

Clickable CAPTCHAs

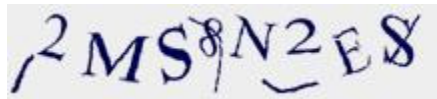
Ad-Fraud 2007,
9/14/2007

Richard Chow, PARC
Philippe Golle, PARC
Markus Jakobsson, IU
Xiaofeng Wang, IU

CAPTCHAs

- What is a CAPTCHA?
 - Computers can pass only a small fraction of the time
 - Humans can pass most of the time
 - Fast and easy for the human

MSN



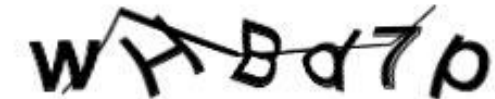
Ticketmaster



Google

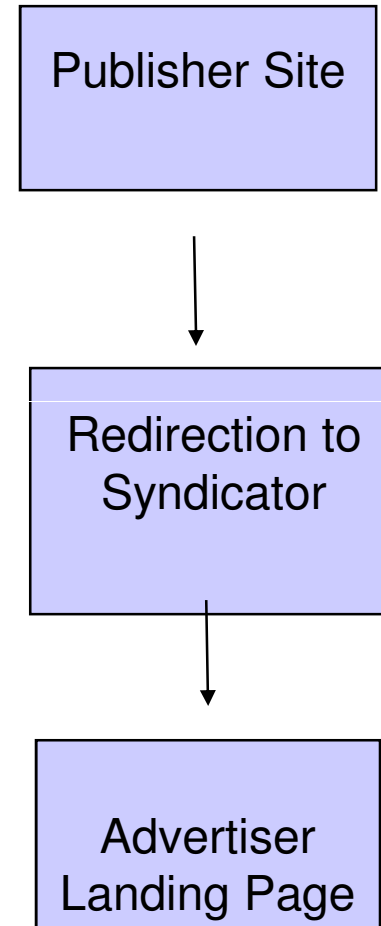


Yahoo!



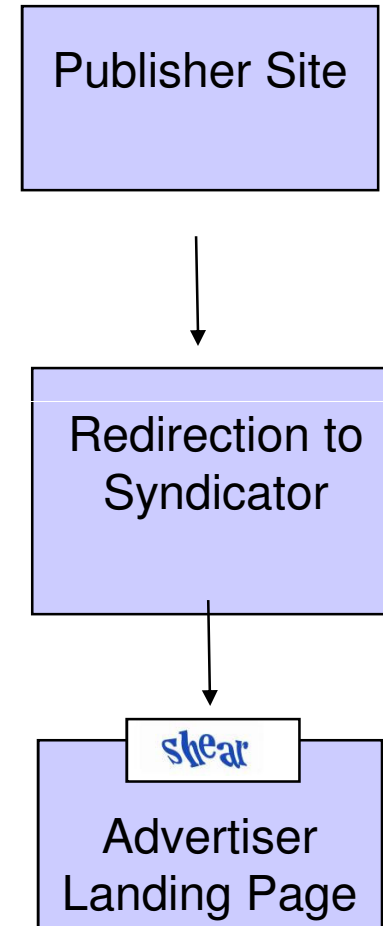
Human Identification at Click-Time

- Clicking on ad leads to a CAPTCHA
- User taken to advertiser only after pass or fail of CAPTCHA
 - By advertiser: Traffic Sentry's ClickHawk
 - By syndicator or publisher also
- Employ CAPTCHA only if there is cause for suspicion



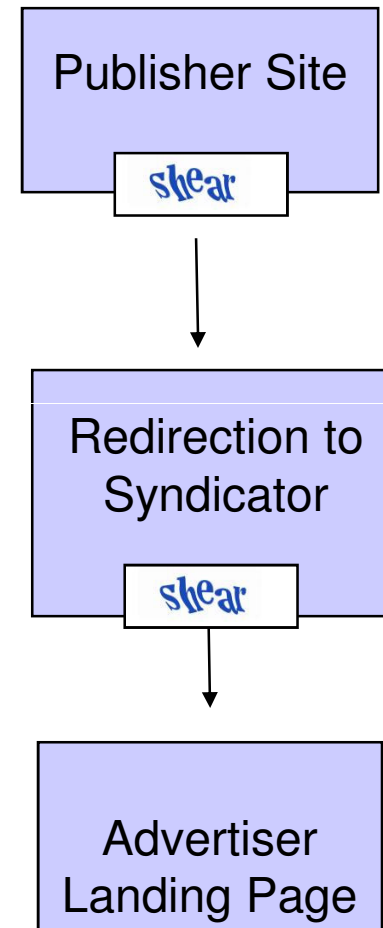
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Human Identification by Publisher

- Solve a CAPTCHA to access publisher content or portal
 - During login
 - Periodically thereafter
- No-Identity login
 - Just use a CAPTCHA
- Portal site is a “walled garden”
 - Clicks on ads served more valuable
 - User is likely human



The screenshot shows a login interface with the title "Log In Now". It contains two input fields: "Member ID or E-Mail Address:" (highlighted in yellow) and "Password:". Below the password field is a link "Forgot Your Password?". A checkbox labeled "Remember me on this computer." is checked. Below the login fields is a CAPTCHA section with the text "Enter the code shown:" followed by an empty input box and a box containing the word "shear" in a stylized font. At the bottom is a "Log In" button.

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Enter the code shown:



Enter site

Persistent, Internet-wide Identification of humans

- Tag users as human using CAPTCHAs
- Store information on user's computer for Internet-wide use
 - See “Premium Clicks” paper (A. Juels, S. Stamm, and M. Jakobsson)

Problem

- CAPTCHAs are annoying
- Especially for UI-limited devices, such as cell phones
 - In Japan, 40% of Internet users access from mobile device
- How to make CAPTCHAs more usable?



Clickable CAPTCHA:

Pick the 3 English Words

<i>Aquiltse</i>	Legeramed	Cessain
<i>Dayeash</i>	Sayston	Stolof
<i>Hicirsto</i>	Thfuleric	<i>Power</i>
<i>Needle</i>	<i>Could</i>	Theassing

Clickable CAPTCHAs

- CAPTCHAs that can be solved solely through clicking
- As strong as current CAPTCHAs
 - Based on any binary problem that is hard for computers
- Resilient: Can combine various CAPTCHA technologies
- Less tedious, more fun

Easy-to-use (even without touch screen)

Latseny	Berct	Conglilat	1	2 ABC	3 DEF
Conglilat	Bodgo	WOOD	4 GHI	5 JKL	6 MNO
Alsece	Dinner	Conglilat	7 PQRS	8 TUV	9 WXYZ
Waymerad	Hicirsto	Wednesday	*	0	#

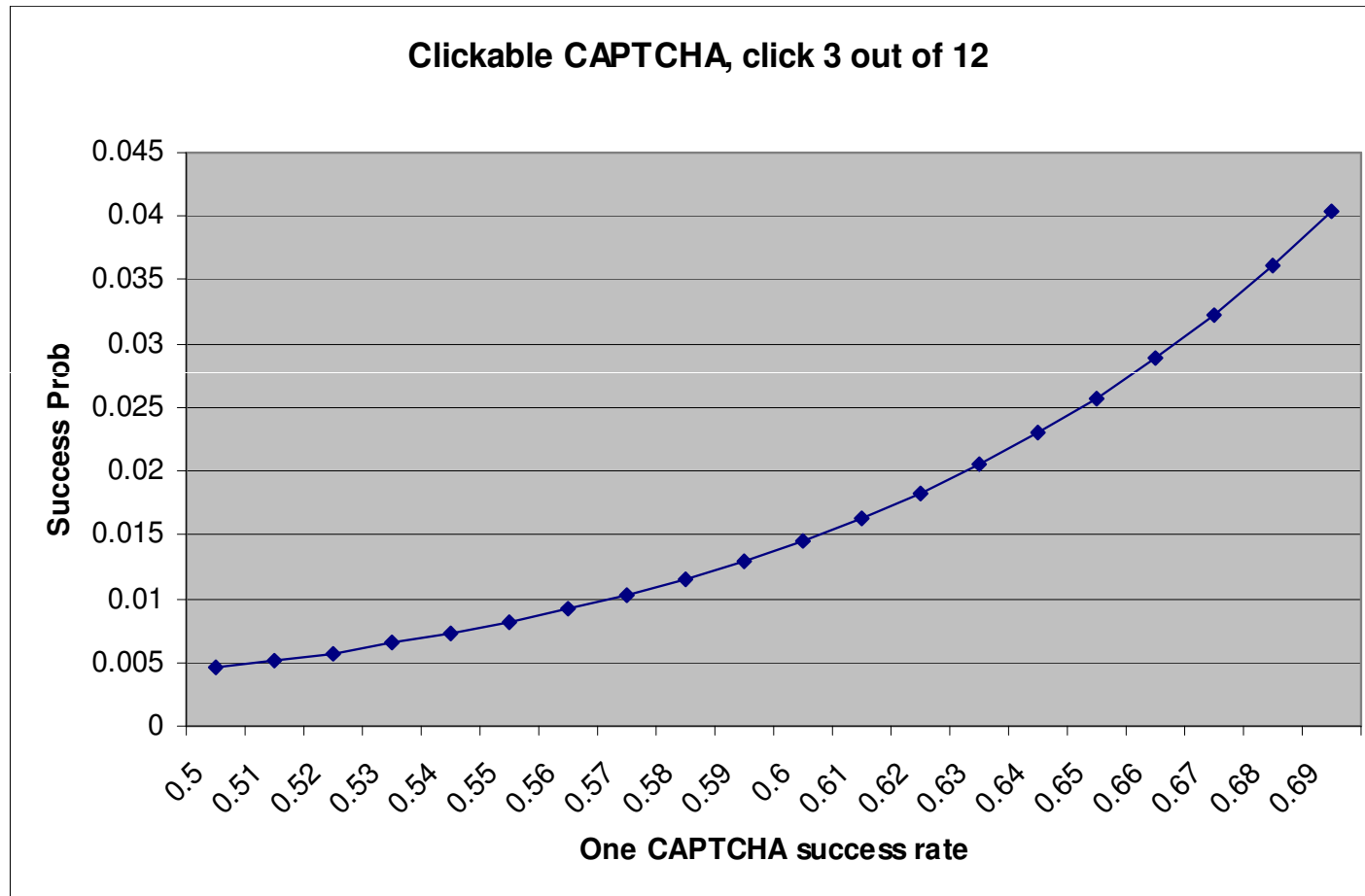
Probability calculation

Assuming adversary is correct 60% of the time...

$0.015 \approx \text{Prob}(\text{Success})$

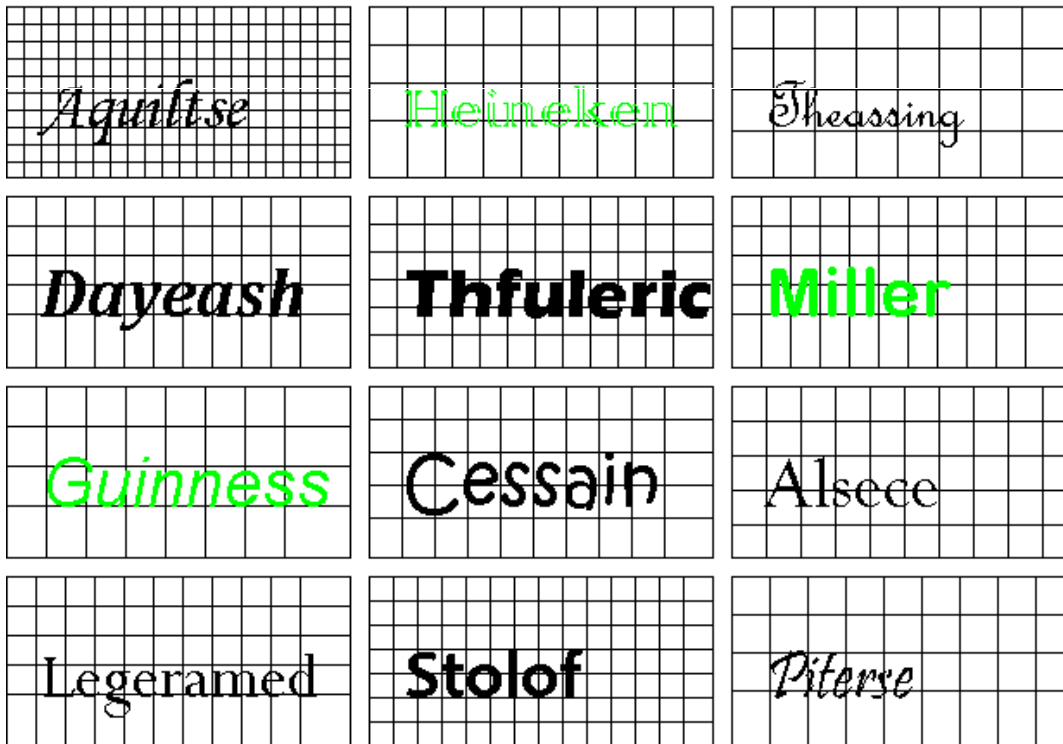
$$\begin{aligned} &= (0.6)^3 \left(\begin{aligned} &0.6^9 + \binom{9}{1} 0.6^8 0.4^1 / \binom{4}{3} + \binom{9}{2} 0.6^7 0.4^2 / \binom{5}{3} + \dots \\ &+ \binom{9}{8} 0.6^1 0.4^8 / \binom{11}{3} + 0.4^9 / \binom{12}{3} \end{aligned} \right) + \\ &\quad \binom{3}{1} 0.6^2 0.4 (0.6)^9 / \binom{10}{1} + \binom{3}{2} 0.6^1 0.4^2 (0.6)^9 / \binom{11}{2} + \\ &\quad 0.4^3 (0.6)^9 / \binom{12}{3} \end{aligned}$$

Probability calculation



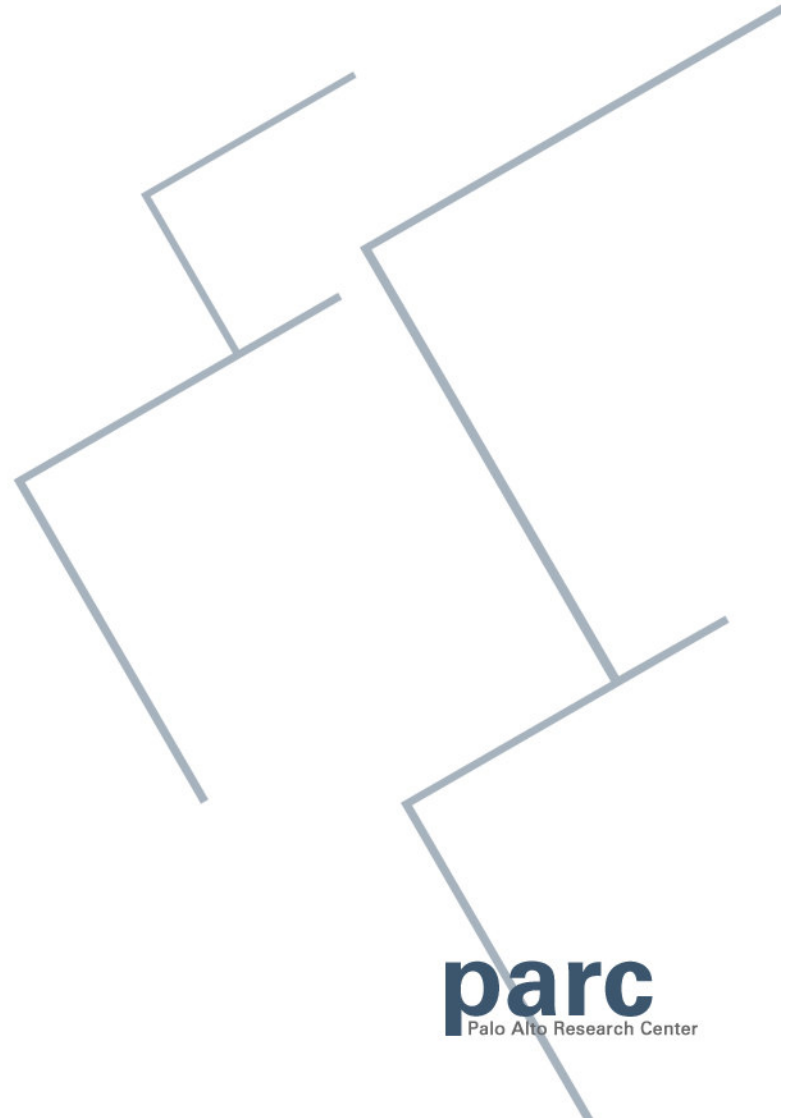
Other variations

- Do not assume familiarity with English
 - Middle character numeric or alphabetic
- Images
 - Microsoft's Asirra uses cat vs. dog classification
- Learn about user through word semantics
 - For example: Pick the 3 Beers:

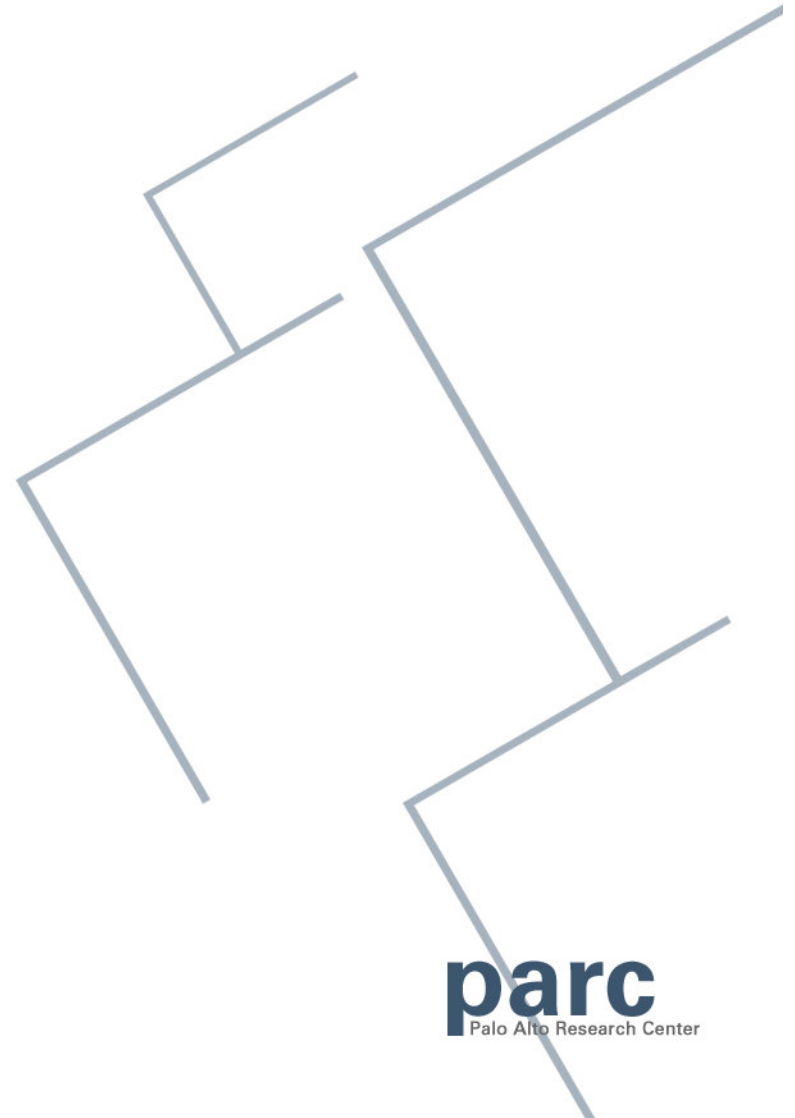


**“To err is human but to really foul up
requires a computer.”**

- Dan Rather



**To click is human, but to do click fraud
requires a computer.**



parc
Palo Alto Research Center