

# Two New Mobile Touchscreen Text Entry Techniques

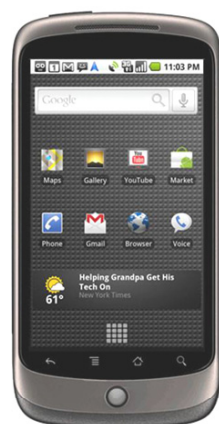
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## Mobile Touchscreen Text Entry

- Difficult to type on touchscreen keyboards.
- Keys usually smaller than finger tips.
- No tactile feedback.
- Error rate higher.
- WPM lower.



Apple iPhone



HTC Nexus One



Samsung Instinct

## New Techniques

- 1) Delay-based,
- 2) Pressure-based.

± Tactile Feedback  
(e.g., vibration)

## The Idea

- List of less probable characters.
- Make these harder to input:
  - 1) Add time-out or delay.
  - 2) Make them harder to press.

## Less Probable Characters

- Use digram frequencies:

$$\rho(C_n | C_{n-1}) = \frac{\rho(C_{n-1}, C_n)}{\rho(C_{n-1})}$$

$C_n$  =  $n$ -th character.

$\rho$  = probability of  $C_n$ 's appearance after  $C_{n-1}$ .

- Dictionary, grammar rules, ... can be used.

## Pressure Sensing Workaround

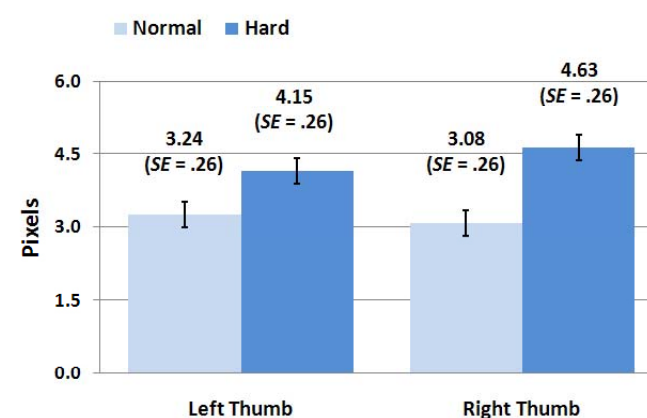
- Current touchscreen phones can't measure pressure.
- Touch centre moves with contact force.



Can we use this to detect pressure?

## Pilot Study & Result

- Within-subjects:  
3 Participants × 2 Sessions (*normal* & *hard* presses) × 2 Blocks (*left* & *right* thumb) × 26 Keys = 312 Presses.



- No significant effect of thumb orientation.
- Significant effect of pressure on centre movement.

## Experiment

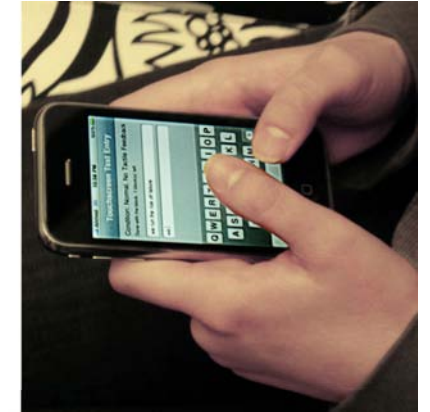
- Within-subjects, 6 × 6 balanced Latin square:  
12 Participants  
× 6 Sessions:  
Tactile feedback **No** Regular, Delay, Pressure.  
Tactile feedback **Yes** Regular, Delay, Pressure.  
× 20 Phrases = 1440 Phrases.

## Summary

- New techniques improve performance.
- Regular with tactile & Pressure **faster**, Delay the **most accurate**.
- Adding tactile feedback **reduces** errors.

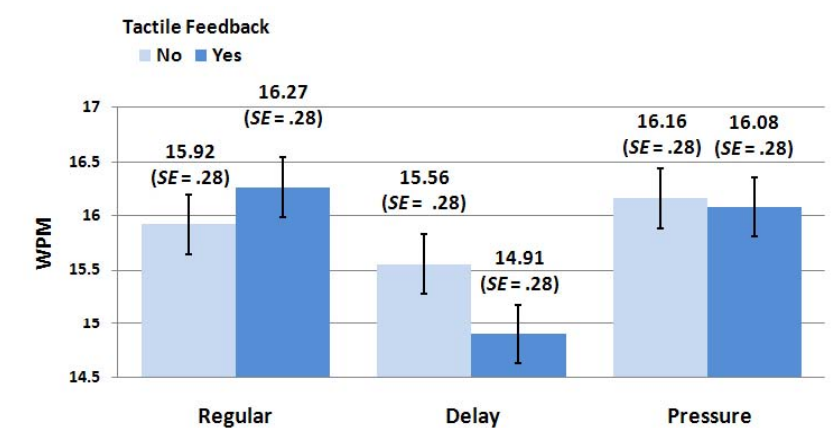
Q New techniques better?

Q Does tactile feedback increase performance?



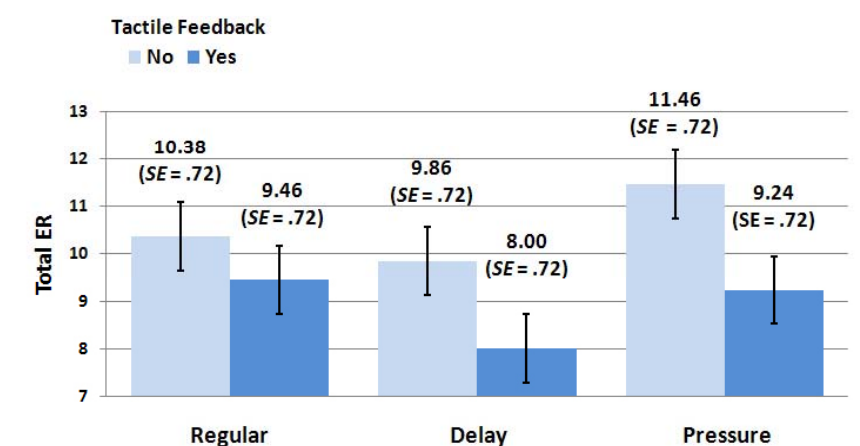
## Results

### WPM



- Significant effect of entry techniques.
- No significant effect of tactile feedback.

### Total ER



- Significant effect of entry techniques.
- Significant effect of tactile feedback.