

PICATCHA |

A platform to monetize usable & secure
CAPTCHAs for desktop and mobile devices

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Final Project Report

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Introduction

With the explosive growth of the Internet, there is a need to defend online content and services such as online polls, webmail systems, blog comments, signup processes and e-commerce services such as ticketing websites from bots and scripts engaging in malicious activity (spam).

To minimize automated abuse, a reverse Turing test or CAPTCHAs (Computer Automated Public Turing Test to tell Computers and Humans Apart) in the form of text recognition tests are widely used. These tests were meant to be easy for users but hard for computers, effectively distinguishing between the two. Unfortunately with improvements in OCR technologies, these tests had to be made harder by distorting the text characters to an extent that the user experience is compromised. The same CAPTCHAs are being migrated to the mobile world too. When we add in the new difficulty of typing on mobile device and other form-factor constraints, we have a doubly frustrating task that is only going to get more frustrating as computers get smarter. The direct implication of the bad user experience¹ in CAPTCHAs can be seen in the drop of new-user conversions (~3 – 18% lost opportunity) for publishers², i.e. after people fill up a sign-up form and fail the CAPTCHA once or twice, they abandon the activity thereby not becoming a member of the publisher service.

Another major, problem with cotemporary CAPTCHAs is how smart computational agents can circumvent them. In 2010, few ticket scalpers exploited vulnerability of CAPTCHAs in websites like LiveNation, TicketMaster resulting in a loss of \$25Million³. A couple of research scientists broke CAPTCHAs employed by technology companies like Microsoft, Yahoo, Google etc by using novel techniques⁴.

Deciphering a CAPTCHA always takes a few seconds of focused attention. The big idea of Picatcha is to tap into this user attention by changing the “are you human?” test from a necessary

¹ <http://www.johnmwillis.com/other/top-10-worst-captchas/>

² <http://www.seomoz.org/blog/captchas-affect-on-conversion-rates>

³ <http://www.wired.com/threatlevel/2010/03/wiseguys-indicted/>

⁴ Jeff Yan and Ahmad Salah El Ahmad, at the School of Computing Science, Newcastle University, England

evil to a positive experience that can be used for brand advertising and bring ad dollars into the Picatcha ecosystem.

Picatcha is an image-identification CAPTCHA solution that asks users to select a particular image or type of image from a set of them, like identifying "all bags/all coke-cans" as shown in Figure 1. The two primary goals of this alternate solution are to ensure great user-experience for consumers and also have highest levels of security. It also offers a great opportunity for brand advertising.

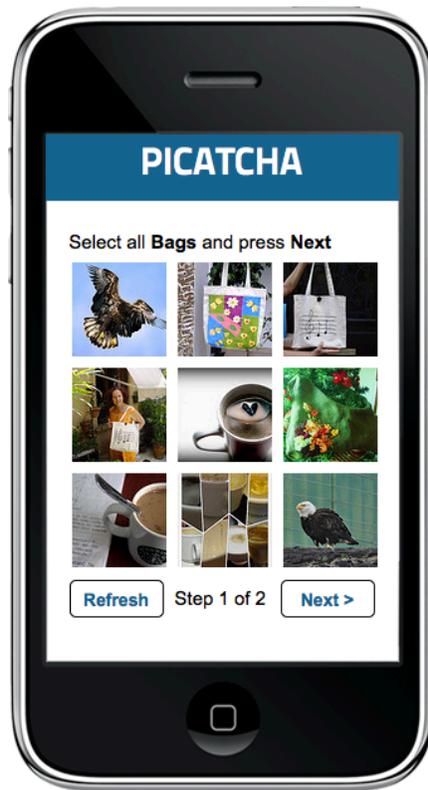
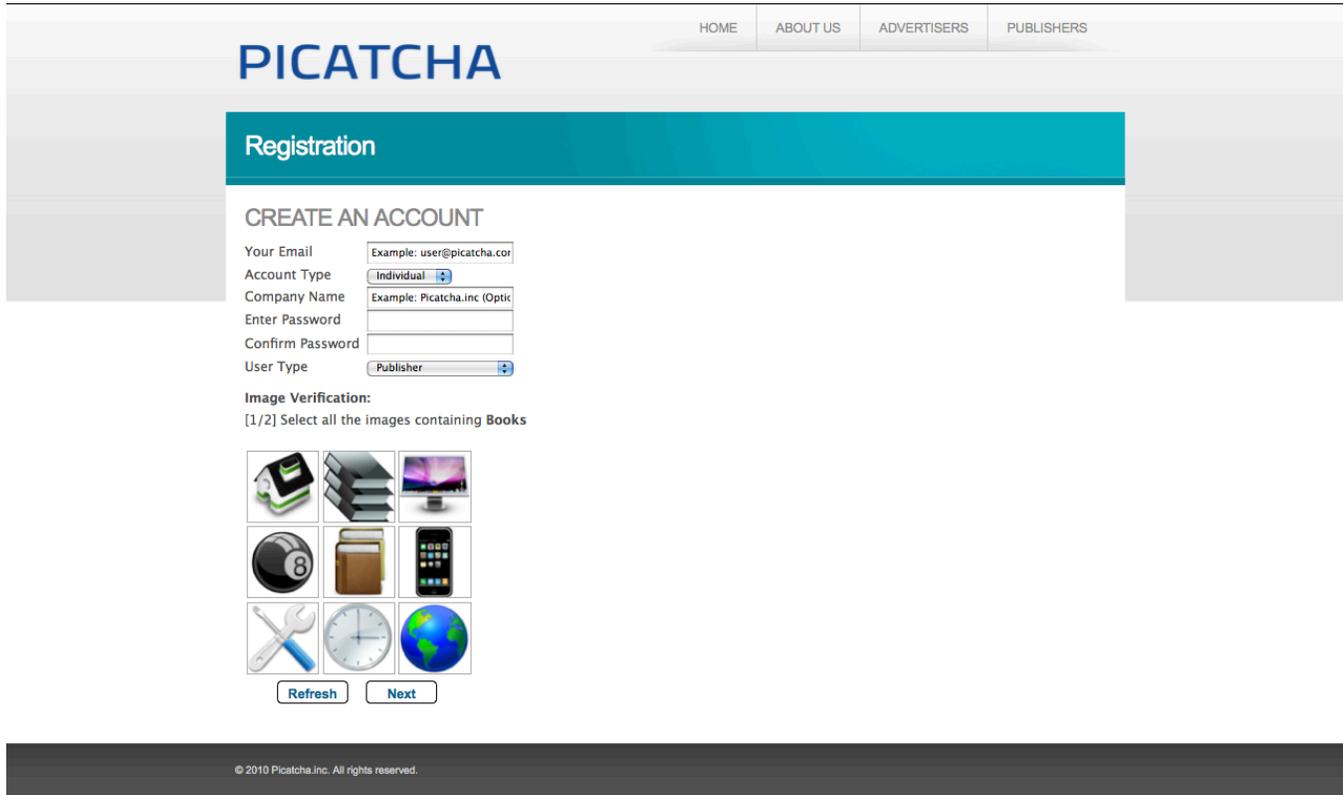


Figure 1: Snapshot of Picatcha Solution

Figure 2 shows a commonly encountered registration (sign-up) page with our CAPTCHA deployed. We designed our user interface in such a way that the experience is great on both desktop and mobile devices.

Figure 2 (below): Picatcha's CAPTCHA (Live!) integrated into a sample Publisher Page



The screenshot displays the Picatcha website's registration interface. At the top, there is a navigation menu with links for HOME, ABOUT US, ADVERTISERS, and PUBLISHERS. The main heading is "PICATCHA" in large blue letters. Below this, a teal banner reads "Registration". The primary section is titled "CREATE AN ACCOUNT" and contains several input fields: "Your Email" (with a placeholder "Example: user@picatcha.com"), "Account Type" (a dropdown menu currently set to "Individual"), "Company Name" (with a placeholder "Example: Picatcha,inc (Optic...)", "Enter Password", "Confirm Password", and "User Type" (a dropdown menu currently set to "Publisher").

Below the form fields is an "Image Verification" section. It includes the instruction "[1/2] Select all the images containing Books". A 3x3 grid of nine images is shown for selection. The images are: a stack of books, a stack of papers, a computer monitor, a clock face with the number 8, a brown folder, a smartphone, a wrench and screwdriver, a round clock face, and a globe. At the bottom of the grid are two buttons: "Refresh" and "Next".

At the very bottom of the page, a dark grey footer contains the text: "© 2010 Picatcha, Inc. All rights reserved."

Our primary motivation for the project was to build a service system around the Picatcha solution that involves the two stakeholders – advertisers, publishers. The system will enable publishers to create accounts, specify their advertising preferences and enable publishers to download an embed-code and install on their websites. The system also enables advertisers to create accounts and advertising campaigns. The service will then dynamically serve Picatcha's CAPTCHA challenges to the publisher's pages along with advertiser brand messages.

Our product Picatcha is a proof-of-concept service that demonstrates how the experience of CAPTCHAs could be improved, how brands and publishers can leverage our platform through advertising.

Project Stakeholders

Primary Stakeholders: Users and publishers use and serve CAPTCHAs respectively. Adoption of our product with these two communities is vital for its success. We focused our ethnographic studies to understand user behaviors (solving CAPTCHAs) and publishers needs.

Secondary Stakeholders: Brand advertisers and agencies will be using our platform to spend ad dollars to make their images appear in our CAPTCHAs. We identified advertiser needs using academic and web research. We validated our findings by interviewing people who worked in the mobile advertising.

Our Solution

Listed below are some of the main features of our proposed solution:

Multiple devices: Picatcha's image-identification CAPTCHAs will work on multiple devices – smartphones, tablet computers and desktop machines ensuring the best user experience at different form-factors.

Account Management: Picatcha system allows advertisers and publishers to create accounts on our platform for two main reasons – specifying their advertising preferences and monitoring advertising campaigns.

Ad Targeting: Advertisers can target different audiences using different age, gender, category and location parameters. Picatcha system connects to external Data Partners to know more demographic information about each ad-request and serve the most relevant ads.

Monitoring: Advertisers can check how their campaigns are performing. They can check how people are interacting with their brand images across different demographic and device data. Publishers can see visualizations on how many Picatcha CAPTCHAs are served on their websites along with related metrics.

What We Accomplished

Background Research and Problem Space

We looked at literature to understand the history of CAPTCHAs – origin, how it changed over time and different kinds of CAPTCHAs (beyond text). Our focus was to understand how people behaved with different kind of CAPTCHAs and how the experience improved/degraded from its inception to the current existing solutions.

Market Trends & Product Fit

We studied the growth of mobile devices and the shift towards mobile Internet from desktop Internet. We use this report to show how the market is maturing and Picatcha's solution is a good fit for this shift.

Ethnographic Studies and Research

We interviewed publishers in Spring 2011 who use CAPTCHAs on their platforms extensively. In Fall 2010 as part of I School course INFO 213, "User Interface Design & Development", we conducted contextual inquiries understanding user's CAPTCHA experience and also conducted user testing with Picatcha's CAPTCHA.

CAPTCHA Security Analysis

We spent substantial time with Computer Vision groups at Berkeley and professors/students working in security to design our algorithms that ensure highest levels of security. We have seen contemporary CAPTCHA solutions in the market and analyzed how we compare with them in terms of offering security. We looked at all the existing literature related to CAPTCHA security.

System Design

We came with block diagrams that to show the information flows between user, publisher and advertiser with Picatcha system. We implemented a proof-of-concept that can be integrated into websites to serve our CAPTCHAs.

Competitive Analysis

We looked at different companies who are trying to work in the same space of monetizing CAPTCHAs. We clearly identified the opportunity for our product, a holistic solution that addresses both usability and security.

Future Work

- a. Beta-Product: In Summer 2011 we will build a more functional product based on our service blueprints. We are planning to contact and partner with an ideal publisher network to pilot our solution.
- b. Brand Recall Experiment: To test the memorability of embedded advertising content in our CAPTCHA solution, we will push our Picatcha challenges onto Amazon Mechanical Turk (crowdsourcing platform). The CAPTCHA task will be followed with a simple survey to gauge how people are able to recall the advertiser brand/message. This will be helpful to position the brand-lift of our product against our competition.
- c. Scaling: The current implementation focused on functionality and we intentionally deferred considerations of performance and scalability.

Conclusion

We researched advertising in CAPTCHAs, user-experience with CAPTCHAs and built a proof-of-concept system. We designed our technical architecture and information flows for different scenarios. We also did studies including competitive analysis, security analysis, market opportunity and product fit. We are confident that Picatcha stands above the competitive alternatives in terms of user experience, ease of use on mobile, format flexibility and higher security. Picatcha satisfies users, publishers and advertisers by bringing better experience, security and user-attention respectively.

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