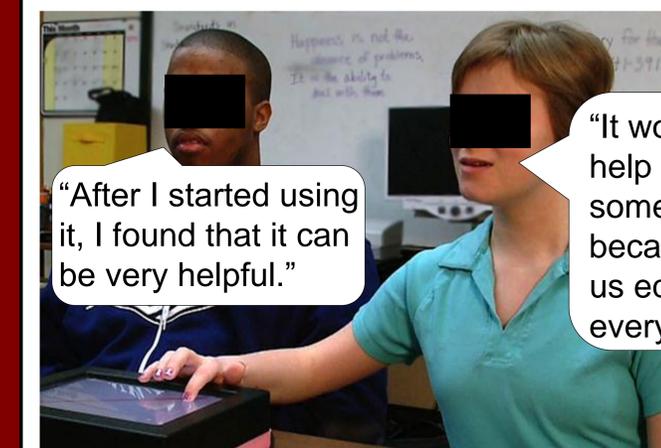
Shape/Line Study with Blind Students

- Can students identify shapes and lines?



- Students correctly identified all of the lines using vibrations or sound.
- Shapes were more difficult, but students gave valuable feedback on making them easier to identify.

Student and Teacher Feedback



“After I started using it, I found that it can be very helpful.”

“It would really help to have something like this because it makes us equal to everyone else.”

Teachers said:

- “One of these haptic tablets would allow (students) to keep up much better (in class). If I didn’t have to attend class with them, it would also make them feel more independent.”
- “The more experience I have with it, the more valuable I think it could be. It makes the work more accessible.”

Acknowledgements

- NSF CAREER award #IIS-1054331
- NSF Graduate Research Fellowship