Name: Kamyar Dowlatabadibazaz
Project: Smart Cane project
Participants: Maryam Rabiei (Mother)
Dates: (#1, March 2, 2026)

This document includes the observations and data taken from experimentation on the Cane. Experiments have been conducted in a home environment in different areas, and will be extended to outdoor environments as data collection progresses.

All events of data collection have been recorded. The data has been analyzed to assess the success rate and specific observations when applicable.

Participants have so far included Maryam rabiei (My mother), as well as Kamyar Dowlatabadibazaz (Myself).

While this represents the majority of the data,the data analysis is not fully complete. Here is a link to a live updated version of the data.

Link:

https://docs.google.com/document/d/1sdxe4DJ9Vpuv_PMcGQwhF-izDrTpZpdLDEdk4uPCECM/edit?usp=sharing

Ultrasonic test

Number	**Environment / task**	**Participant**	**Outcome**	**Observations**	**Date**
1	Pass through hall while blindfolded, avoiding obstacles, as well as unexpected obstacle of Monopoly board placed in the way.	Maryam Rabiei (Mother of Kamyar).	This first test represented a complete failure in the detection system of the cane.	The cane was unable to notice the monopoly board slightly to the right. This means that the horizontal scope of the sensor is limited, and a horizontal swaying technique should be adopted. In addition, a limitation is presented in the disability to detect high obstacles, like the elliptical that the participant had a mild collision with.	March 2, 2026

				Finally, the cane turned off prematurely, leading to a collision with further objects.	
2	Same as #1.	Same as #1.	Represents a success in identifying an obstacle and notifying the user of it.	While the same environment was used, a swaying tactic was utilized in this test. This meant that the horizontal reach of the cane was extended, and the obstacle was detected. It is also apparent that there is no issue with the notifying system, via the vibration motor on the handle and the digital siren. The user was clearly notified of the danger.	March 2, 2026
3	Participant passing down a narrow walkway while blindfolded into a room. The door of the room is closed as they approach creating an unpassable obstacle they are headed straight for.	Same as #1.	Successful detection of walls on the narrow walkway, as well as detection of the door directly ahead of the user.	It is clear that the sensor was able to detect an obstacle, being the adjacent wall, that was not directly in front of the sensor and user. This indicates a wide range of detection. Additionally, the detection of the door in front of the user was effective enough that the user was able to understand that a beep while holding the cane straight ahead likely means an impassable obstacle, leading them to avoid the door.	March 2, 2026
4	Participant navigates a hardwood environment with many obstacles like furniture and walls. She is passing from the hall into the	Same as #1.	Successful ability to navigate past the narrow hall without collision.	As the user moves forward, they travel the unintended path to the kitchen, which makes for a good experiment to gauge the effectiveness of the cane.	March 2, 2026

	kitchen past the narrow entry. Floor mats are also present.			Despite this the participant does hold a basic understanding of where the path is as it is their longtime home, which represents a scenario many users may face. Her eyes are fully covered. As the participant passes, the cane first alerts them to the fridge on their left, and we can see the user uses this information to change their path. Then an obstacle on the right does the same, causing an adjustment. Finally, an alert as the user is approaching cabinets straight ahead leads the user to ultimately turn and make it to the destination of the kitchen sink.	
5	Participant navigates a narrow hardwood environment while blindfolded and in partial darkness. They travel past home plants and furniture through a hall from the dining room to the front door.	Same as #1.	Successful navigation of the path. Difficulty experienced in the middle with timing out of the system.	As The user passes through a very narrow under 1 meter wide, the cane alerts them of a house plant, allowing them to navigate past and into the living hall. Here ,as she approaches the narrow hall, the cane unexpectedly turns off, leading to a collision with the cabinets. After the experiment is paused and the device activated, the user is able to traverse the remainder of the path without harm. In one instance, the user is diagonally headed down a flight of stars as the sensor detects the railing, and guides the user away from the danger.	March 2, 2026

Total / overall.		All conducted by Maryam Rabiei.	⅘ overall success ⅖ connection error ⅗ flawless operation		

Tilt / crash sensor and sound testing

Number	**Environment / task**	**Participant**	**Outcomes**	**Observations**	**Date**
1	In a hall, testing the reliability of the trip sensor. Trip in the forward - left direction.	Maryam Rabiei.	The buzzer and siren were instantly alerted the moment the fall occurred.	The direction of the controlled trip was forwards to the left, meaning that this non-perfect angle was able to be noticed. The buzz was fast and loud, and lasted until instantly ending when the cane was made upright.	March 2, 2026
2	In a hall, testing the reliability of the trip sensor. Trip done backwards in the right direction.	Same as #1.	The Buzzer and siren were able to detect the trip immediately.	The alarm could be heard continuously until the cane was made upright. Successful testing in the back - right direction hints at strong reliability and angle reception.	March 2, 2026
3	In a hall, testing reliability of the trip sensor. Trip done to the forward direction.	Same as #1.	The buzzer buzzed immediately upon the trip.	Another instant equation. The new angle of straight forwards further shows reliability of	March 2, 2026

				the sensor.	
4	Testing the sound distance and decibel impact of the buzzer. Test done from 1 level below, at the stairwell, while the user was in a room upstairs.	Same as #1	Buzz was clearly heard, and a decibel increase of 30 from 27 to 57 was recorded.	Very loud and distinct siren. Increase of sound to decibel of 57 means that until a decibel of 57 home noise pollution, the device will easily be heard.	March 2, 2026
5	Testing the sound distance and decibel impact of the buzzer. Test done from 2 levels below, at the stairwell, while the user was in a room 2 floors up.	Same as #1	Buzz was heard clearly, and a decibel change of 28, from 26 to 54 was recorded.	The sound was still distinct and easy to hear. A decibel of 54 means that within a house noise pollution of 54 in the basement, the cane can easily be heard two floors up.	March 2, 2026
6	Testing the sound distance and decibel impact of the buzzer. Test done from 2 levels below, at a cornered room while the user was in a room upstairs.	Same as #1	Buzz was heard, a change in decibel of 6, from 26 to 32 was recorded.	While the sound was not as clear, it was still easily noticeable. A decibel of 32 means that within a noise pollution of 32, the cane can be heard between two of the farthest points within the home	March 2, 2026
Total / Overall.		Same as #1	3/3 reliability for triggering		March 2, 2026

			when fallen Noise heard in 3/3 different home environments and distances recorded.		

RFID sensor distance / orientation testing

Number	**Environment / task**	**Participant**	**Outcomes**	**Observations**	**Date**
1	Testing the distance in which a RFID sensor would trigger the feedback on the cane.	Kamuar Dowlatabadib azaz (Myself)	The cane was triggered at a distance of approximately 3cm from the tag.	This 3cm distance was quite small, and required positioning by the participant to be triggered, pointing at a potential flaw.	March 2, 2026
2	Testing the RFID's ability to sense tags that were above the cane.	Kamyar Dowlatabadib azaz (Myself).	The Cane was able to detect RFID tags, between 0-4cm from the floor.	The tags themselves were detected regardless of their orientation. Tags held directory above the reader were not detected, with a range of 0 - 4cm for detection observed.	March 2, 2026