

Introduction

Recent advances in stylus technology and handwriting recognition have made handwriting a viable text-entry option on touchscreen devices. Initial ideas for building intuitive and usable handwriting applications originated nearly 30 years ago [1,4]. In this poster, we present a study intended to replicate studies from the 80s involving the elicitation of hand-drawn gestures from users for common text-editing tasks in order to design a “guessable” gesture-set and to determine if the early results still apply given the ubiquity of touchscreen devices today. We analyzed 360 gestures, performed with either the finger or stylus, from 20 participants for 18 tasks on a modern tablet device.

Analysis and Results

- ❖ Gestures for every referent were classified into groups based on semantic similarities.
- ❖ Agreement score was calculated for every referent (shown in the Figure 1) [2,3].
- ❖ We designed our “guessable” gesture-set (Figure 3) by assigning the gestures belonging to the largest group to every referent [2,3].
- ❖ We obtained a guessability score of 56.67% for our final gesture-set which means that 56.67% of the proposed gestures of the participants are contained in the final set. [2,3]
- ❖ We incorporate “aliasing” by assigning a group of (semantically-equivalent) gestures to a referent rather than a single specific gesture. [2,3]

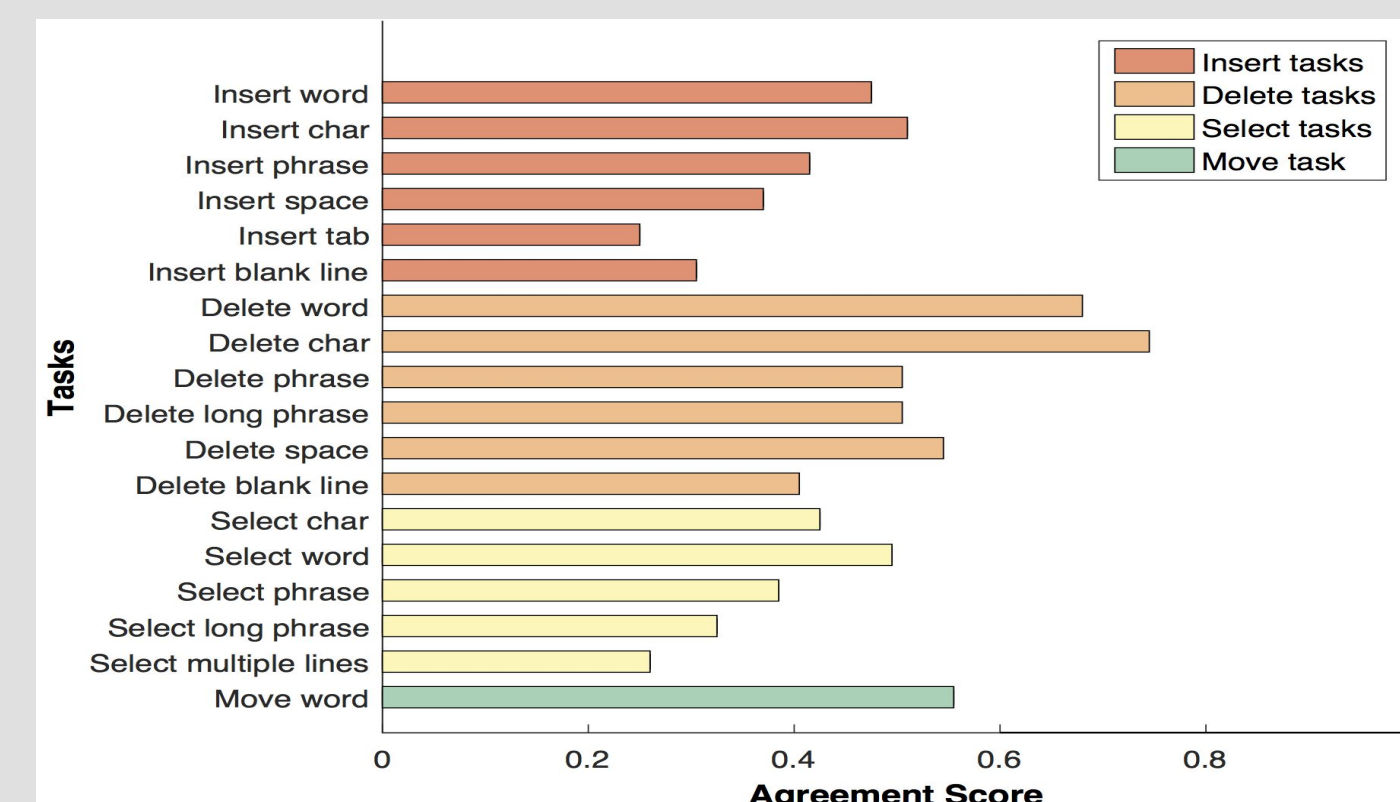


Figure 1:
Agreement
score for
each referent

Final Gesture Set

Tasks	Gestures
Insert word	th ^{of} Darkness * th ^{of} Darkness
Insert character	cop ^{arison} only * cop ^{arison} only cop ^{arison} only
Insert phrase	it was * it was it was
Insert space	fore ^{ver} * fore ^{ver} fore ^{ver} fore ^{ver} fore ^{ver} fore ^{ver} fore ^{ver}
Insert Tab	There were a king with * There were a king with There were a king with a large jaw and a queen with
Insert blank line	fore ^{ver} . * fore ^{ver} . By Charles Dickens fore ^{ver} . By Charles Dickens fore ^{ver} . By Charles Dickens
Delete word	ind ^{irect} * ind ^{irect} ind ^{irect}
Delete character	be ^{ing} * be ^{ing} be ^{ing}
Delete phrase	we were all going direct to Heaven *
Delete long phrase	There were a king with a large jaw and a queen with a plain face, on the throne of England; there were a king with a large jaw and a queen with a fair face, on the throne of France. It was There were a king with a large jaw and a queen with a plain face, on the throne of England; there were a king with a large jaw and a queen with a fair face, on the throne of France. It was (See Figure 7 for gesture extension) *
Delete space	vis ^{dom} * vis ^{dom} vis ^{dom} vis ^{dom} vis ^{dom}
Delete an empty line	There were a king with a large jaw and a queen with a plain face, on the throne of England; there were a king with a large jaw and a queen with a fair face, on the throne of France. It was
Select character	king * king
Select word	king * king
Select phrase	king with a large jaw * king with a large jaw
Select long phrase	a plain face, on the throne of England; there were a king with a large jaw and a queen with a fair face, on the throne of France. It was * a plain face, on the throne of England; there were a king with a large jaw and a queen with a fair face, on the throne of France. It was a plain face, on the throne of England; there were a king with a large jaw and a queen with a fair face, on the throne of France. It was a plain face, on the throne of England; there were a king with a large jaw and a queen with a fair face, on the throne of France. It was
Select multiple lines	It was the spring of hope, it was the winter of despair, we had everything before us, we had nothing before us, we were all going direct to Heaven, we were all going (See Figure 7 for gesture extension) *
Select a word and move	on its being received, for good or for evil, * e a king with a large jaw and a queen with its being received, for good or for evil, relative degree of coparison only. king with a large jaw and a queen with its being received, for good or for evil, relative degree of coparison only. king with a large jaw and a queen with

Figure 3

Study Design

We conducted a within-subjects elicitation study [3] where participants were given referents, or examples of the desired output, and asked to perform the gesture that should result in that referent.

Instruction

Line 4 reads:
4. it was the season of Light, it was the of Darkness,

Please insert the word **season** so that it reads:
4. it was the season of Light, it was the **season** of Darkness,

Please indicate what gesture(s) you would use and how would the application respond?

Figure 2: A sample referent for inserting a word

Design Implications

Based on the qualitative observations, we suggest some design implications:

- ❖ We recommend designing more intuitive, “dynamic in-situ” handwriting interfaces on tablet device allowing handwriting (and recognition) **anywhere** on the document.
- ❖ Designers should consider gestures for text editing that are in accordance with the mental model of “writing on paper”.
- ❖ We recommend that stylus-based gestures be used for text-editing, reserving finger gestures for navigation (e.g. zoom in/out, swipe to next page).
- ❖ A successful text entry and editing interface must also allow users to write in white space that exists, or to make whitespace by creating “writing windows” directly within the recognized text to insert new text (see Figure 4).

- STEP 1. Please vote for poster.
- STEP 2. Please vote for poster.
- STEP 3. Please vote for poster.
- STEP 4. Please vote for our poster.

Figure 4: A mock-up of our interface illustrating the creation of ‘writing windows’ in four steps

References

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