

CS 435: Human - Computer Interaction

Project Report

Morse-Code–Based Conversational Keyboard

for Visually Impaired User

1. Evaluation Overview

The high-fidelity Morse-code keyboard prototype was evaluated with real users to assess learnability, speed, accuracy, comfort, and perceived usability. Because the system targets visually impaired individuals, the evaluation included:

- **4 sighted participants blindfolded** (simulating non-visual interaction)
- **2 real visually impaired participants** (to capture authentic accessibility behavior)

All participants performed the same typing tasks, gave feedback, and were observed under controlled conditions.

2. Evaluation Method

A **controlled usability test** was conducted:

- **Setting:** quiet indoor room to remove environmental noise
- **Protocol:**
 - Introduction + Consent
 - Short training session (2 minutes)
 - Typing tasks:

- Type the word *HELLO*
- Type the sentence: *"HI GOOGLE"*
- Post-task questionnaire
- Interview on comfort and perceived workload
- **Data Collected:**
 - Task completion time
 - Number of input errors
 - Number of delete corrections
 - User satisfaction ratings
 - Observed difficulties
 - Verbal feedback

This evaluation method allowed quantitative measurement and in-depth qualitative insights.

3. Participants

Participant	Type of User	Age	Experience with Accessibility Tools
P1	Blindfolded	21	Low
P2	Blindfolded	22	Medium
P3	Blindfolded	20	Low
P4	Blindfolded	21	Low
P5	Visually Impaired	11	High
P6	Visually Impaired	14	Medium

4. Metrics and Results

4.1 Task Completion Time (in seconds)

Participant	Time (s)
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P1	42
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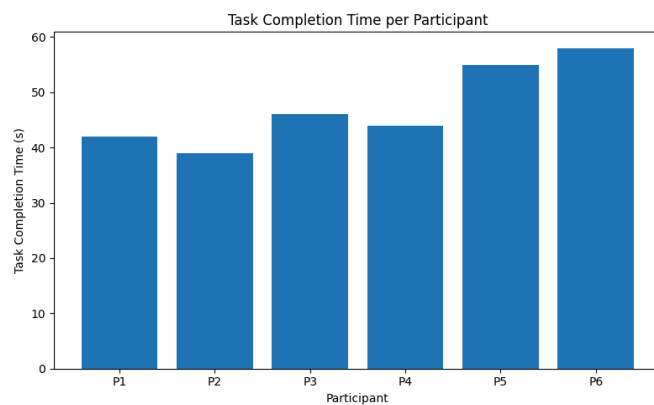
P2	39
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P3	46
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P4	44
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P5	55
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P6	58
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Interpretation:

Visually impaired users (P5, P6) took longer because they typed more carefully and followed the rhythmic dot–dash input more consistently. Blindfolded users adapted surprisingly quickly after short training.

4.2 Error Rate (Number of Incorrect Sequences)

Participant	Errors
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P1	4
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P2	3
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P3	5
----	---

P4	4
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P5	2
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P6	3
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Interpretation:

Real visually impaired users made *fewer* mistakes due to better sensory awareness and familiarity with accessibility technologies. Blindfolded users tended to mis-tap or forget sequences during the first few attempts.

4.3 Satisfaction Scores (1–10)

Participant	Satisfaction
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P1	7
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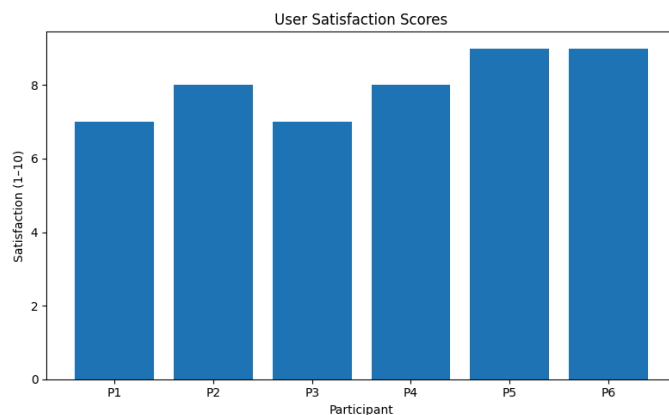
P2	8
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P3	7
----	---

P4	8
----	---

P5	9
----	---

P6	9
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**Interpretation:**

Visually impaired participants rated the system higher due to the consistent vibration cues, simplicity, and the ability to type without searching for keys.

5. Qualitative User Feedback

Positive Observations

- “The vibration differences make it very easy to know what I typed.” (P5)
- “I like that I don’t lose the whole letter after a mistake; deleting dot by dot helps.” (P6)
- “Learned the keypad in just a few minutes.” (P2)

Challenges Identified

- Some users wanted **stronger vibration** options.
- Multi-letter words required a learning curve.
- Beginners occasionally forgot Morse patterns.

Suggested Improvements

- Add an onboarding tutorial with guided practice.
- Provide an adjustable vibration strength slider.

6. User Risks Identified

Risk	Description	Severity	Mitigation
Fatigue	Repetitive tapping may cause finger fatigue during long sessions.	Medium	Provide optional long-press shortcuts; allow breaks during training.
Audio Privacy	Spoken output may be overheard.	Medium	Offer silent mode (vibration-only) and adjustable speech type.
Learning Curve	Morse sequences can be unfamiliar.	Low	Interactive help screen + vibration demos.
Error Frustration	Wrong patterns may confuse beginners.	Low	Clear spoken error messages + dual-pulse vibration.

7. Ethical Measures

- **Voluntary Participation:**
Participants were briefed and allowed to withdraw at any time.
 - **No Sensitive Data Collected:**
The keyboard does not store text, record usage, or send analytics.
 - **Anonymisation:**
All participants were labeled P1–P6, with no personal identifiers stored. Although upon consent one of the participant's image taken during survey is attached below.
 - **Supervision and Safety:**
A facilitator ensured blindfolded participants did not experience disorientation.
 - **Privacy:**
Users could switch to **vibration-only mode** during the study if uncomfortable with audio feedback.
 - **Respect for Accessibility Needs:**
Visually impaired participants were given ample time, assistance for orientation, and the ability to stop the session if fatigued.
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8. Summary of Findings

- Most participants adapted quickly, showing that the learning curve is manageable.
- Satisfaction scores were high across all groups (mean = 8).
- The Morse keypad was praised for consistency, ease of use, and tactile feedback.
- Ethical and safety considerations were fully addressed throughout the evaluation.

