

Exploring the Usability of CAPTCHAS on Smartphones: Comparisons and Recommendations

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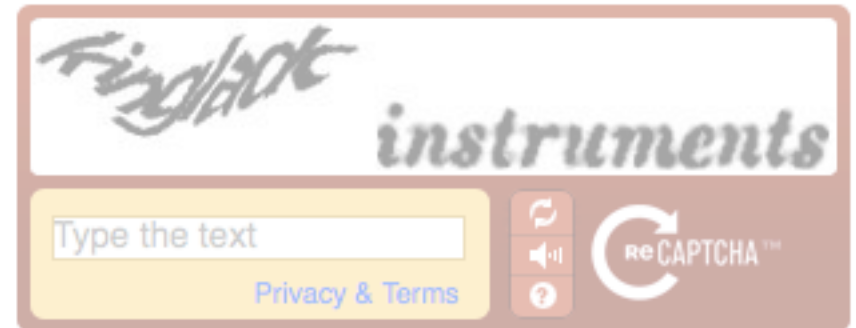
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Introduction



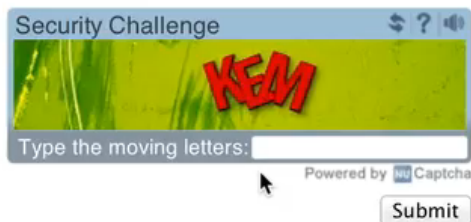
- CAPTCHA
- Mobile devices have become a primary means of accessing online resources
- Limited usability work has been carried out to evaluate captchas for mobile device usage
- Captchas are primarily evaluated on their security¹

1) Bursztein and Bethard, WOOT '09. El Ahmad et.al. EUROSEC '10

Evaluated Captcha Schemes

- Character Recognition (CR), Image Recognition (IR), Moving Image Object Recognition (MIOR)

reCaptcha



NuCaptcha



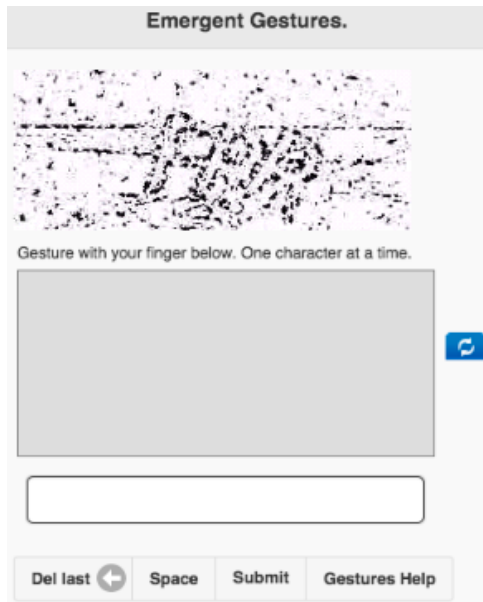
Picatcha



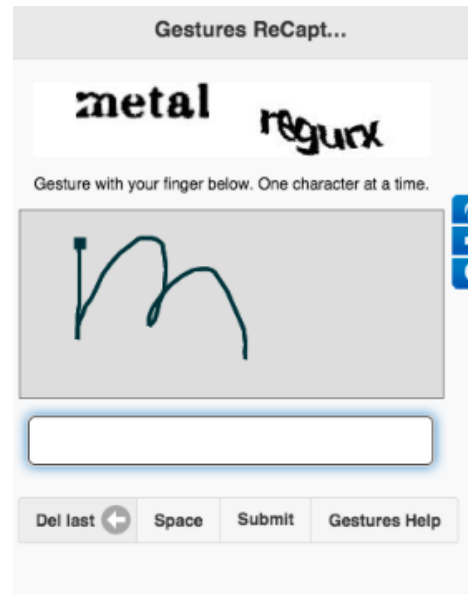
Asirra

Evaluated Captcha Schemes

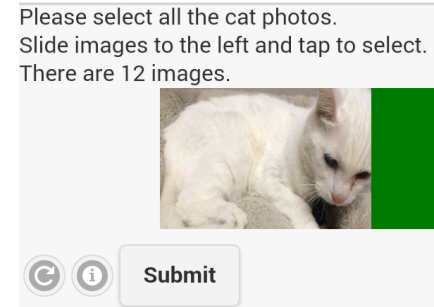
Gesture Emerging



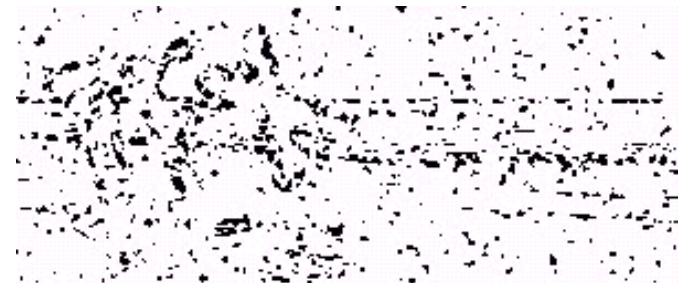
Gesture reCaptcha



Asirra Slide



Emerging



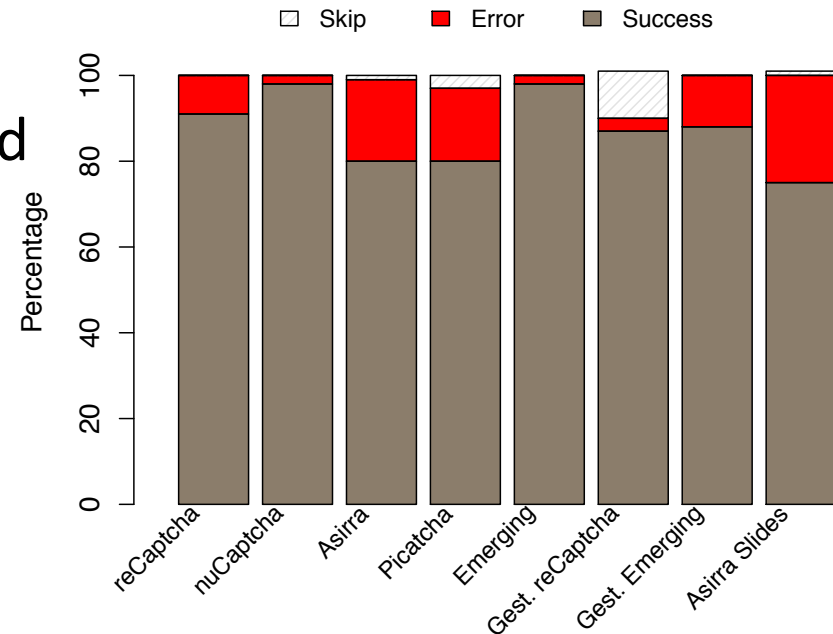
User Study

Data Collection:

- Logs (performance)
 - Questionnaires (perception & demographics)
 - Observations
- Controlled environment
 - 28 Participants
 - Mixed experimental design
 - Implementation: PHP, HTML5, CCS3 and JS
 - Wizard of Oz gesture

User Study Results

- No inferential statistics, misleading given the WoZ and mixed design



- Outcomes
 - Success: NuCaptcha & Emergent at 98%; CR schemes > 90%
 - Most Errors: Asirra and Asirra Slides; Picatcha
 - Skips: few number of skips

User Study – Times

Scheme	Mean Time (SD) in Sec
reCaptcha	25.2 (17.50)
NuCaptcha	8.5 (2.92)
Asirra	29.2 (9.83)
Picatcha	12.3 (4.97)
Emerging	22.4 (6.46)
Gesture reCaptcha	55.3 (12.49)
Gesture Emerging	44.5 (12.65)
Asirra Slides	30.6 (12.98)

User Study- Participant Opinion

1 Most Negative
10 Most Positive

8.19	8.81	9.88	7.19	7.38	7.19	7.46	7.57	reCaptcha
9.6	9.6	9.8	9.3	9.7	9.2	9.2	8.6	nuCaptcha
7.13	8.53	9.53	6.07	7.6	5.07	5.57	7.31	Asirra
8.11	7.67	8.56	7.33	8.11	6	6.89	5.56	Picatcha
8.2	8.2	9	7.4	8.7	6.3	6.4	7.78	Emerging
5.81	7.88	9.06	5.25	6.25	5.12	4.6	4.47	Gest. reCaptcha
5.27	6.64	7.73	4.91	5.09	4.6	3.18	4.64	Gest. Emerging
8	8.8	9.6	7.67	7.07	8	6.43	6.25	Asirra Slides

Accurate solving
Understandability
Memorability
Pleasant
Solvability*
Suitability
Preference
Input Mecahnism*

User Study - Observations

- Phone handling
 - Placing the phone on the table when typing; holding when gesturing
 - From portrait to landscape
- Challenges and schemes
 - Image quality



User Study - Observations

- Distraction from main task
 - Game-like schemes were considered as distracting
 - Picatcha's success message; Asirra "Adopt me"
- Gesture input
 - Unsure on how to gestures characters

Summary of Results

- Best outcome: NuCaptcha
- Best preferred: NuCaptcha
- Good overall outcomes: Emerging
- Most disliked: gesture schemes
- Virtual keyboard familiarity
- Participant preferred: CR schemes

Recommendations

- Design challenges
 - Design with one-task only focus
 - Use input mechanisms that are cross-platform
- Screen layout
 - Consider isolating the captcha
 - Minimize bandwidth usage

Future Work

- Limitations
 - Not a MTurk sample size, but we were able to observe and discuss
 - Using WoZ impacted the performance and perception
 - Emerging animated implementation was slow
- Future Work
 - A full gesture recognition implementation
 - Explore alternative input methods: sensors and multi-finger gestures

Conclusion

- The aim of this work was
 - to explore whether alternative input mechanisms help improve the usability of captchas on smartphones
 - evaluate the usability of the schemes
- Gesture input in web forms requires robust and reliable implementation of recognizers
- The disconnect between users' preferences and their ability to correctly solve challenges
- The security is central to any scheme

Thank you

Questions?

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