Clickable CAPTCHAs

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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  
Google  
Ticketmaster

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
Human Identification by Publisher

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

Aquiltse    Legeramed    Cessain
Dayeash    Saystou     Stolof
Hicirsto   Thfuleric   Power
Needle     Could       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)

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Probability calculation

Assuming adversary is correct 60% of the time…

\[ 0.015 \approx \text{Prob}(\text{Success}) = (0.6)^3 \left( 0.6^9 + \binom{9}{1} 0.6^8 0.4^1 / \binom{4}{3} + \binom{9}{2} 0.6^7 0.4^2 / \binom{5}{3} + \cdots \right) + \]

\[ + \binom{9}{8} 0.6^1 0.4^8 / \binom{11}{3} + 0.4^9 / \binom{12}{3} \]

\[ + \binom{3}{1} 0.6^2 0.4(0.6)^9 / \binom{10}{1} + \binom{3}{2} 0.6^1 0.4^2 (0.6)^9 / \binom{11}{2} + \]

\[ 0.4^3 (0.6)^9 / \binom{12}{3} \]
Probability calculation

Clickable CAPTCHA, click 3 out of 12

One CAPTCHA success rate

Success Prob
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:

```
Aquitise Heineken Sheissing
Dayeash Thfuleric Miller
Guinness Cessain Alsece
Legeramed Stolof Botvese
```
“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.