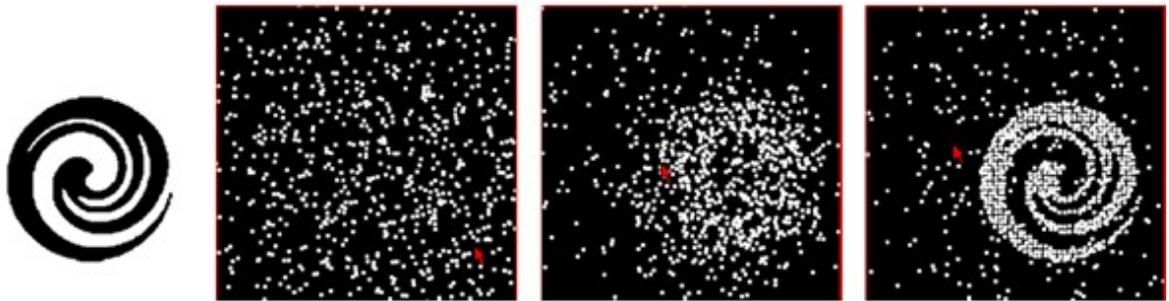# CAPTCHaStar! A Novel CAPTCHA Based on Interactive Shape Discovery

(a) A random starting picture. (b) A sample unsolved challenge. (c) An almost solved challenge. (d) A correctly solved challenge

Description of the invention

We propose CAPTCHaStar, a new image-based CAPTCHA that relies on user interaction. This novel CAPTCHA leverages the innate human ability to recognize shapes in a confused environment. We assess the effectiveness of our proposal for the two key aspects for CAPTCHAs, i.e., usability, and resiliency to automated attacks. In particular, we evaluated the usability, carrying out a thorough user study, and we tested the resiliency of our proposal against several types of automated attacks: traditional ones; designed ad-hoc for our proposal; and based on machine learning. Our CAPTCHaStar is user friendly and resilient to automated attacks.

A demo is available at http://captchastar.math.unipd.it/demo.php

Which need does it respond to?

Public services on the Internet are subject to automated attacks, i.e., an automated program can exploit a vulnerable on-line service, pretending to be a legitimate user. In the last years, an increasing number of websites adopted countermeasures against these malicious attacks. The most common method consists in allowing access to a service only to users able to solve a CAPTCHA (Completely Automated Public Turing Test to Tell Computers and Humans Apart). The main purpose of a CAPTCHA is to distinguish a human user from a software robot (from now on also referred as "bot") that runs automated tasks. In order to do that, researchers leverage the existing gap between human abilities and the current state of the art of software, including also Artificial Intelligence techniques. A

CAPTCHA is a program that generates a test, which has the property to be easily solvable by humans, but hardly solvable by a bot. As an example, a bot cannot easily understand the meaning of a sentence (or a picture), while humans can carry out this task with negligible effort. The design of a good CAPTCHA is not a trivial task. Indeed, both usability to legitimate users and resiliency against automated attacks must be simultaneously satisfied. Attackers of CAPTCHA usually improve automated attacks over time. For this reason, designers use to improve their CAPTCHAs in order to reduce the success rate of novel attacks. Unfortunately, these improvements usually cause a dramatic decrease in usability. For this reason, researchers put a significant effort in understanding the trade-off between usability and resiliency to attacks.

Market size and Applications

Over the last years, most websites on which users can register (e.g., email providers and social networks) adopted CAPTCHAs as a countermeasure against automated attacks. For example, an email provider without a reliable CAPTCHA countermeasure can be the target of automatic attackers which exploit this vulnerability in order to create multiple accounts on an e-mail provider and use them to send spam messages.

Commercialization and Advancement status

A working prototype has been built and tested. We are seeking industrial partners to support commercialization of the technology.

Titolarità del brevetto Università di Padova

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