Towards Rapid Fabrication of Custom Tactile Surface Indicators For Indoor Navigation

Background

Tactile surface indicators (TSIs) serve as navigation aids for Blind and Low-Vision (BLV) people. Originally introduced in Japan in the 1965, TSIs have spread throughout the world to become a critical part of accessible infrastructure.

Challenges

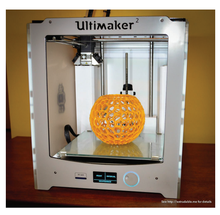
Installation typically requires extensive manual labor with teams of workers casting or bolting down TSI tiles. This makes it difficult and costly to fix, edit, and rearrange tiles once they have been installed.

Incorrectly installed tiles are ineffective at providing navigation cues for BLV people but also put them in hazardaous or dangerous situations.

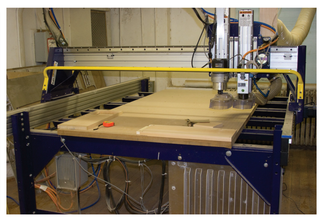
Rapid Prototyping

New computational methods has facilitated faster prototyping and production times. These systems lower the barrier to entry for users to make custom objects. Which led us to wonder:

Can we use digital fabrication methods to rapidly produce tactile surface indicators?
What digital fabricaiton methods are best suited for this process?

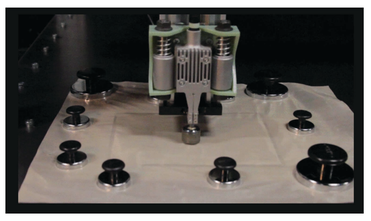


3D Printing



CNC Milling

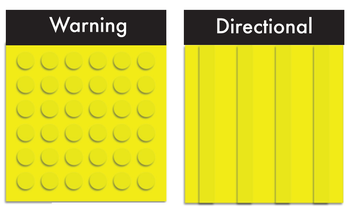
Vacuum Former



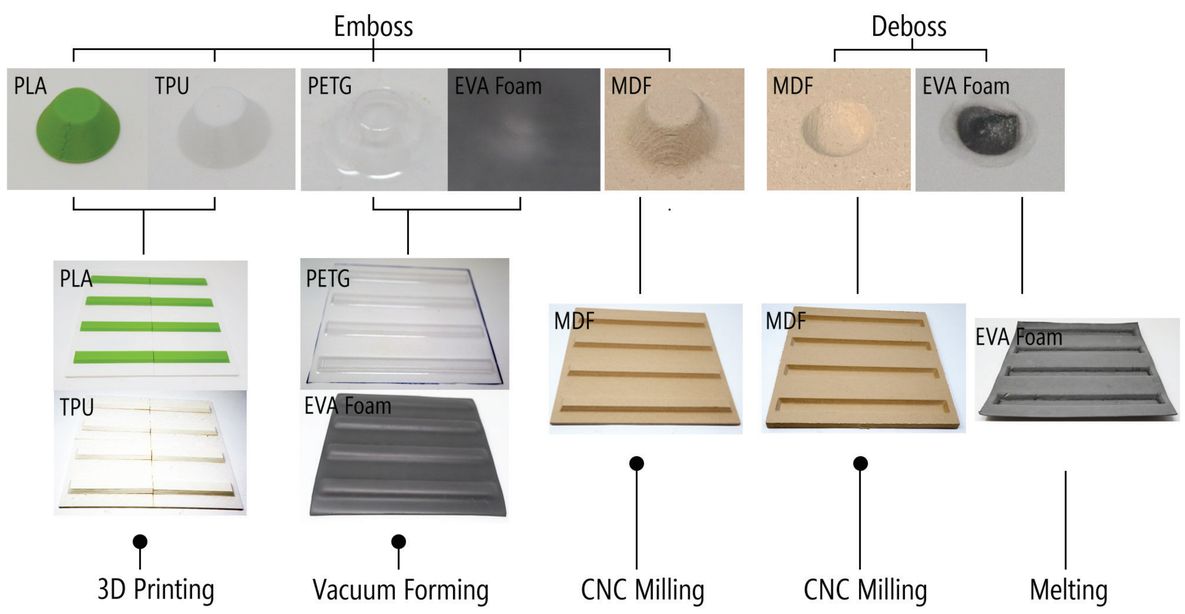
Example of a heat melting transfer

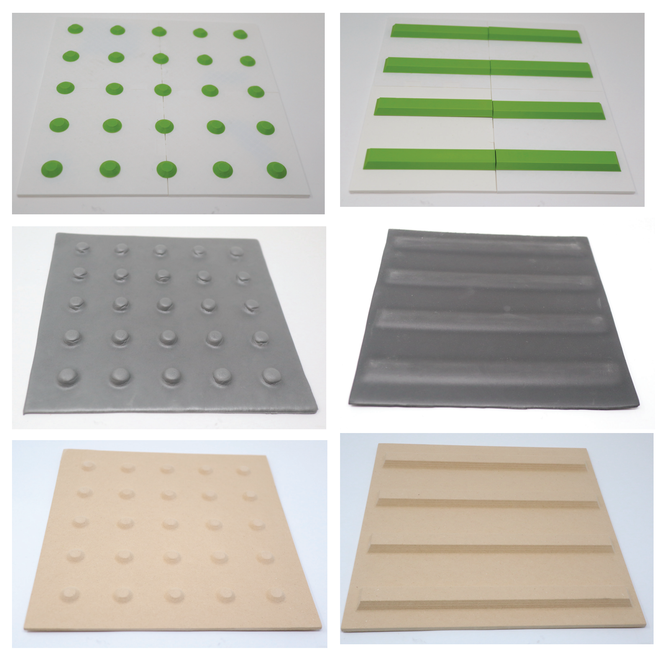
Prototypes

We used rapid prototyping tools to make a series of prototype TSIs to explore several design dimensions of tactile surface indicators.



we chose designs tiles that serve as a warning and a bar pattern that serves as directional guidance.

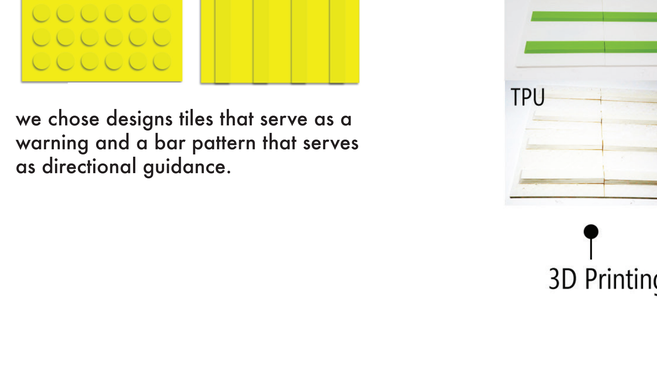




Sample of our prototype TSI

Evaluation

We evaluated the prototypes in a two stages. The first one was a pilot study with one Blind participant and an Orientation and Mobility teacher expert.



Our Blind participant indicated that they could identify the TSI tile pattern with their cane and underfoot.

The Lighthouse for the Blind, Inc.

Our O&M specialist has taught BLV people how to navigate independently for over 20 years. They indicated that the 3D printed and CNC milled samples were the most promising.

Future Work

We are thinking of ways of using 3D printing to autonomously print tactile surface indicators on floor surfaces

Overview of a mobile 3D printer

Printing a blister pattern on the floor

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