ONE-HANDED MOBILE TEXT ENTRY Evaluation of five-key text entry techniques

Frode Eika SANDNES

Faculty of Engineering

Oslo University College (HIO)

Oslo, Norway

Why five keys?

- **Physical limitations**
  - Small devices, no space for full keyboards
  - Small keys -> errors (Fitt's law)
- **Human ergonomics**
  - One hand, five fingers
  - No need to move fingers between keys (speed, low-error rate, eyes free)
- **Attitude**
  - 5-key interface, non intimidating

Related Work (one-hand/five-keys)

- Chording (Noyes, 1983 + many more)
- Device independent handwriting (Isokoski, 2000)
- Mesh techniques (Bellman et al. 1998)
- Half-QUERTY (Matias et al, 1993)

This study – 3 multi-keystroke techiques

- Multitap (similar to old handsets)
- Tree-based
- One-stroke (similar to T9)

This study – 3 multi-keystroke techniques

- Multitap (similar to old handsets)
- Tree-based
- One-stroke (similar to T9)

Key-1: a, b, c, d, e, f
Key-2: g, h, i, j, k, l
Key-3: m, n, o, p, q, r
Key-4: s, t, u, v, w, x, y, z
Key-5: [break-key]

Characters retreived by repeadedly pressing the key labelled with the desired character until it appear, then the break key.

This study = 3 multi-keystroke techniques

- Multitap (similar to old handsets)
- Tree-based
- One-stroke (similar to T9)

Step 1: Chose category
Key-1: a, b, c, d, e
Key-2: f, g, h, i, j
Key-3: k, l, m, n, o
Key-4: p-q, r, s, t, u,
Key-5: v, w, x, y-z, [ ]

Step 2: Chose within cat.
Key-1: a
Key-2: b
Key-3: c
Key-4: d
Key-5: e

This study – 3 multi-keystroke techiques

- Multitap (similar to old handsets)
- Tree-based
- One-stroke (similar to T9)

Key-1: a, b, d, e
Key-2: f, g, h, i, j ,k, l, m
Key-3: n, o, p, q, r
Key-4: s, t, u, v, w, x, y, z
Key-5: [space]

Key with desired character once.

Word appear after word completed– or resolve ambiguities

Experiment

- **Subjects:**
  - 3 volunteer undergraduate students at OUC
- **Equipment:**
  - Desktop computer with full keyboard, monitor, mouse
    - 5-keys pammed to keys a, s, d, f and [space]
  - Text entry implemented as apples, running in browser
- **Procedure each method**
  - 5 minutes practice
  - 15 minutes typing session (source text on screen)
- **Measurements**
  - Timestamped keystroke events

Results

Subject	measure	MultiTap	Tree-based	One-stroke
Subject 1	Mean ikd	1.0	2.3	2.1
	Median ikd	0.5	1.4	1.2
	Mean ch/min	22.5	13.0	28.5
Subject 2	Mean ikd	0.76	1.62	1.97
	Median ikd	0.52	1.02	1.94
	Mean ch/min	27.2	18.6	31.1
Subject 3	Mean ikd	0.73	3.93	1.44
	Median ikd	0.24	2.13	0.55
	Mean ch/min	26.5	7.7	26.2

Results

The one-stroke strategy achieves the fastest typing rate

Subject	measure	MultiTap	Tree-based	One-stroke
Subject 1	Mean ikd	1.6	2.3	2.1
	Median ikd	0.5	1.4	1.2
	Mean ch/min	22.5	13.0	28.5
Subject 2	Mean ikd	0.76	1.62	1.97
	Median ikd	0.52	1.02	1.94
	Mean ch/min	27.2	18.6	31.1
Subject 3	Mean ikd	0.73	3.93	1.44
	Median ikd	0.24	2.13	0.55
	Mean ch/min	26.5	7.7	26.2

Results

Subject	measure	MultiTap	Tree-based	One-stroke
Subject 1	Mean ikd	1.0	2.3	2.1
	Median ikd	0.5	1.4	1.2
	Mean ch/min	22.5	13.0	28.5
Subject 2	Mean ikd	0.76	1.62	1.97
	Median ikd	0.52	1.02	1.94
	Mean ch/min	27.1	16.6	31.1
Subject 3	Mean ikd	0.7	3.9	1.44
	Median ikd	0.24	1.3	0.55
	Mean ch/min	26.5	7.7	26.2

Tree based is the slowest – it is the most cognitive demanding strategy

Results

Subject	measure	MultiTap	Tree-based	One-stroke
Subject 1	Mean ikd	1.0	2.3	2.1
	Median ikd	0.5	1.4	1.2
	Mean ch/min	22.5	13.0	28.5
Subject 2	Mean ikd	0.76	1.82	1.97
	Median ikd	0.52	1.02	1.94
	Mean ch/min	27.2	18.6	31.1
Subject 3	Mean ikd	0.73	3.93	1.44
	Median ikd	0.24	2.13	0.55
	Mean ch/min	26.5	7.7	26.2

MultiTap is cognitively esasy but very slow to use comparedto one stroke

General conclusion

- Multi-keystroke based techniques easy and quick to learn compared to chording
- Multi-keystroke based techniques cannot match typing speeds achieveable by chording
- Multi-keystroke based techniques suitable for ordinary occational users
- Chording suitable for specialised trained users
- Maybe 5-keys not the best solution for multi-keystroke class of text entry strategies.

Thank you!!!