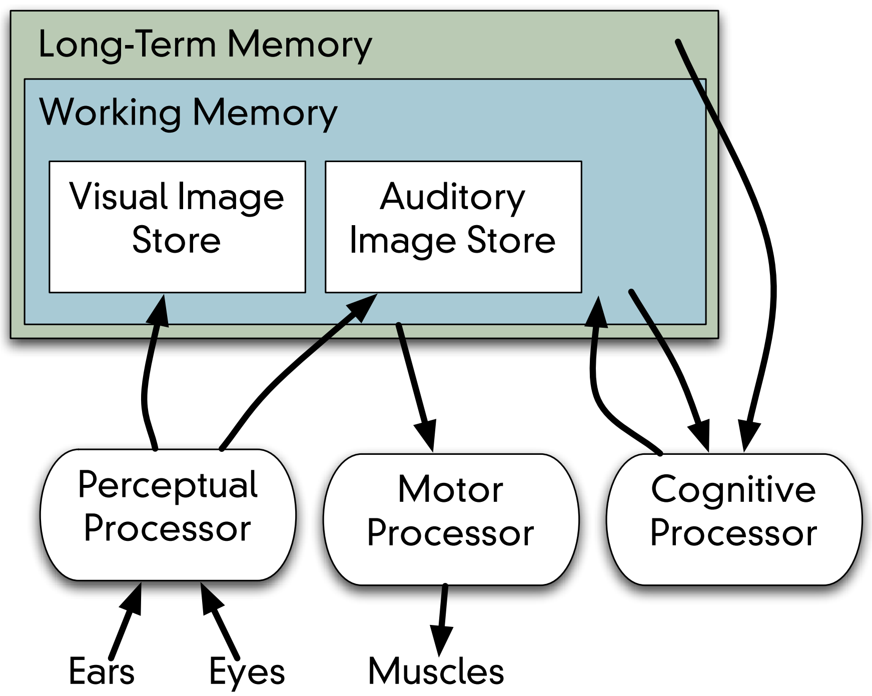
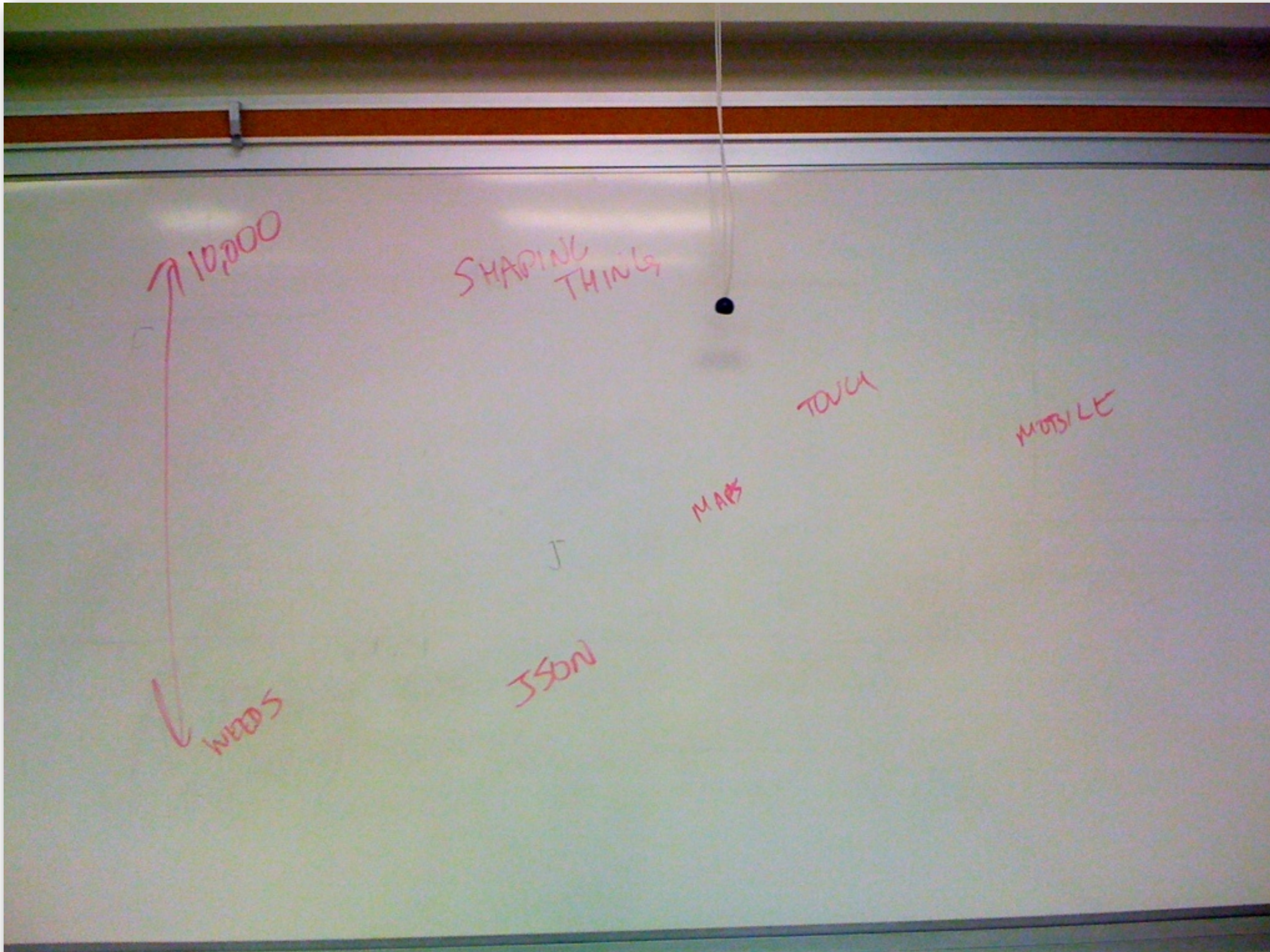


- Eyes as human output
- Touch as human input
- Sensory Memory
- Social Organization Around the individual
- External cognitive aids
  - Augmented Reality
  - Search

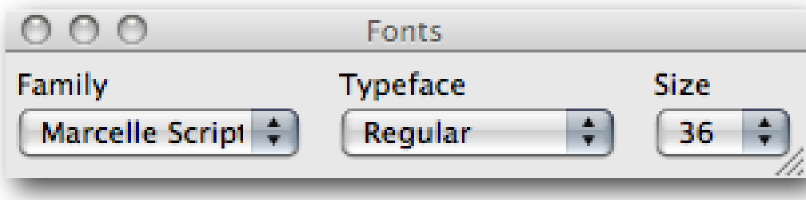

10,000
SHAPING THINGS
TOUCH
MOBILE
MAPS
JSON
WOODS

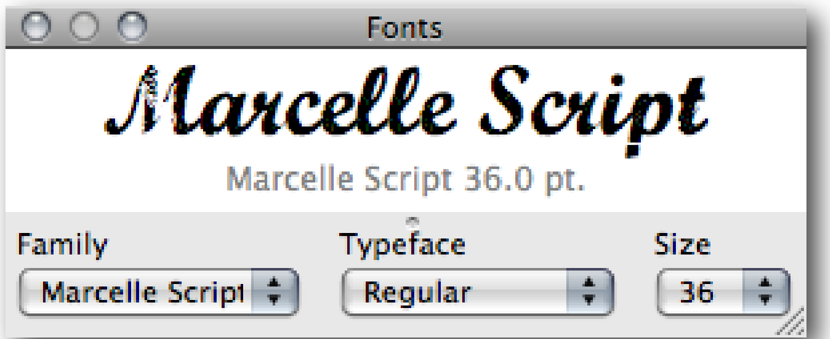
Individuals vary in their abilities

- long term
  - sex, physical and intellectual abilities
- short term
  - effect of stress or fatigue
- changing
  - age

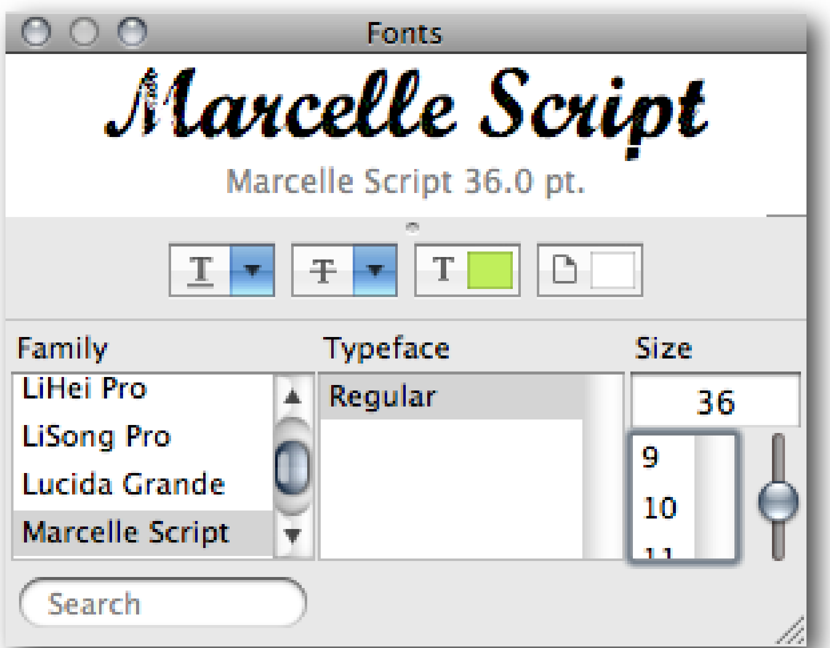
- Ask yourself:
  will design decision exclude section of user population?

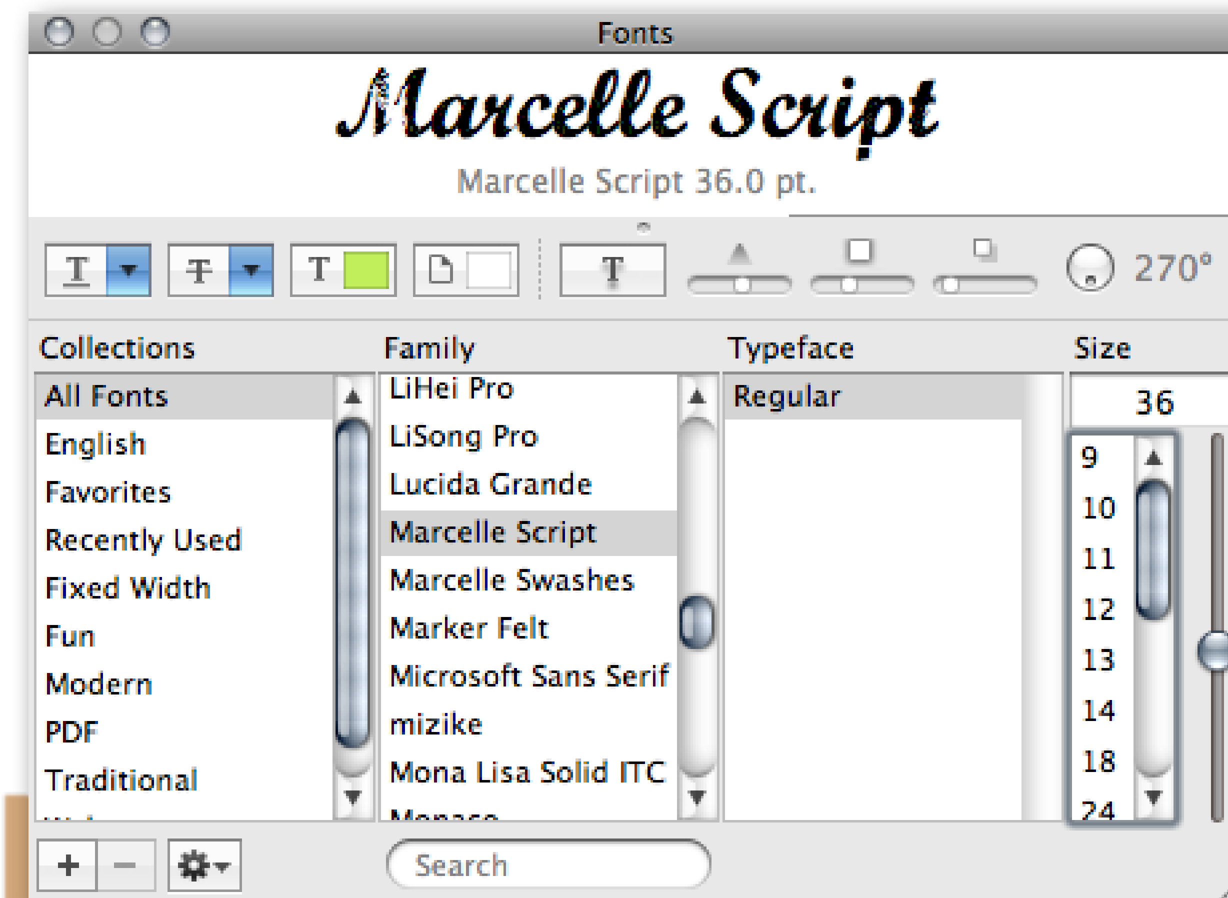
Addressing different skills and environments





- "Plasticity"
  - Adapting to different environments easily.
  - What environments?





Emotion influences human capabilities

Emotion

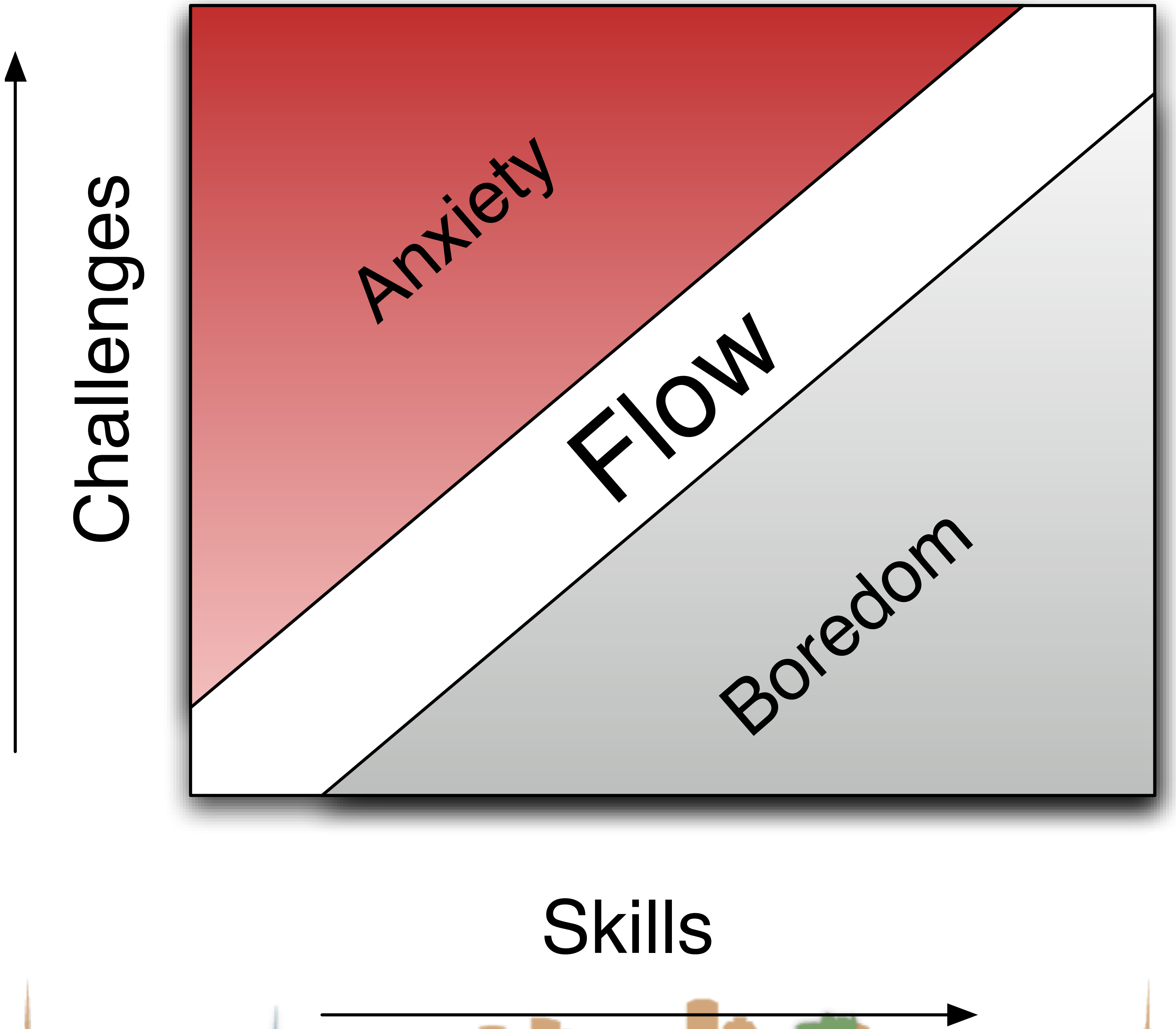
- Various theories of how emotion works
  - James-Lange: emotion is our interpretation of a physiological response to a stimuli
  - Cannon: emotion is more than a psychological response to a stimuli
  - Schacter-Singer: emotion is the result of our evaluation of our physiological responses, in the light of the whole situation we are in
- Emotion clearly involves both cognitive and physical responses to stimuli

Emotion

- The biological response to physical stimuli is called affect
- Affect influences how we respond to situations
  - positive → creative problem solving
  - negative → narrow thinking

“Negative affect can make it harder to do even easy tasks; positive affect can make it easier to do difficult tasks.”

D.A. Norman, 2002



From "Flow: Psychology of Optimal Experience" by Csikszentmihalyi

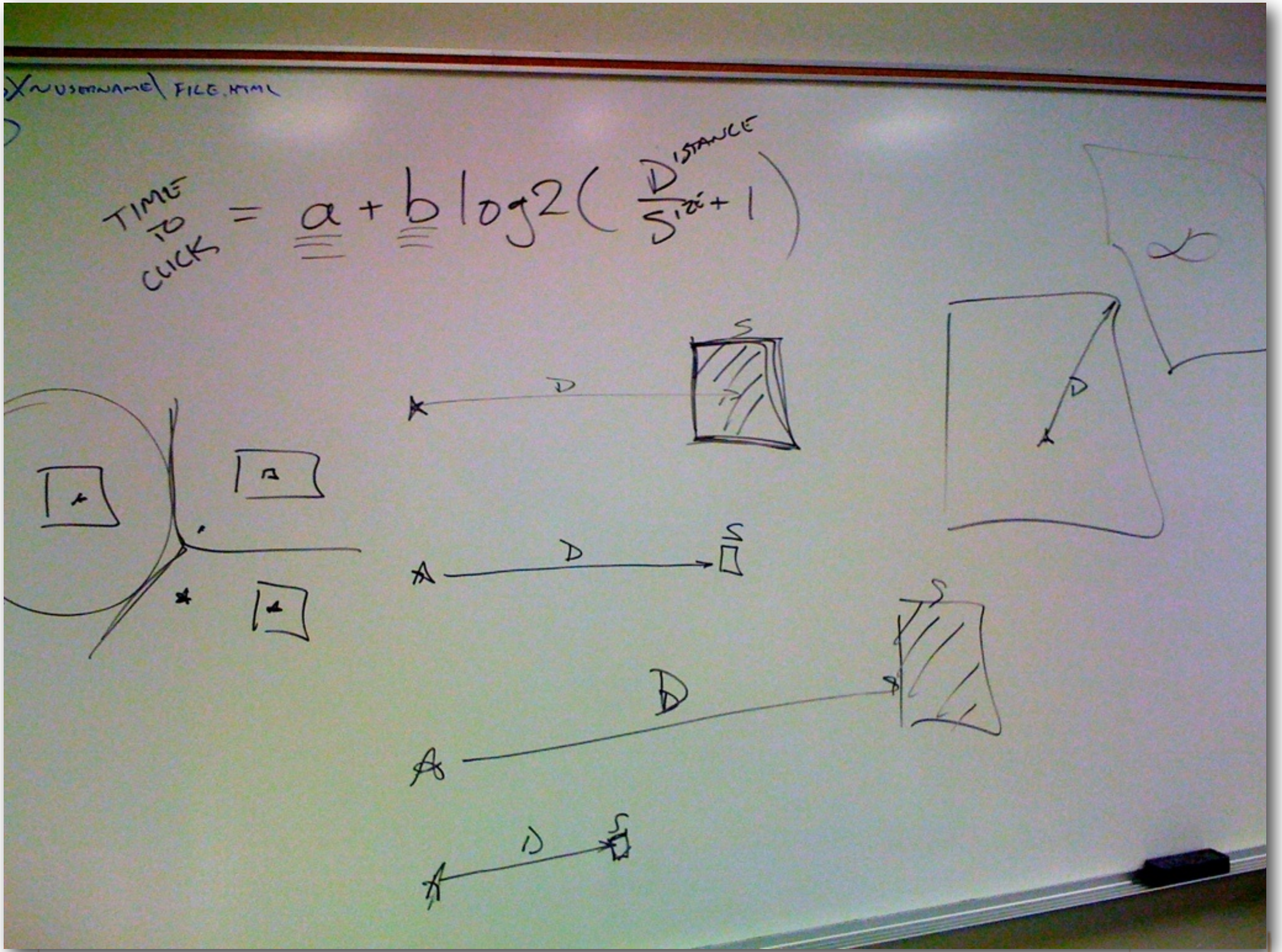
Aesthetic-Usability Effect

UPoD:Lidwell et.al.

- "Aesthetic-Usability Effect" is a phenomenon
- aesthetic designs
  - are perceived as more usable
  - are more likely to be used
  - make people more tolerant of problems
- unaesthetic designs
  - may be more usable, but don't get used

http://youtu.be/EBqHjEbLHEc

- 3 Models of Humans
  - Model Human Processor
    - Theoretical
  - Fitt's Law
    - Empirical [a+b log2(d/s +1)]
  - Flow
    - Design Concept
- Humans are heavily biased by expectations
  - From our biology to our cognitive response
- Think about design in terms of your actual real users
  - What are their capabilities?
  - What do they expect?


X\username\FILE.HTML
TIME TO CLICK = a + b log2(DISTANCE / SIZE + 1)
S
D
D
S
D
S
D
S
D

Individuals vary in their abilities

- Using an ATM if you are blind

3D U/Is

GEAR & GADGETS / PRODUCT NEWS & REVIEWS

3D on your smartphone, sans glasses: it's coming

Glassesless 3D is coming to a smartphone near you, and it's going to look ...

by Jon Stokes - Sept 24 2010, 4:40am PDT

41

The 3D user interface, like the pre-iPad tablet computer, is one of those long-heralded solutions that has yet to really find its problem. But whether we're ready for it or not, the same kind of glasses-less 3D found in Nintendo's 3DS handheld is coming to a smartphone near you. The 3D effect will be great for games and movies, but it's not clear that it should be used for anything else.

So-called parallax barrier screen designs from Sharp and Master Image, which can deliver a good-looking 3D image without requiring the user to don any kind of special eyewear (i.e., "autoscopic 3D"), cost in the neighborhood of $15 to add to a smartphone-sized screen. That's not a lot of money, given how good the 3D effect is—I saw one in action at the Scaleform booth on the floor of NVIDIA's GPU Technology Conference, and it looked very good. These are going to be a hot item when they start hitting the market.

Scaleform is a software company that's working on a middleware layer for mobile 3D games, both the normal kind and Flash-based, casual games. A number of shipping games use Scaleform's technology already, and the company is now targeting the upcoming wave of parallax barrier-based displays with its first attempt at a UI toolkit that looks and functions naturally in an autoscopic 3D environment.

Like so many UI geeks over the past quarter century or so, Scaleform is convinced that some form of actual 3D is the future of interfaces—not Android-style "it uses the 3D parts of the GPU to add bling to what is essentially a 2D interface," but honest-to-God, "these interface components are really positioned at different depths" type of 3D.

Color me skeptical.

"3D visual interfaces need to be paired with 3d physical interfaces"

3D U/Is

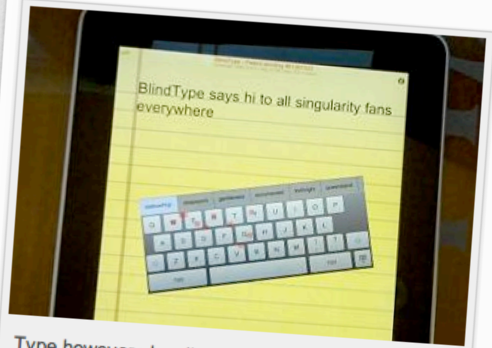
Holodeck video

BlindType

Written By: Aaron Saenz
Posted: 07/29/10 6:04 PM

Tweet 141 +1 4 Like 320 Email Story

EXCLUSIVE: I USED BLINDTYPE, VIRTUAL KEYBOARD OF THE FUTURE



Type however sloppily you want. BlindType knows what you mean to say.

Typing on the iPhone is like squeezing sausages into a soda can – you can get it to work, but it's not pretty. BlindType is changing that. The startup has created a new touchscreen keyboard program of the same name that changes size, orientation, and position to match your wandering fingers as they type. BlindType also features some of the most impressive typing correction software I've ever seen. The result is a practical touchscreen interface that knows what you meant to type, even if you make mistakes. Lots of them. In fact, you can type without looking at the screen at all! It's amazing, and I got to see it in person when I visited with BlindType creators Kostas Eleftheriou and Panos Petropoulos in San Francisco. Check out their demonstration video below. It's hard to believe that they developed this software in less than one year.

Because BlindType is still under development Kostas and Panos would only let me take still shots of the program. Yet as you can see in their public demo video, BlindType lets the user be sloppy. When I tried the program on an iPad I could relax about mistakes. Not in spelling, but in the actual way I actually tried to hit keys on the touchscreen keyboard. Do you have fat fingers like me? Not a problem. Do your hands migrate slowly as you type? It can handle that too. Hold your iPad to one side, type in progressively larger or smaller movements, even ditch the keyboard altogether. BlindType can deal with it all. Just watch and learn:

“users don't trust a keyboard without feedback”

“typing corrector not a spelling corrector”

Casual Test of Text Entry Speed

Pen v keyboard v Newton v Graffiti v Treo v iPhone

For some time I've been meaning to test my small collection of PDA/smartphone gadgets to see which of their methods of input was quickest. The iPhone's software keyboard? The Newton's handwriting recognition? Palm's Graffiti? With the possible imminent arrival of a tablet from Apple that will save the world, it seemed a good time to get round to the test.

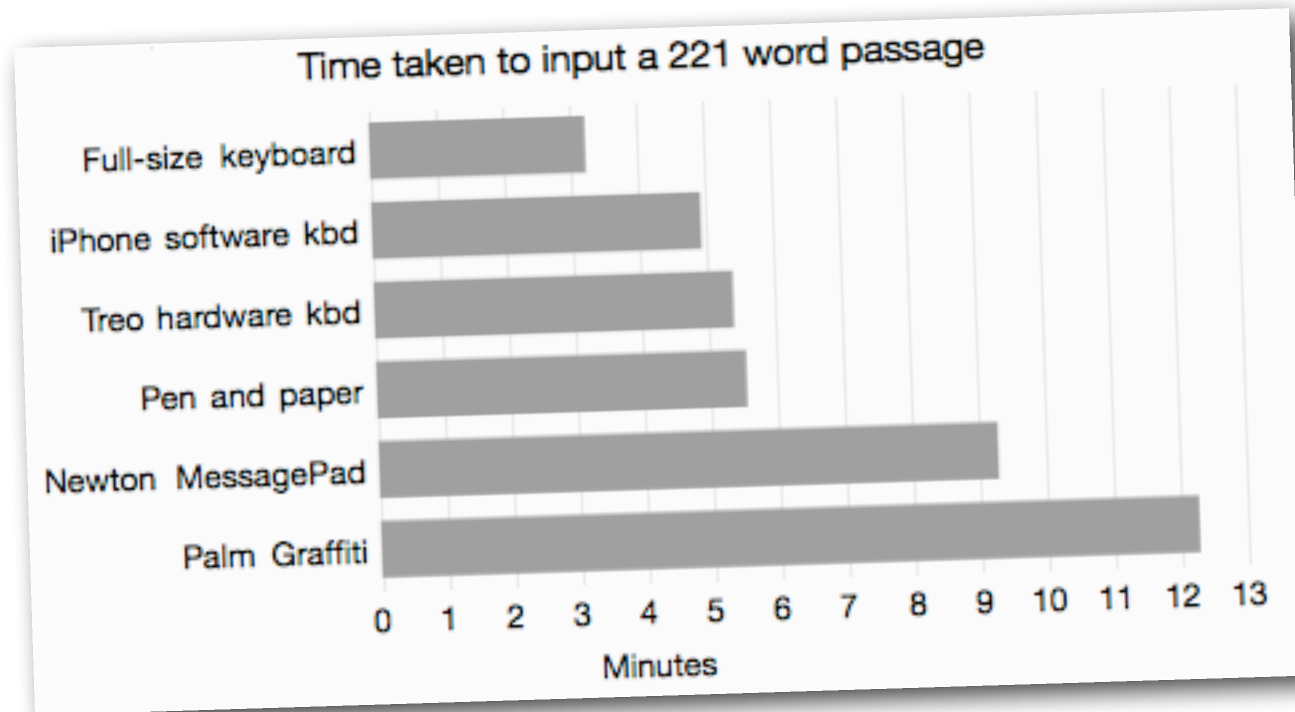
I have six input methods to compare:

- The Apple Newton MessagePad 2100's handwriting recognition (1997)
- The Palm Vx's Graffiti (1999)
- The Palm Treo 650's hardware QWERTY keyboard (2004)
- The Apple iPhone 3G's software QWERTY keyboard (2009)

Although an exhaustive test could have included other devices, these four seem to cover the main types of input. For comparison's sake I also tested:

- Pen and paper
- A full-size QWERTY keyboard

To test the speed of input I was going to use the same piece of text for each one. I also wanted to use some text I could memorise, so I didn't have to pause typing/writing to look up, and the later tests wouldn't benefit from my increasing knowledge of the text.



"I decided to time my fast handwriting"

"this is not a particularly scientific experiment"

Mobile Text Entry

Mobile Text Entry

Twiddler One-Handed Keyboard

Mini-QWERTY Keyboards

Over 1 trillion wireless messages are typed each year, and more e-mail is being sent via mobile phone than home PC in some countries. Yet current typing methods on mobile phone keypads such as Multitap and T9 are slow, averaging 8 to 20 words per minute (wpm) for experts. We are investigating text entry methods that enable typing at 50-130wpm, which is equivalent to highly-skilled desktop typing rates. We have performed longitudinal studies on the Twiddler one-handed chording keyboard, the multi-tap method implemented on the Twiddler (for comparison), and two mini-QWERTY (thumb) keyboards. In addition to issues of typing speeds, error rates, and learnability, our research investigates viable methods of text entry when the user may have limited visual feedback, such as when walking or engaged in a face-to-face conversation.

The Twiddler is a one-handed chording mobile keyboard that employs a 3x4 button layout, similar to that of a standard mobile telephone. Despite its seeming applicability to the mobile market and use by the wearable computing community, there has been very little data on the Twiddler's performance and learnability. In our longitudinal study comparing novice users' learning rates on the Twiddler versus multi-tap, we found that multi-tap users' maximum speed averaged 20wpm while Twiddler users averaged 47wpm. One user averaged 67wpm. We analyze the effects of learning on various aspects of chording and provide evidence that lack of visual feedback does not hinder expert typing speed. Such "blind" typing" situations are common during face-to-face conversations, classroom lectures, or business meetings. We examine the potential use of multi-character chords (e.g. pressing the g and h keys for to produce "ing ") to increase text entry speed (Thad has bursted up to 130wpm on certain phrases while testing the experimental software). Finally, we explore improving novice typing rates on the Twiddler through use of a chording tutorial and create a prototype design of a mobile phone that could use the Twiddler's typing method.

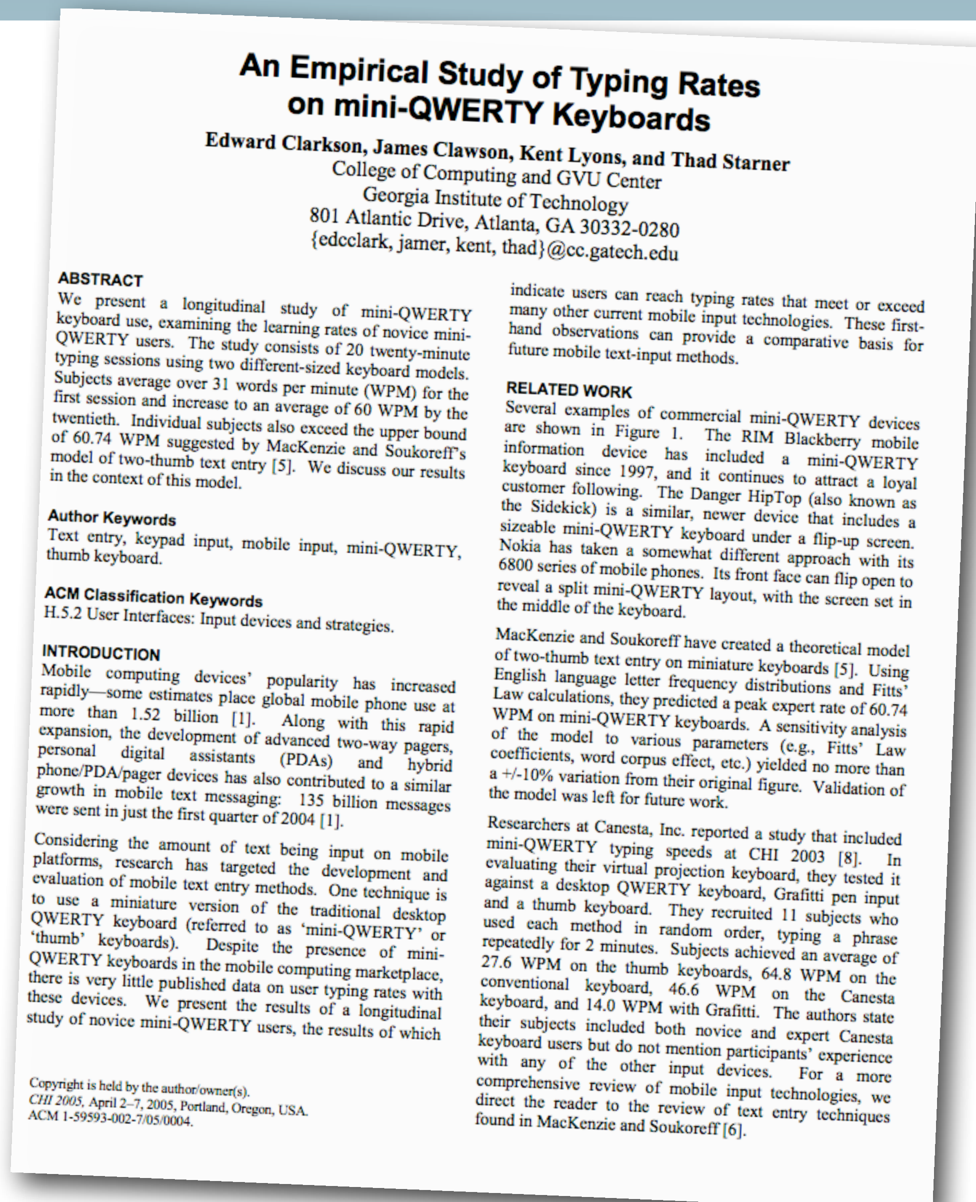
In our longitudinal study of mini-QWERTY keyboards, beginning users who are already expert at desktop keyboards type at approximately 30wpm. With practice, these typists average 60wpm. However, in the blind condition, our subjects peaked at 45wpm with much higher error rates than in the normal mini-QWERTY condition or in any of the blind Twiddler typing experiments. We analyze the types of errors made by mini-QWERTY typists, suggest methods of improving accuracy, and use our experimental results to update the current theoretical model of the maximum expected typing rates for a mini-QWERTY keyboard.

We conclude that desktop typing rates are possible on small mobile devices. This empirical result suggests that desktop-style computing services may be supportable on current mobile phone form factors. In selecting a typing method for the design of new device we can offer the following suggestions. The mini-QWERTY keyboard should be considered if the user is expected to already be expert at desktop QWERTY typing and is expected to be able to use both hands and visually concentrate on the keyboard while typing. If the user is learning to type for the first time, if the device does not have physical space for more than a 12 key numberpad, or if the user is expected to use the device in "hands-limited" scenarios, then the Twiddler style of chording should be considered. We also suspect, but have not shown, that the Twiddler would enable typing and error rates superior to those of the mini-QWERTY keyboard while the user is walking or otherwise mobile. If the Twiddler style of text entry is chosen for the design of a new device, we suggest the inclusion of a built-in tutor, such as our Twidor Java software, to encourage novice typists by demonstrating that they can achieve fast typing rates quickly.

"chording keyboard"

"desktop typing rates are possible on a small mobile device"

..Empirical Study...



An Empirical Study of Typing Rates on mini-QWERTY Keyboards

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ABSTRACT
We present a longitudinal study of mini-QWERTY keyboard use, examining the learning rates of novice mini-QWERTY users. The study consists of 20 twenty-minute typing sessions using two different-sized keyboard models. Subjects average over 31 words per minute (WPM) for the first session and increase to an average of 60 WPM by the twentieth. Individual subjects also exceed the upper bound of 60.74 WPM suggested by MacKenzie and Soukoreff's model of two-thumb text entry [5]. We discuss our results in the context of this model.

Author Keywords
Text entry, keypad input, mobile input, mini-QWERTY, thumb keyboard.

ACM Classification Keywords
H.5.2 User Interfaces: Input devices and strategies.

INTRODUCTION
Mobile computing devices' popularity has increased rapidly—some estimates place global mobile phone use at more than 1.52 billion [1]. Along with this rapid expansion, the development of advanced two-way pagers, personal digital assistants (PDAs) and hybrid phone/PDA/pager devices has also contributed to a similar growth in mobile text messaging: 135 billion messages were sent in just the first quarter of 2004 [1].

Considering the amount of text being input on mobile platforms, research has targeted the development and evaluation of mobile text entry methods. One technique is to use a miniature version of the traditional desktop QWERTY keyboard (referred to as 'mini-QWERTY' or 'thumb' keyboards). Despite the presence of mini-QWERTY keyboards in the mobile computing marketplace, there is very little published data on user typing rates with these devices. We present the results of a longitudinal study of novice mini-QWERTY users, the results of which indicate users can reach typing rates that meet or exceed many other current mobile input technologies. These first-hand observations can provide a comparative basis for future mobile text-input methods.

RELATED WORK
Several examples of commercial mini-QWERTY devices are shown in Figure 1. The RIM Blackberry mobile information device has included a mini-QWERTY keyboard since 1997, and it continues to attract a loyal customer following. The Danger HipTop (also known as the Sidekick) is a similar, newer device that includes a sizeable mini-QWERTY keyboard under a flip-up screen. Nokia has taken a somewhat different approach with its 6800 series of mobile phones. Its front face can flip open to reveal a split mini-QWERTY layout, with the screen set in the middle of the keyboard.

MacKenzie and Soukoreff have created a theoretical model of two-thumb text entry on miniature keyboards [5]. Using English language letter frequency distributions and Fitts' Law calculations, they predicted a peak expert rate of 60.74 WPM on mini-QWERTY keyboards. A sensitivity analysis of the model to various parameters (e.g., Fitts' Law coefficients, word corpus effect, etc.) yielded no more than a +/-10% variation from their original figure. Validation of the model was left for future work.

Researchers at Canesta, Inc. reported a study that included mini-QWERTY typing speeds at CHI 2003 [8]. In evaluating their virtual projection keyboard, they tested it against a desktop QWERTY keyboard, Grafitti pen input and a thumb keyboard. They recruited 11 subjects who used each method in random order, typing a phrase repeatedly for 2 minutes. Subjects achieved an average of 27.6 WPM on the thumb keyboards, 64.8 WPM on the conventional keyboard, 46.6 WPM on the Canesta keyboard, and 14.0 WPM with Grafitti. The authors state their subjects included both novice and expert Canesta keyboard users but do not mention participants' experience with any of the other input devices. For a more comprehensive review of mobile input technologies, we direct the reader to the review of text entry techniques found in MacKenzie and Soukoreff [6].

CHI 2005, April 2–7, 2005, Portland, Oregon, USA.
ACM 1-59593-002-7/05/0004.

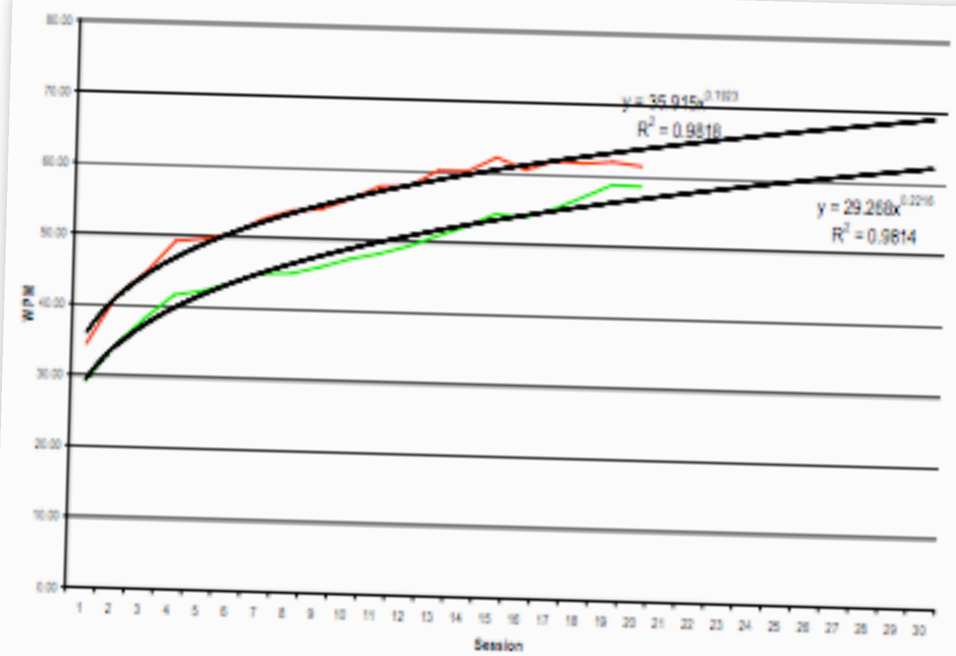

Figure 4. Per-group session average WPM with regression curves, equations and correlations. Dell curves are on the bottom; Targus curves on top.

"One potential reason for the empirical deviation from the model relates to key width measurement."

- About these papers
  - Demonstrate physical variations on input
  - Demonstrate a range of rigor in evaluation
  - Demonstrate techniques that can be applied to new devices

LUCI