CAPTCHA: Telling Humans and Computers Apart Automatically

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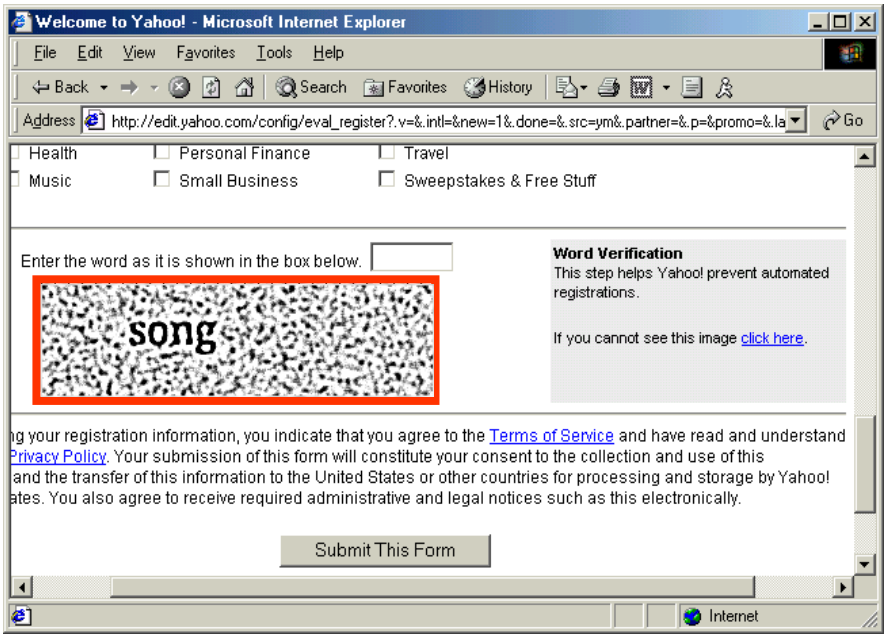

CAPTCHA (2000)

A program that can tell whether its user is a human or a computer

CAPTCHA

A program that can generate and grade tests that:

A. Most humans can pass

B. Current computer programs cannot pass

Example

Example

Picks a random string
of letters

oamg

Example

Picks a random string of letters

Renders the string into a randomly distorted image

oamg →

Example

...and generates a test:

Type the characters that appear in the image

P stands for Public

All code and data used by a CAPTCHA should be publicly available

Completely Automated Public Turing Test to Tell Computers and Humans Apart

Are CAPTCHAs Reverse Turing Tests?

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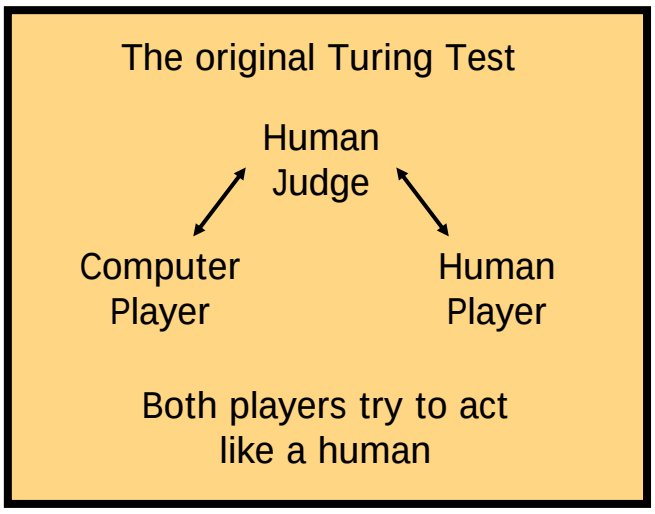


Are CAPTCHAs Reverse Turing Tests?

NO!

The Rest Of The Talk

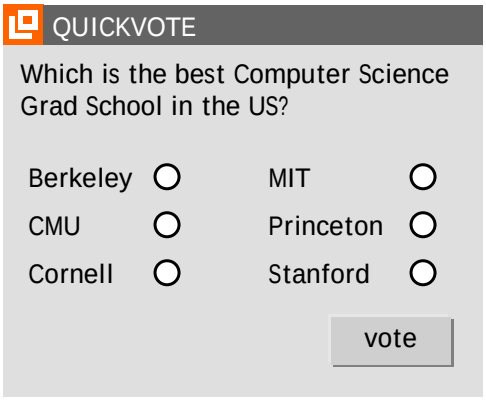
Applications

Examples of CAPTCHAs

Advancing AI

A Spin-off Idea

Applications



(from www.slashdot.com)

Applications

Free E-mail Services

Data Collection

Worms and Spam

Preventing Dictionary Attacks
(Pinkas and Sander ‘02)

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Examples of CAPTCHAs

Pix

What are these pictures of?

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The images need to be randomly distorted

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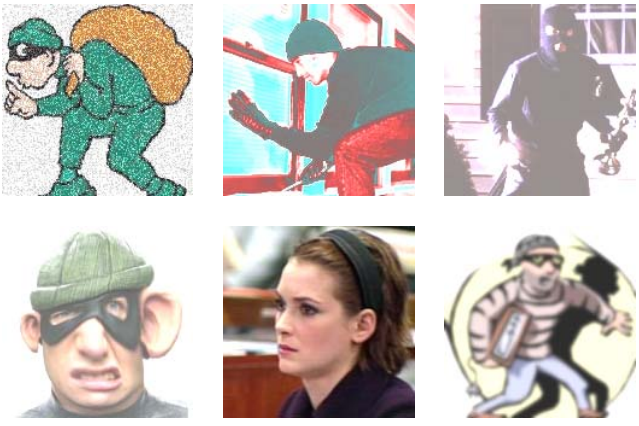
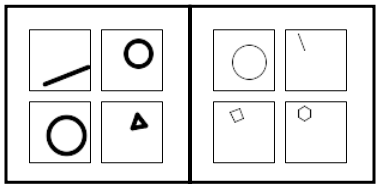


What are these pictures of?

Bongo

Visual Analogy Problems (Bongard 1951)



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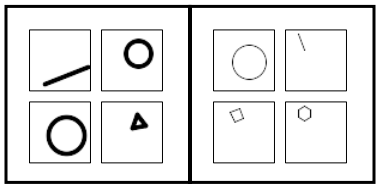

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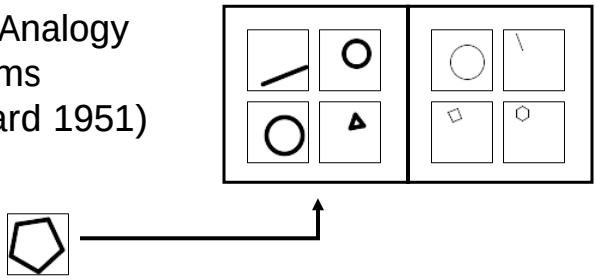

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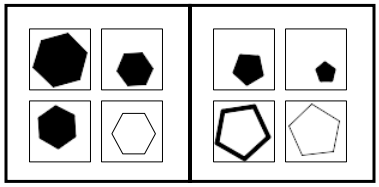

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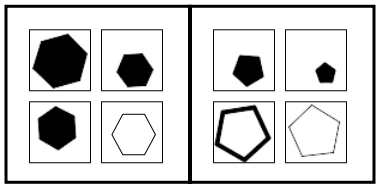

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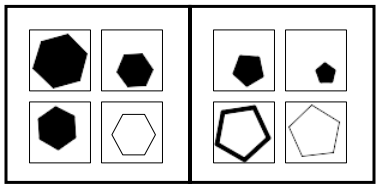

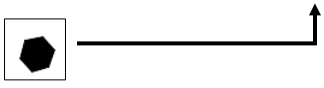

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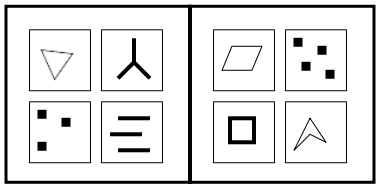
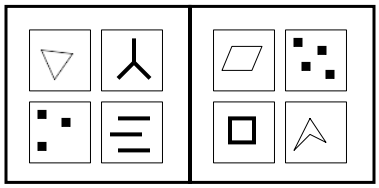


four

Bongo

Visual Analogy Problems (Bongard 1951)



four

Sound Oriented CAPTCHA

Humans are better than computers at understanding spoken language

Question: which English digits are being said?

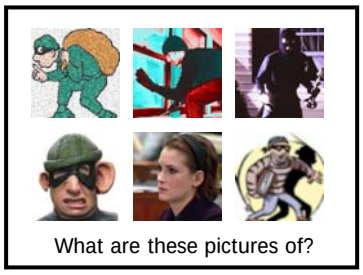
(Written by Nancy Chan)

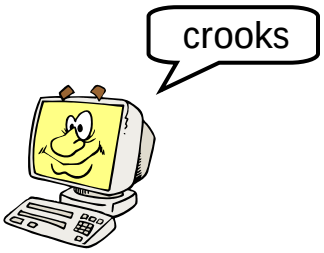
Open Problem

Create a CAPTCHA based on language understanding

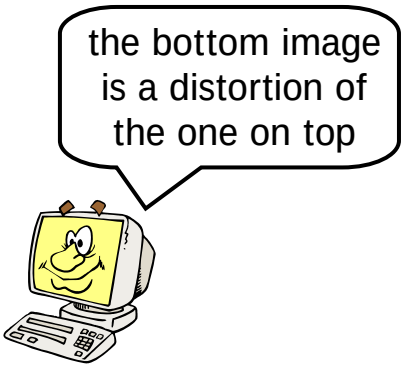
Advancing AI

Any program that passes the tests generated by a CAPTCHA can be used to do something good





Any program that passes certain versions of PIX can be used to do weak watermarking



Any program that passes certain versions of PIX can be used to do weak watermarking

CAPTCHAs Are a Win-Win Situation

Either a CAPTCHA remains secure or
an open problem becomes solved

CAPTCHAs get malicious people to work on AI problems!

Challenges to the AI Community

CAPTCHAs provide well defined problems for the AI community to work on

Challenges to the AI Community

CAPTCHAs provide well defined problems for the AI community to work on

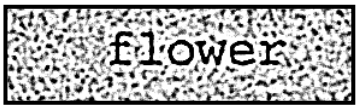
Algorithms for factoring have vastly improved since factoring started being used for security

Advancing AI

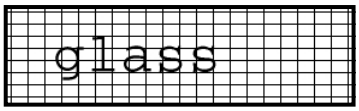
Mori and Malik, 2002: 92% accuracy against Yahoo! CAPTCHA

front

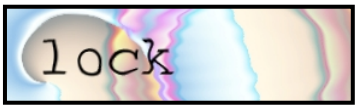
flower



glass



lock



CAPTCHA Sweat Shops

Spam companies hire humans to solve CAPTCHAs all day long

$5 per hour for each human

720 CAPTCHAs solved per hour per human

2/3 cent per account

ter avec Firefox
À la une
reCAPTCHA
Digitizing Books One Word at a Time
HOME
WHAT IS reCAPTCHA
DIGITIZATION ACCURACY
WHAT IS A CAPTCHA
SECURITY
GET reCAPTCHA
MY ACCOUNT
EMAIL PROTECTION
RESOURCES
Type the two words:
stop spam. read books.
Submit
The words above come from scanned books.
By typing them, you help to digitize old texts.
reCAPTCHA is a free CAPTCHA service that helps to digitize books, newspapers and old time radio shows. Check out our paper in Science about it (or read more below).
A CAPTCHA is a program that can tell whether its user is a human or a computer. You've probably seen them — colorful images with distorted text at the bottom of Web registration forms. CAPTCHAs are used by many websites to prevent abuse from "bots," or automated programs usually written to generate spam. No computer program can read distorted text as well as humans can, so bots cannot navigate sites protected by CAPTCHAs.
About 200 million CAPTCHAs are solved by humans around the world every day. In each case, roughly ten seconds of human time are being spent. Individually, that's not a lot of time, but in aggregate these little puzzles consume more than 150,000 hours of work each day. What if we could make positive use of this human effort? reCAPTCHA does exactly that by channeling the effort spent solving CAPTCHAs online into "reading" books.
To archive human knowledge and to make information more accessible to the world, multiple projects are currently digitizing physical books that were written before the computer age. The book pages are being photographically scanned, and then transformed into text using "Optical Character Recognition" (OCR). The transformation into text is useful because scanning a book produces

Scanned type
This aged portion of society were distinguished from
OCR reads as
"niis aged pntkm at society were distinguished frow."
reCAPTCHA improves the process of digitizing books by sending words that cannot be read by computers to the Web in the form of CAPTCHAs for humans to decipher. More specifically, each word that cannot be read correctly by OCR is placed on an image and used as a CAPTCHA. This is possible because most OCR programs alert you when a word cannot be read correctly.
But if a computer can't read such a CAPTCHA, how does the system know the correct answer to the puzzle? Here's how: Each new word that cannot be read correctly by OCR is given to a user in conjunction with another word for which the answer is already known. The user is then asked to read both words. If they solve the one for which the answer is known, the system assumes their answer is correct for the new one. The system then gives the new image to a number of other people to determine, with higher confidence, whether the original answer was correct.
Currently, we are helping to digitize old editions of the New York Times and books from Google Books.
How can I help?
In order to achieve our goal of digitizing books, we need your help.
If you run a website that suffers from problems with spam, you can put reCAPTCHA on your site. For some applications (such as Wordpress and Mediawiki), we have plugins that allow you to use reCAPTCHA without writing any code. We also have easy-to-use code for common web programming languages such as PHP.
If you get email spam we have a method that will help you to reduce it. Many spammers crawl the web looking for email addresses. When they see an email address on a web page, they send spam to the address. Mailhide allows you to safely post your email address on the web. Mailhide takes an address such as jsmith@example.com and turns it into jsm...@example.com. In order to reveal the address, a user must click on the "..." and solve a reCAPTCHA. If you use the Mailhide version of your email address, spammers won't be able to find your real email address and you'll get less spam.
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A Spin-off Idea

Labeling Images With Words

Labeling Images With Words

Labeling Images With Words

→ Martha Stewart
Flowers
Super Evil

Labeling Images With Words

→ Martha Stewart
Flowers
Super Evil

Completely Open Problem

Image Search on The Web

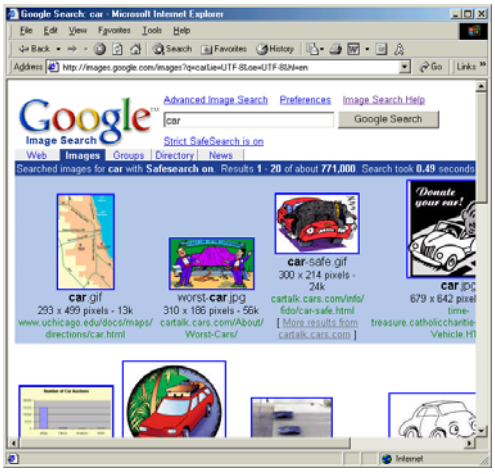
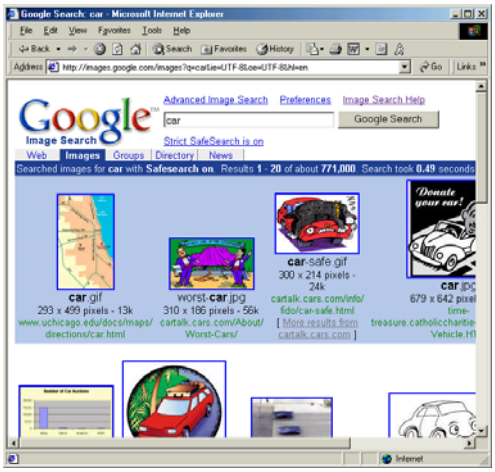


Image Search on The Web

Uses filenames and surrounding text

Doesn't look at the actual image



Desiderata

A method for labeling images that:

1. Actually looks at the images
2. For any image gives several keywords that make sense
3. Is very fast (Google has 425,000,000 images)

Stealing Cycles From Humans

Stealing Cycles From Humans

Over 50 million people in the United States play computer games on a regular basis!

The ESP Game will allow us to label all images on the web in 30 days!

The ESP Game

Two-player online game

Partners don't know each other and can't communicate

The ESP Game

Two-player online game

Partners don't know each other and can't communicate

Object of the game: type the same word

The only thing in common is an image

The ESP Game

Player 1

Player 2

The ESP Game

Player 1

Guessing: car

Player 2

Guessing: boy

The ESP Game

Player 1

Guessing: car

Guessing: hat

Player 2

Guessing: boy

The ESP Game

Player 1

Guessing: car

Guessing: hat

Guessing: kid

Player 2

Guessing: boy

The ESP Game

Player 1

Guessing: car

Guessing: hat

Guessing: kid

Success!
You both agree on car

Player 2

Guessing: boy

Guessing: car

Success!
You both agree on car

The ESP Game - Microsoft Internet Explorer
0:46
Time Left
The ESP Game
0220
score
Taboo Words
HAT
SUNGLASSES
Your Guesses
MAN
PERSON
GUY
Type your next guess:
Pass
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The ESP Game - Microsoft Internet Explorer
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Your Guesses
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Pass
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The ESP Game

Taboos guarantee that each image will get many different keywords

The ESP Game

Taboos guarantee that each image will get many different keywords

Preliminary studies suggest that people find the game fun

The ESP Game

Average labeling rate: 4 images per minute

5000 people simultaneously playing the game would label all the images on Google in 30 days!

$$\frac{5000}{2} \times 4 \times 60 \times 24 \times 30 = 432{,}000{,}000$$

Individual games in Yahoo!, Pogo.com or MSN average well over 10,000 players at a time

Take-Home Message #2

There are lots of people doing useless stuff on the internet

Stealing Cycles From Humans is a More General Idea...

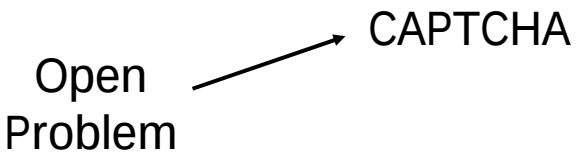
This talk hints at a paradigm for dealing with unsolved AI problems:

This talk hints at a paradigm for dealing with unsolved AI problems: getting others to do the work for you

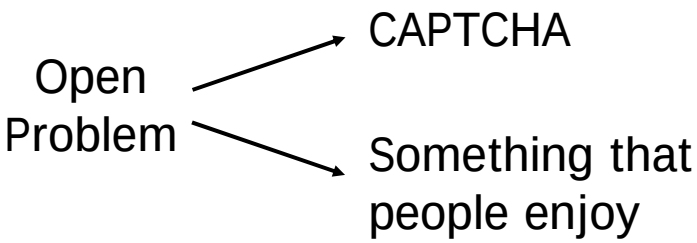
This talk hints at a paradigm for dealing with unsolved AI problems: getting others to do the work for you

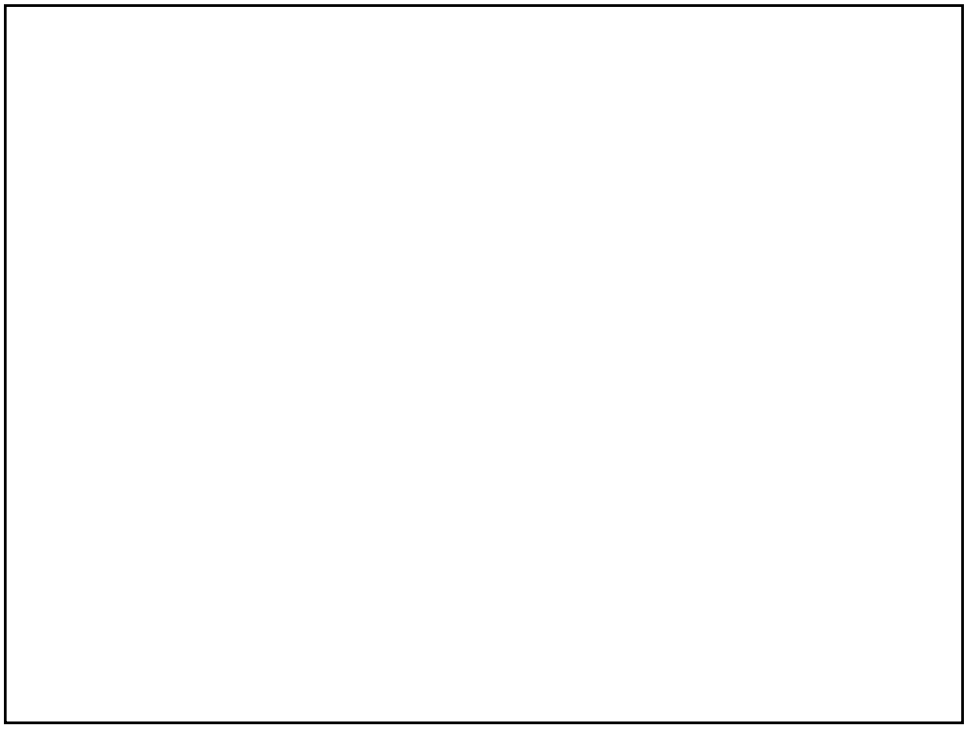
Open
Problem

This talk hints at a paradigm for dealing with unsolved AI problems: getting others to do the work for you



This talk hints at a paradigm for dealing with unsolved AI problems: getting others to do the work for you



www.captcha.net

www.espgame.org