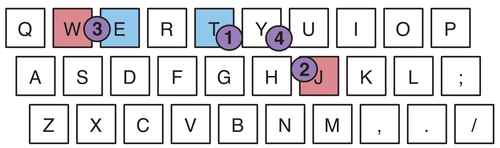
Identifying and Correcting Typing Errors for People with Motor Impairments

TrueKeys is an assistive text entry system that automatically detects and corrects typing errors as the user types. TrueKeys combines a word frequency list and a model of the user's keyboard layout to detect typing errors and choose the best candidate for correction.

Correction Algorithm

TrueKeys uses a weighted minimum string distance metric (wMSD) to classify errors. This metric counts the number of (1) correct key presses, (2) substitution errors, (3) insertion errors, and (4) deletion errors, as well as transpositions, between the entered word and a correction candidate. Errors with nearby keys are weighted as more likely than errors with distant keys. The wMSD is combined with the word frequency and the frequency of the bigram to produce the final score. The candidate with the lowest score replaces the user's input.



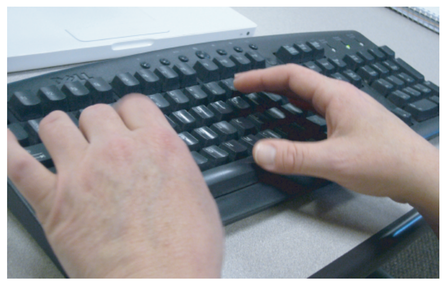
User Study

We evaluated TrueKeys with 9 motor-impaired and 9 non-impaired users. Motor-impaired participants had a range of health conditions including arthritis, cerebral palsy, Parkinson's disease, and peripheral neuropathy. Participants transcribed 20 phrases with TrueKeys correction enabled and 20 with correction disabled.

Sample phrases

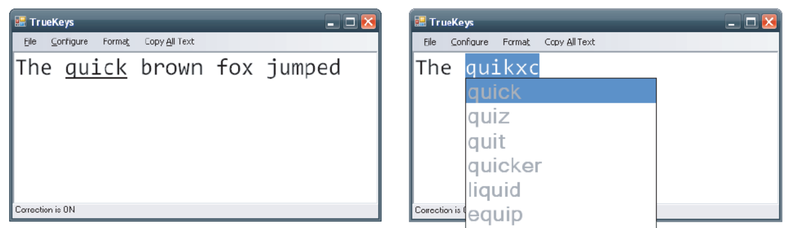
my watch fell in the water

prevailing wind from the east

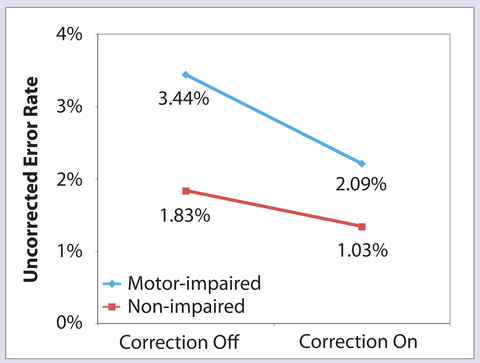


User Interface

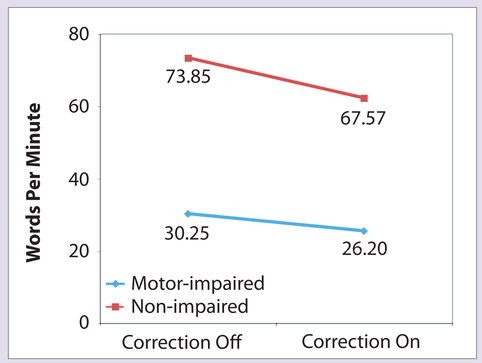
When a user mistypes a word, TrueKeys automatically replaces it with the corrected word. TrueKeys underlines the word to show that it has been changed. If the system guesses incorrectly, the user may choose from an N-best list of correction candidates using the arrow keys.



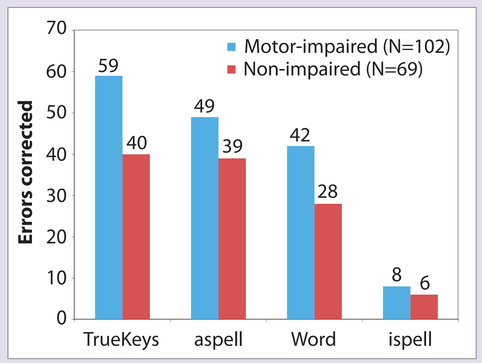
Results: TrueKeys Reduces Typing Errors



TrueKeys reduces uncorrected typing errors for motor-impaired (2.09% vs. 3.44%) and non-impaired users (1.03% vs. 1.83%) ($p<.05$).



However,TrueKeys reduced speed for motor-impaired (26.20 vs. 30.25 wpm) and non-impaired users (67.57 vs. 73.85 wpm) when using TrueKeys interactively ($p<.05$).



Run non-interactively on typing data from our user study, TrueKeys corrected more errors than common open source and commercial spelling checkers.

Future Work

We plan to conduct a longer-term study to better understand how users adapt to TrueKeys over time. We may also evaluate how variations of the TrueKeys user interface may be better for users with varying levels of typing ability.

We also plan to extend the current correction algorithm to produce user-specific error models. This would allow TrueKeys to learn users' common error patterns over time and potentially improve correction accuracy.

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