Interaction Design

Chapter 6 (May 29th, 2013, 9am-12pm): Laws of Interaction Design

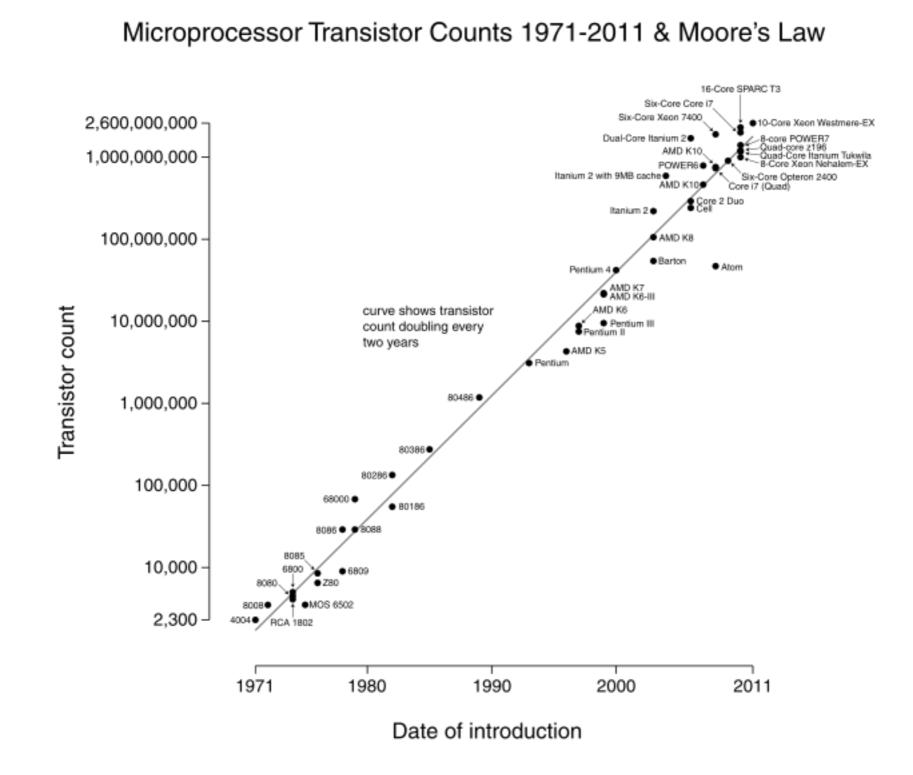
- Moore's law
- Buxton's law
- Fitts' law
- Steering law
- Guiard's Kinematic chain model
- Hick's law
- Law of practice
- Murphy's law

Moore's law

"The complexity for minimum component costs has increased at a rate of roughly a factor of two per year...Certainly over the short term this rate can be expected to continue, if not to increase. Over the longer term, the rate of increase is a bit more uncertain, although there is no reason to believe it will not remain nearly constant for at least 10 years. That means by 1975, the number of com-ponents per integrated circuit for minimum cost will be 65,000. I believe that such a large circuit can be built on a single wafer."

[Moore, Gordon E. (1965). "Cramming more components onto integrated circuits". Electronics, Volume 38, Number 8, April 19, 1965.]

Moore's law illustration

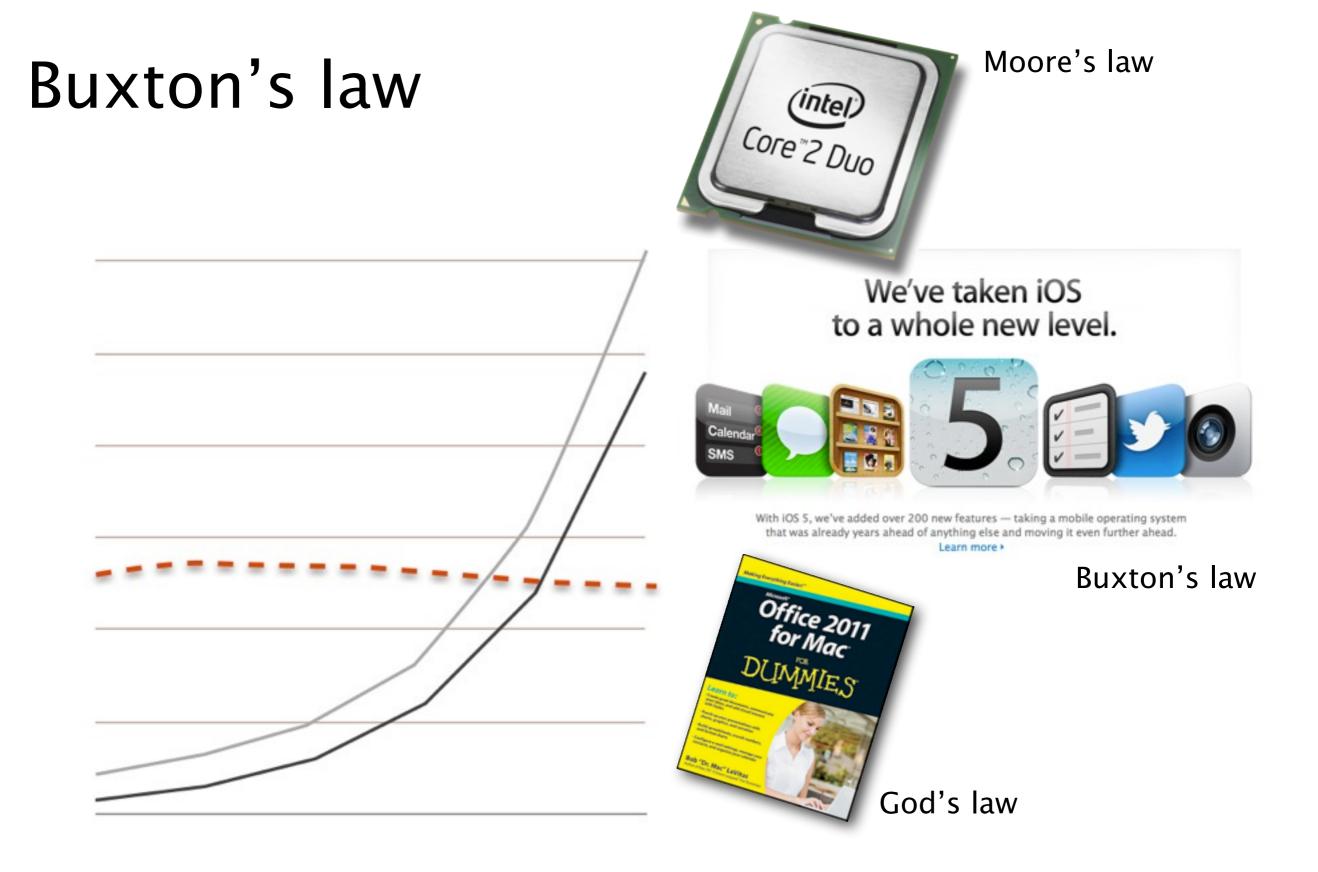


Moore's law implications

Don't worry too much about:

- computing power
- storage capacity
- screen resolution
- device size
- weight
- battery life (?)

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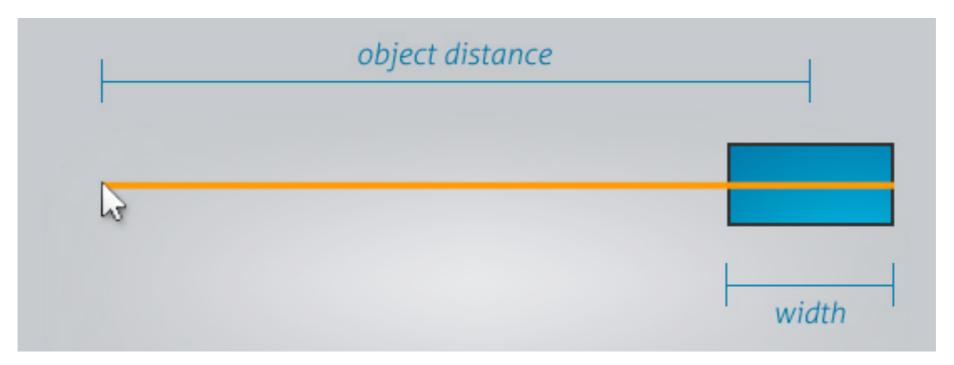


http://www.billbuxton.com/LessIsMore.pdf

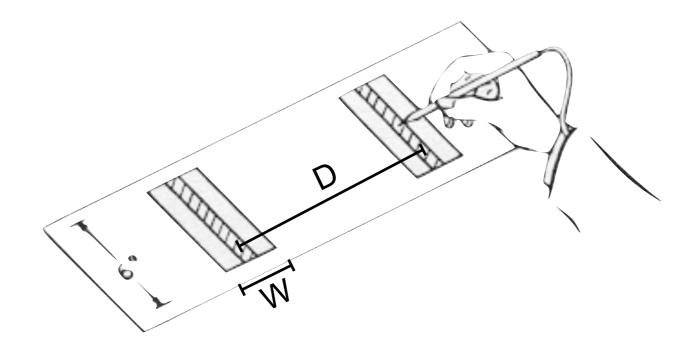
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Fitts' law

The time to acquire a target is a function of the distance to and width of the target.



Fitts' law



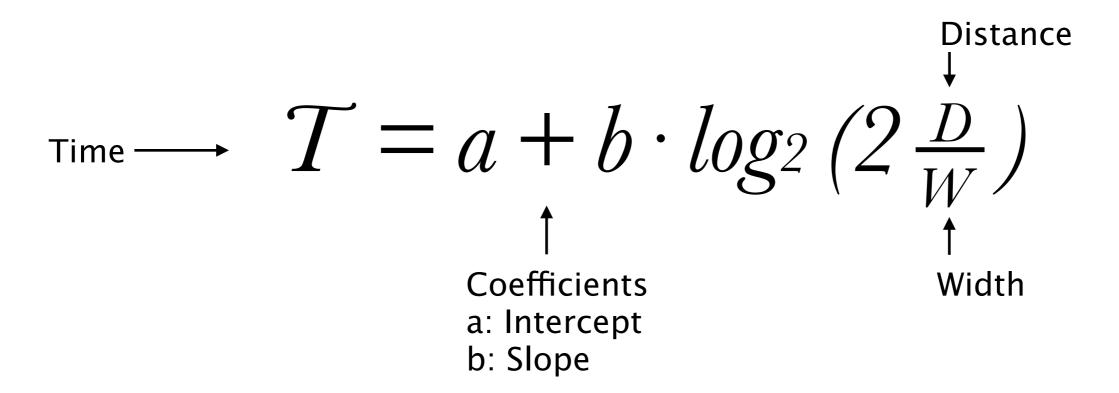






Illustration from http://particletree.com/features/visualizing-fittss-law/

Implications of Fitts' law

Larger targets are easier to hit -> maximize button size List of Invoice
Archive Delete Copy Print Send Enter Payment Pay Online
Invoice Client Name Description Date
Date

Movement time increases (logarithmically) with distance -> minimize distances

-> no movement is even better!

Infinite Target Widths at Edges

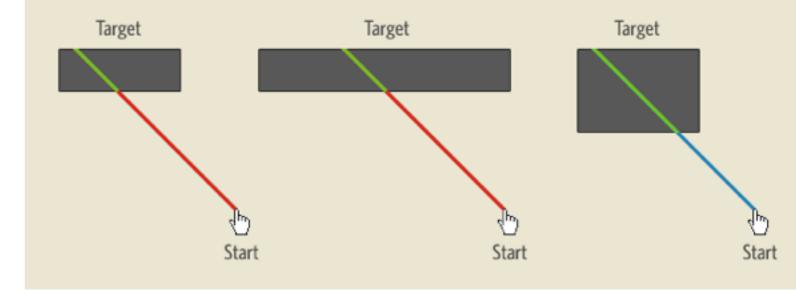
Infinite targets:

- -> leverage screen borders
- -> leverage corners

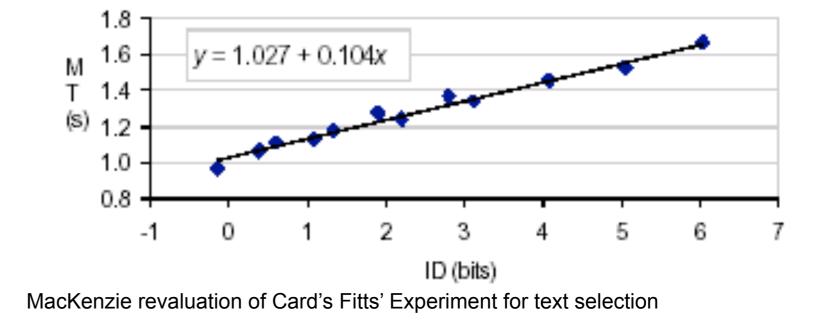
Illustration from http://particletree.com/features/visualizing-fittss-law/

Bigger Is Not Always Better

Movement direction to target

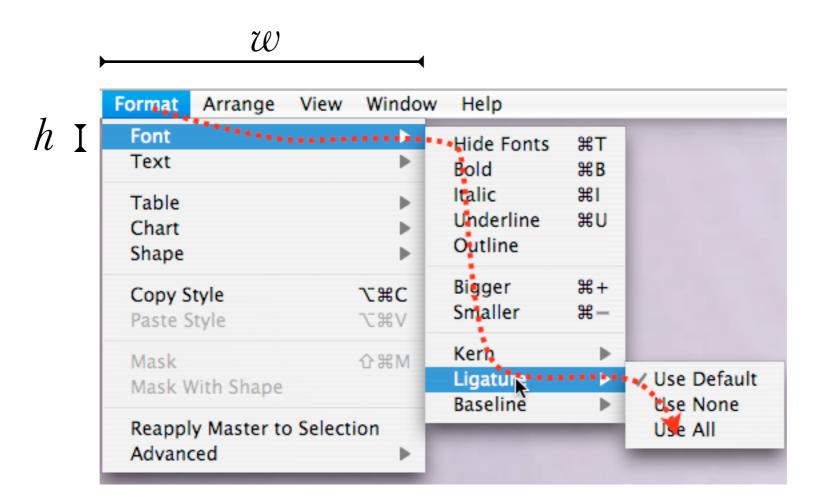


Logarithmic improvements with size



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Steering law

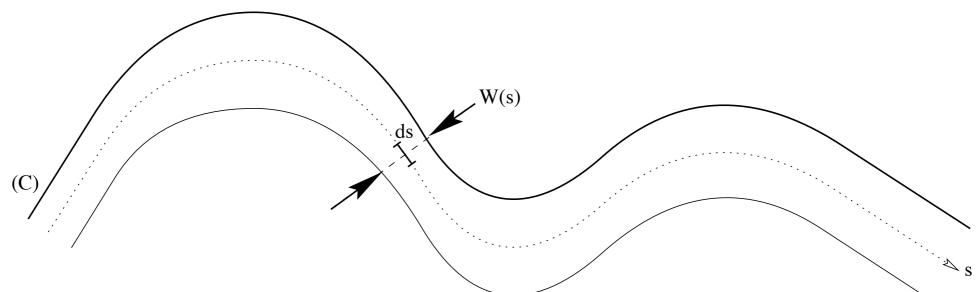


$$T_n = \underbrace{a + b \frac{nh}{w}}_{\text{trical}} + \underbrace{a + b \frac{w}{h}}_{\text{trical}}$$

$$= 2a + b(\frac{n}{x} + x) \text{ with: } x = \frac{w}{h}$$

Steering law on curved paths

C is the path parameterized by s:



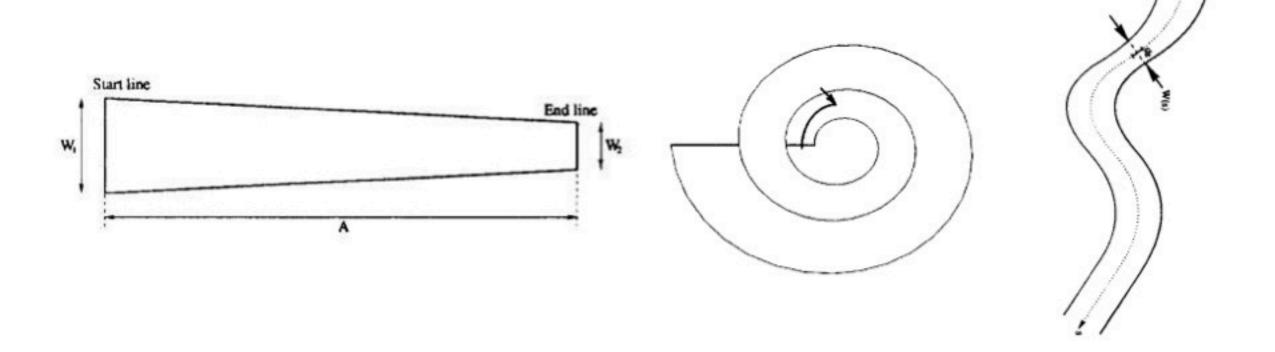
average time to navigate through the path

$$\begin{array}{c} \downarrow \\ T = a + b \int_C \frac{ds}{W(s)} \leftarrow \quad \text{width of the path at s} \end{array}$$

experimentally fitted constants

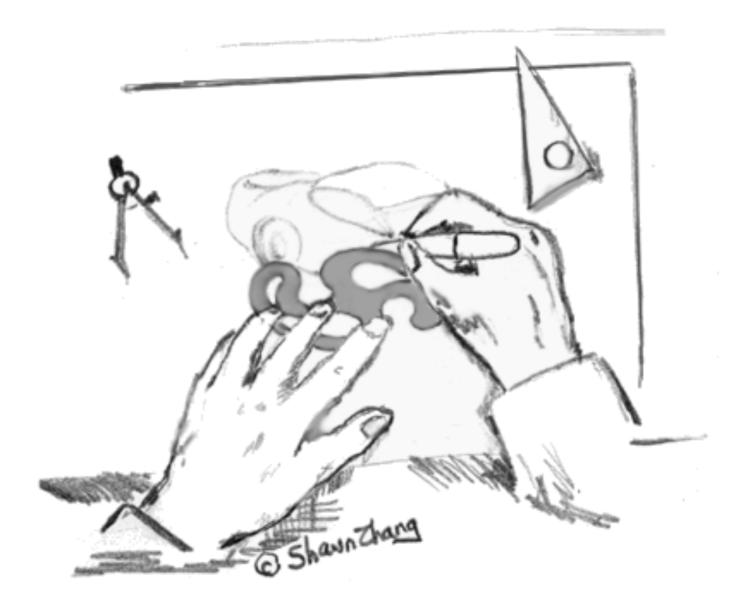
Steering Law applications

- Early work focused on car driving scenarios and models with straight tunnels
- · Various example tunnel shapes have been explored



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A human capability



From The Two-Handed Desktop Interface: Are We There Yet? [MacKenzie & Guiard, 2001]

Guiard's Kinematic Chain

"Under standard conditions, the spontaneous writing speed of adults is **reduced** by some **20%** when instructions **prevent the non-preferred hand** from manipulating the page"

Non-dominant hand provides a frame of reference for the dominant hand

- Non-dominant hand operates at a coarse temporal and spatial scale;
- Dominant hand operates at a fine temporal and spatial scale

l'internete est une contraster que se developpe générieure. . d'une mensie deservieurs el seu que l'on pusse de contracter .

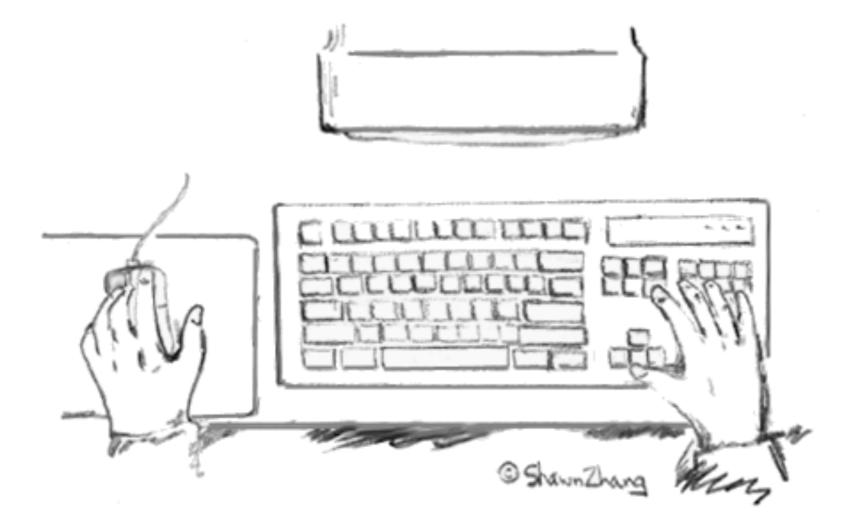
Cu suit qu'une contourner est une chierten changée dans le cos le plus general, le combactible, mis en presence d'un combinant (l'icagérie de l'arc le plus souvent) ans apost d'une flamme on plus geineralement de chalein proseque l'écles con d'un forze d'intende.

la combustion à les en general en place Jajunie (flammen), ben que des maiores remune la cellular on la bois pluident, par nume part, à l'étai douche, en mot agaition (brases).

le developpement provible de l'incendre necessite la présence des lans facteur contentes indigrés sources présentes schemetiquement en trangle. Il défent de du même mit n'y a pas avec d'ais ou cl'angénne, de le combustible



Two handed-interaction at the desktop



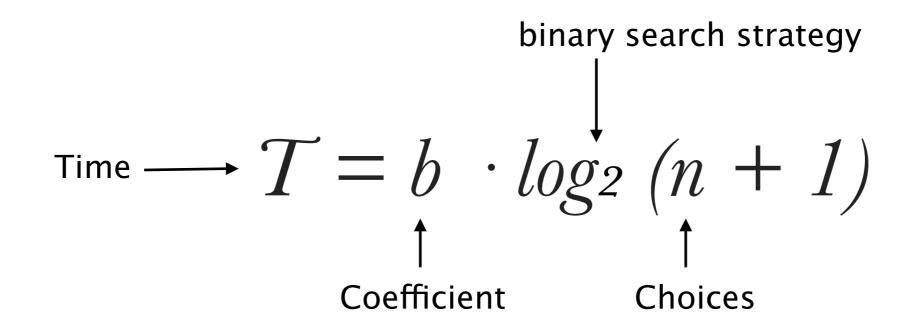
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LMU München – Medieninformatik – Alexander Wiethoff + Andreas Butz – Interaction Design – SS2013

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Given **n** equally **probable choices**, the average reaction **time** *T* required **to choose among them** is:



Hick Law Examples

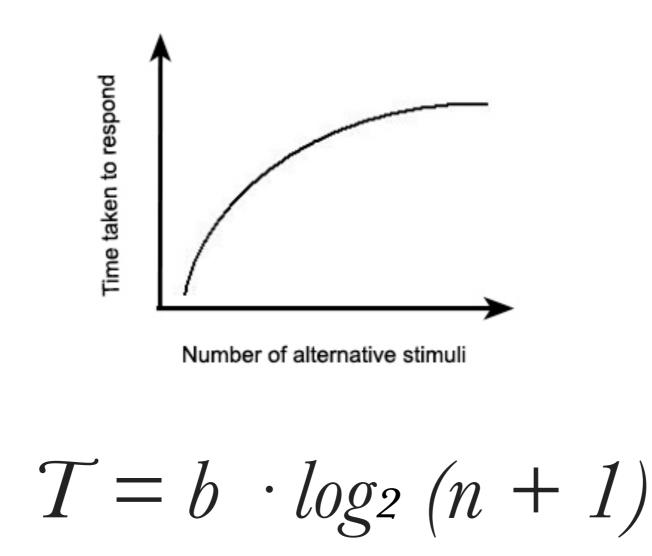
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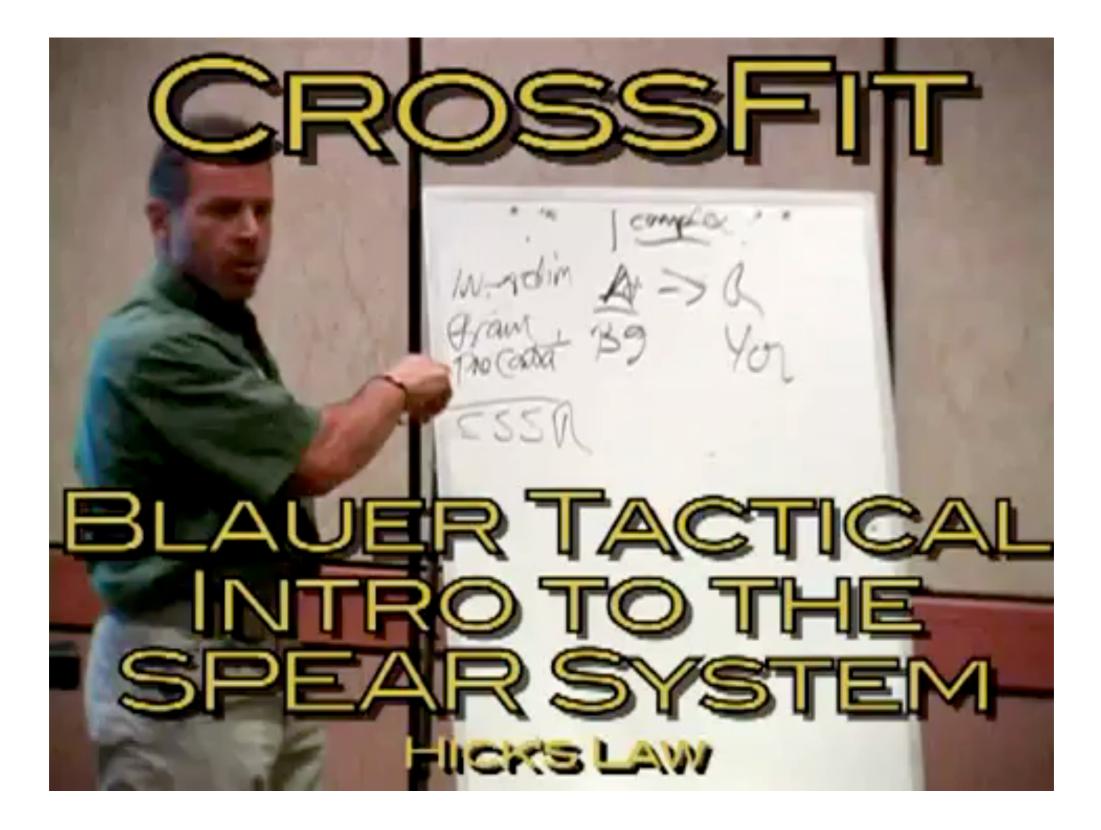


http://www.photosophic.com/iphone_screen

Hick's law



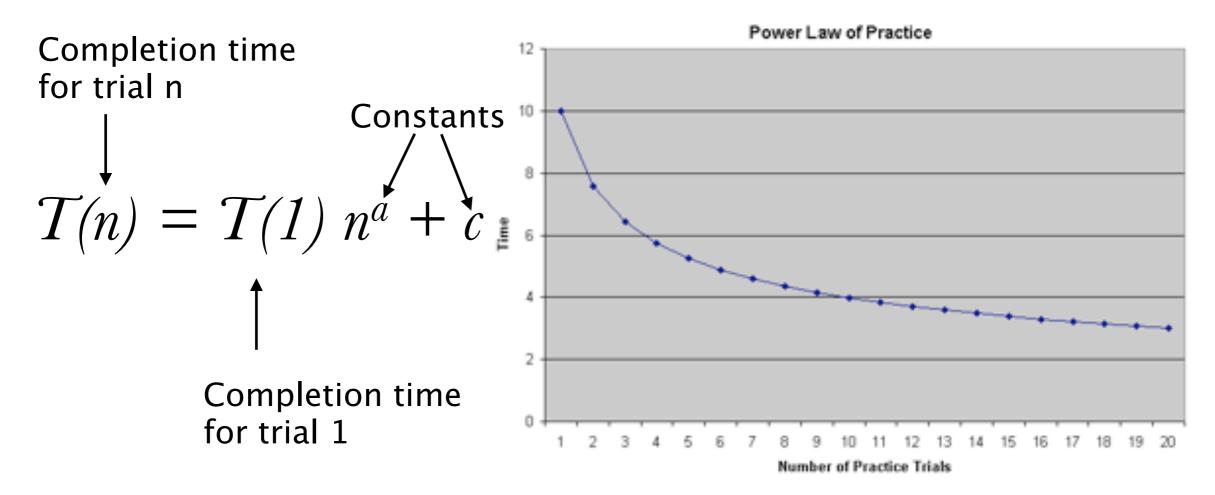
In another context, and slightly wrong ;-)...



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The Power Law of Practice

- When performing a task based on practice trials, people improve in speed at a decaying exponential rate.
- The time needed for a particular task decreases in proportion to the number of practice trials taken raised to a power of about a = -0.4
- The logarithm of the time needed for a particular task decreases linearly with the logarithm of the number of practice trials taken (this formulation is for the math geeks...;-)



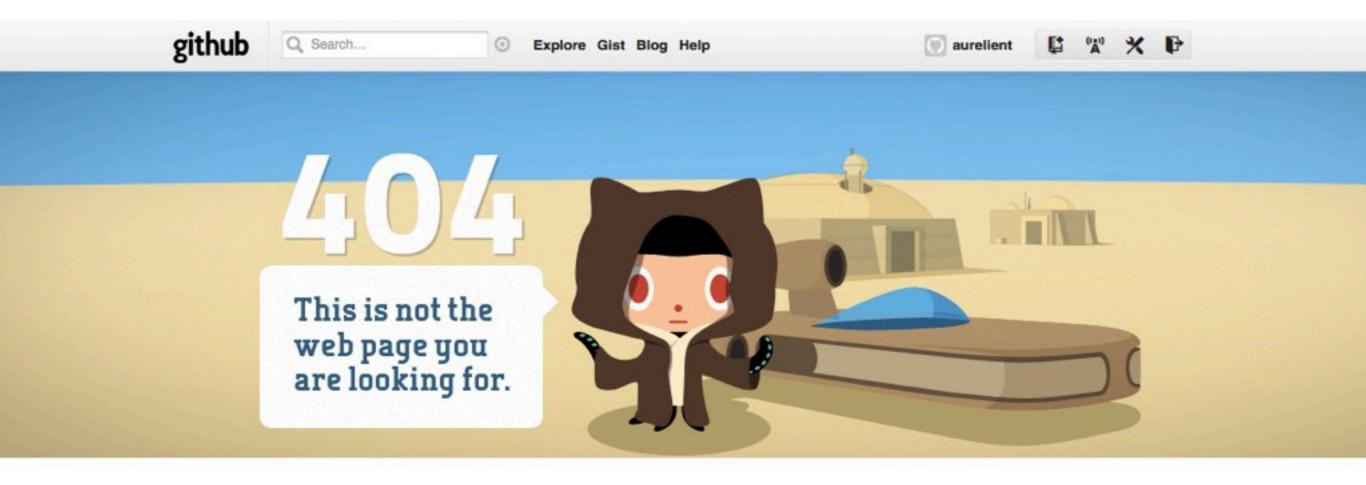
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"Whatever can go wrong, will go [Edward Aloysius Murphy Jr., 1949] wrong."

"If there's more than one possible outcome of a job or task, and one of those outcomes will result in disaster or an undesirable consequence, then somebody will do it that way."

Implications of Murphy's law

- Prepare for human errors, wrong input etc.
 - do sanity checks in dialogs
 - provide useful defaults
 - make serious mistakes hard
- When building stuff, provide extra time for:
 - mistakes in manufacturing
 - non-functioning tools
 - faulty material
 - misunderstandings



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Anti Fitts law

