

Toward a Systematic Characterization of Children's Touchscreen Gestures

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Late Breaking Work

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Problem

- Recognition of children's input (5 to 10 years old) is much worse than adults [1].
- Prior work investigating qualitative and quantitative features of children's gestures has been limited. Most work has looked only at recognition rates.

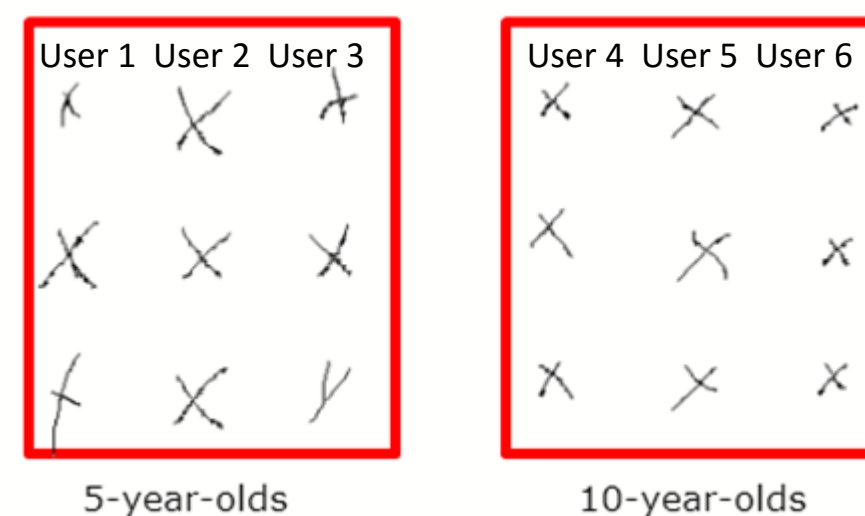


Figure 1. "X" gestures drawn by a three 5-year olds (left) and three 10-year-olds (right) on a touchscreen surface [1]. Younger kids show more variation in their gestures.

Solution

- Quantitatively & qualitatively analyze kids' gestures.
- Apply existing analysis tools to children's gestures.
- Create new analysis tools for children's gestures.
- Characterize children's gestures by age.
- Use discoveries to create better recognizers for children.

Data Collection

- 29 children age 5 to 10.
- 20 different gestures.
- 12 repetitions per gesture.
- Total of $29 \times 20 \times 12 = 6,960$ samples.
- Analogous data set of adults' gestures collected.
- Gestures were also used to run recognition experiments.

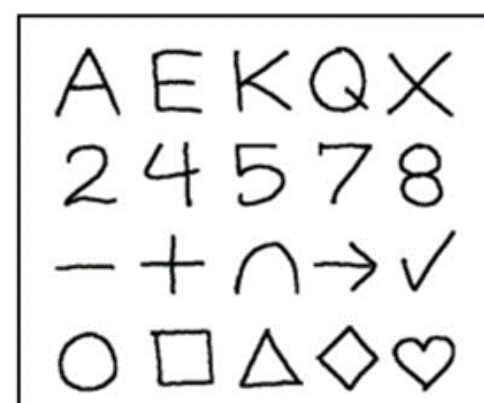


Figure 2. The gestures used in our study [2].

Analyses

- Gesture Relative Accuracy Toolkit (GREAT) [3]**

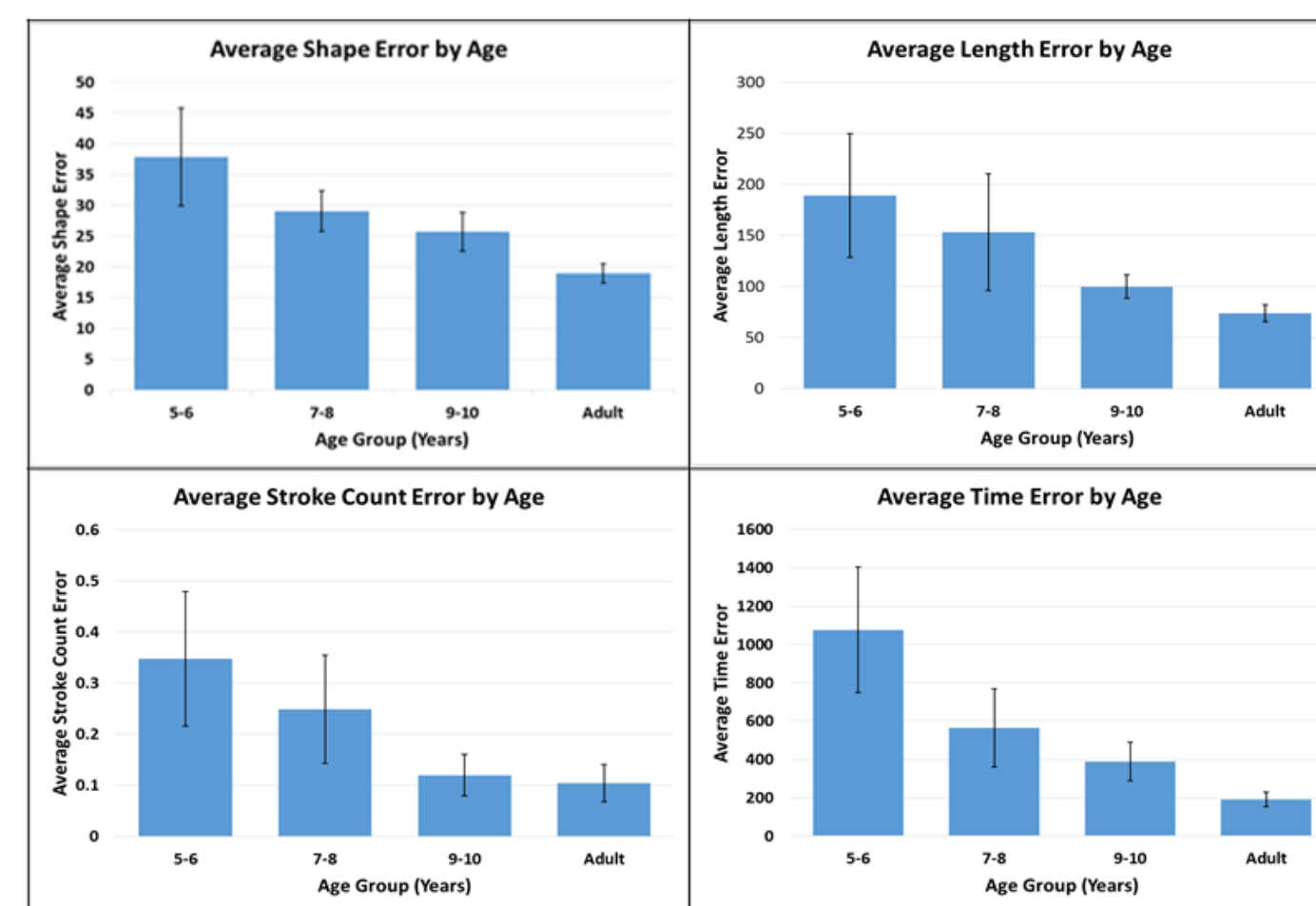


Figure 3. Relative accuracy measures from GREAT for participants in our study. These metrics are highest for youngest children and increase for older participants, like recognition rates.

- Gesture Heatmaps Toolkit (GHOST) [4]**



Figure 4. Visualization of a 10-year-old's gesture execution speed using GHOST. Blue represents slow execution, while red means fast.

- Confusion Matrices**

	2	4	5	7	8
2	0.58	0.03	0.02	0.01	0.04
4	0	0.66	0.01	0.01	0.04
5	0.04	0.02	0.62	0.02	0.06
7	0.01	0.03	0.02	0.6	0.03
8	0.01	0.01	0.06	0.03	0.73

Figure 5. Partial confusion matrix for one participant in our study. Highlighted values represent correct recognitions.

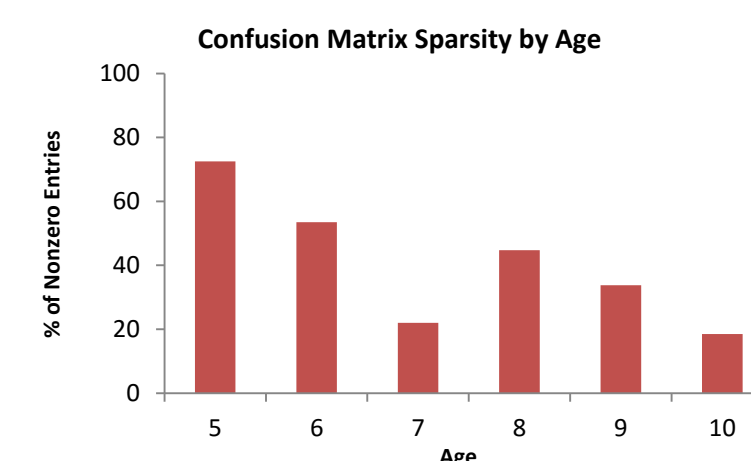


Figure 6. Sparsity of confusion matrix by age. A higher value means more pairs of gestures were confused.

Future Work

- New Metrics**, such as:
 - Joining Error** – measure of how poorly stroke ends meet.
 - Stroke Thickness / Traceovers** – Children tend to trace over their strokes much more than adults.
 - Measure of Stray Strokes** – measure of amount of ink that is isolated from rest of gesture.
- Improving Recognition**

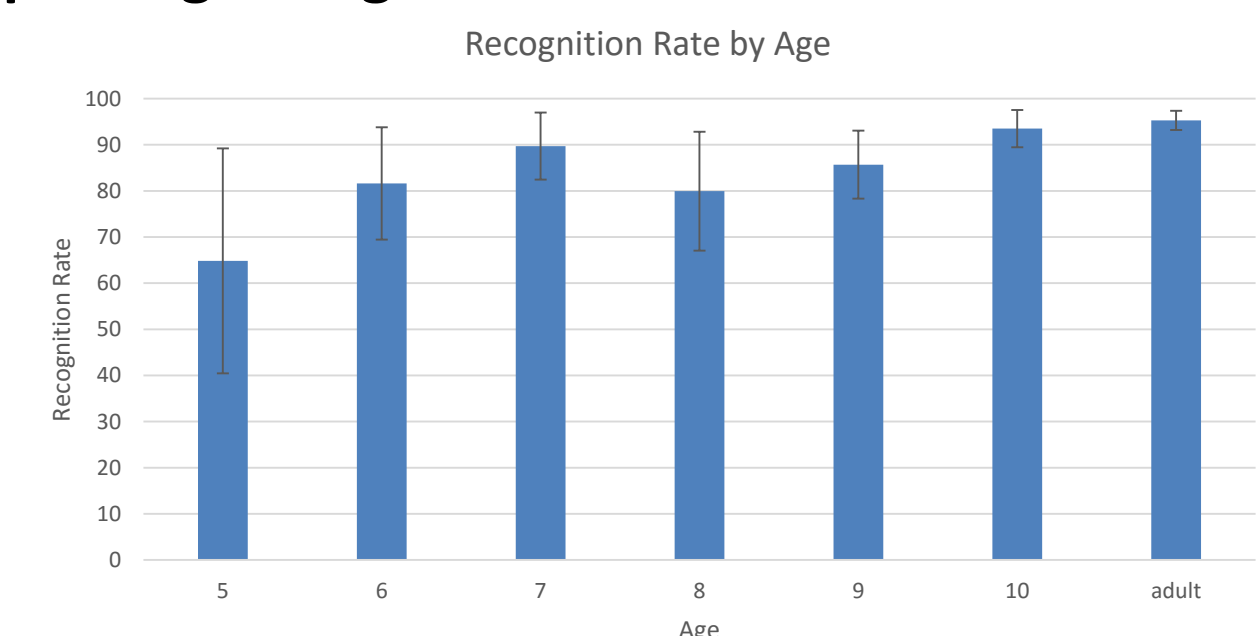


Figure 7. Recognition rates for gestures in our study. Recognition accuracy is lowest for 5-year-olds and increases for older participants.

References

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