

Improving accessibility in cities

*Helping visually impaired people navigate
outdoor spaces independently*

LONG4



Introduction



The vision impaired require assistance to navigate modern cities independently. This includes assistance in orienting themselves, identifying hazards and using existing public transport and public infrastructure.

Tack-Tiles is a piece of smart pavement infrastructure, alerting pedestrians about roadside traffic conditions. Our concept aims to improve the ground surface indicators already present in most developed cities. While existing designs have proven effective in defining hazards, they lack effectiveness in conveying the type of obstacle present and alerting users to changes in traffic conditions.

The physical form of Tack-Tiles is similar to a traditional tactile ground surface indicator typically found at traffic light crossings or train platforms. The product conveys vibration and audio based messages to alert visually impaired individuals on traffic conditions or other potential hazards. For example, Tack-Tiles installed at Zebra crossings produce vibrational messages and audio instructions depending on whether the crossing is clear or a car is approaching.



Team Structure

Although the entire design process was a deeply collaborative effort, each team member was allocated with tasks that best suited their strongest skills and abilities.



Patrick

Phase 1: Contributed to statistical background research and group charter.

Phase 2: Optic Locket ideation, testing and overall evaluation.

Phase 3: Mixed responsibilities that include coding for sound output via Tack-Tiles and animations used in video showcase.



Tom

Phase 1: Contributed to statistical background research.

Phase 2: Beacon ideation, testing and overall evaluation.

Phase 3: Mainly design responsibilities that include graphic designs in documentation and videos. Furthermore, he was in charge of video production.



Reg

Phase 1: Contributed to background research in existing blind infrastructure.

Phase 2: Tack-Tiles ideation, testing and overall evaluation.

Phase 3: Technical responsibilities that include Arduino hardware installations and coding for vibrational emissions, LED output and sound production.

My responsibilities



Phase 1: Contributed to competitor market research.

- My efforts were in extensive competitor research into corporations that assist the visually impaired in a public setting.

Phase 2: Tack-Tiles ideation, testing and overall evaluation.

- My efforts can be noted in the creation of the use case scenario for Tack-Tiles and creation and conduction of interviews, surveys and observations.

Phase 3: Mainly physical construction of Tack-Tiles.

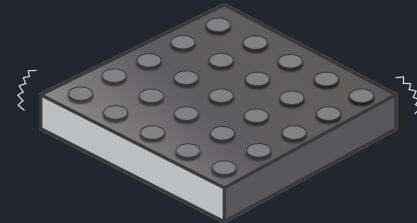
- My efforts comprised of fabricating the blueprints of the enclosure, organising necessary components for the physical aspects of the device and Tack-Tiles construction.

Contributions

Phase 1

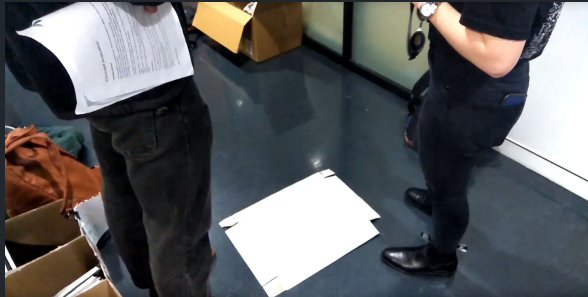
My contributions to the research phase of Tack-Tiles can be noted in the extensive investigation into existing competitors that offer solutions to difficulties faced by the visually impaired. The market research primarily examined competitors that focused on navigation within a public setting. This included details on product or service descriptions, drawbacks and advantages. The organisations I examined were, Blitab, Buro North and iBeacons.

Through Reg's investigation into tactile surfaces and with inspiration from Buro-norths product, I was able to derive a truly unique concept in the form of Tack-Tiles. My reasoning lay in a realistic approach in the expansion of existing public infrastructure, that could be implemented immediately. My work can further be noted in initial Tack-Tile features and hardware and software requirements.



Phase 2

My contribution to phase 2 was mainly attributed to Tack-Tiles low fidelity prototype testing. I laid out the set of tasks test subjects were required to follow as well as ensuring fair testing by mimicking blind conditions. Furthermore, I was responsible for assembling analytical methods. By that I mean creating questions, conducting interviews, producing surveys and the observational attributes post Tack-Tiles testing.



I aided in the second round of Tack-Tiles testing. My tasks were to create a survey that judged sound preference were future iterations of Tack-Tiles. With that, I conducted the testing scenarios and recorded them

I created a persona, that was not only based on a holistic overview from overall testing results, but also through my efforts in acquiring details from a visually impaired individual over the phone. These results were preliminary and creating a truly helpful and functional product in the real world. This led to further concept ideation and development.



Phase 3

In the final phase, I was tasked in the physical design and construction of Tack-Tiles. The first step involved creating a blueprint, which included the dimensions and structural rigidity ideation. Next, I decided on the material requirements that would be best suited to the High-fidelity prototype. Fortunately, my employment at Bunnings provided me knowledge on materials that not only suit the aesthetics of Tack-Tiles but also suitable to withstand the immense weight.

Finally, my work ideated on the final core functionality of Tack-Tiles and the future direction it could take.

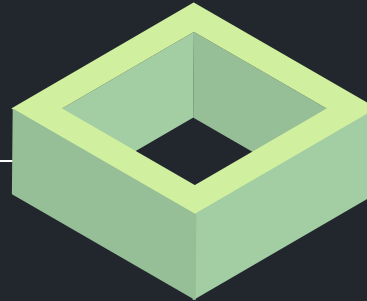


Challenges

Due to our chosen target audience, we were unable to attain direct user research and had to resort to existing secondary research. This may have affected preliminary results.

Moreover, it was extremely challenging in composing ideas, that truly help visually impaired individuals improve their lives, with only a small number of sensations to take advantage of. Fortunately, we came to a realisation and persevered by combining solutions the visually impaired already know with current and up and coming smart devices used by those with perfect vision.

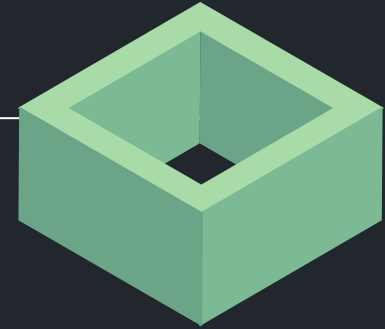
Phase 1



Unfortunately, it would have proven challenging to test visually impaired individuals in the time frame we had. As a result, we had to resort to mimicking blindness by asking users to wear blackout goggles. Even though we might not have yielded accurate results, we resorted to the best possible alternative by slowly adjusting test subjects to blindness.

Furthermore, we were unable to properly test how participants would react to vibrations due to our low fidelity prototype. We resorted to the second-best option by simulating vibrations as best we could through detailed vibrational sounds.

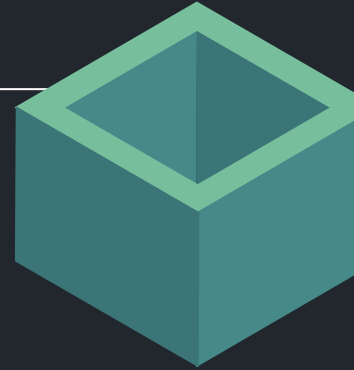
Phase 2



In the final phase of Tack-Tiles the main issues could be noted in the coding and faults in Arduino hardware. The main issue lay in audio emissions in conjunction with the varying vibrational states. It proved difficult to play one audio file once Tack-Tiles informs users to stop and play a second audio file when users are required to go. Eventually the bug was found and resolved by Patrick.

The project also had an issue, where the power supply burned out transistors on the Arduino board. This is was resolved by resorting to a smaller vibration motor, therefore mitigating the power supply.

Phase 3



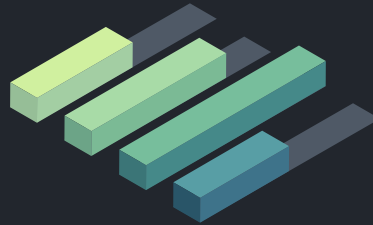
Final Reflection

Group effort

Overall, the team experienced minimal disputes throughout the development of Tack-Tiles. I was extremely satisfied with the team's performance and effort in creating the best possible solution. The team exceeded with their tasked deliverables not only in a timely manner but also to the best of their capability. Communication was clear, with any issues brought up as soon as required. Issues were dealt with as a team collaboration, which proved to me most effective.

Time management

The only issues of note that could have been improved was better time management. During the user testing phase, results might have yielded more detailed statistics if testing was spaced over days rather than rushed on a singular day. Furthermore, creating a time schedule that takes into account of every team member's obligations would have meant more completing tasks ahead of team without leaving sections for other team members to finalise.



Responsibilities

The team could have also benefited from better work allocation making it clearer as to responsibilities each team must undertake to progress the report. When writing the report, the team was unsure which sections were allocated to whom, therefore unfinished sections were left to be complete closer to the due dates.

Future ventures

The team and I believe that Tack-Tiles offers a proven expansion to improve upon assisting the visual impaired in a public space. It is highly likely that in the near future, we might again endeavour in the Tack-Tiles project. The first steps to ensuring future developments begin with a patent.