

HUMAN COMPUTATION

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CARNEGIE MELLON UNIVERSITY



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CAPTCHA

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

PICKS **RANDOM**
STRING OF LETTERS

oamg



RENDERS IT INTO A
DISTORTED IMAGE



...AND GENERATES A **TEST**:



**TYPE THE CHARACTERS THAT
APPEAR IN THE IMAGE**



QUICKVOTE

Which is the best Computer Science
Grad School in the US?

- | | | | |
|----------|-----------------------|------------|-----------------------|
| Berkeley | <input type="radio"/> | MIT | <input type="radio"/> |
| CMU | <input type="radio"/> | Washington | <input type="radio"/> |
| Cornell | <input type="radio"/> | Stanford | <input type="radio"/> |

vote

(FROM WWW.SLASHDOT.ORG)

APPLICATIONS

FREE E-MAIL SERVICES

DATA COLLECTION

WORMS AND SPAM

PREVENTING DICTIONARY ATTACKS



YAHOO!

CAPTCHA SWEAT SHOPS

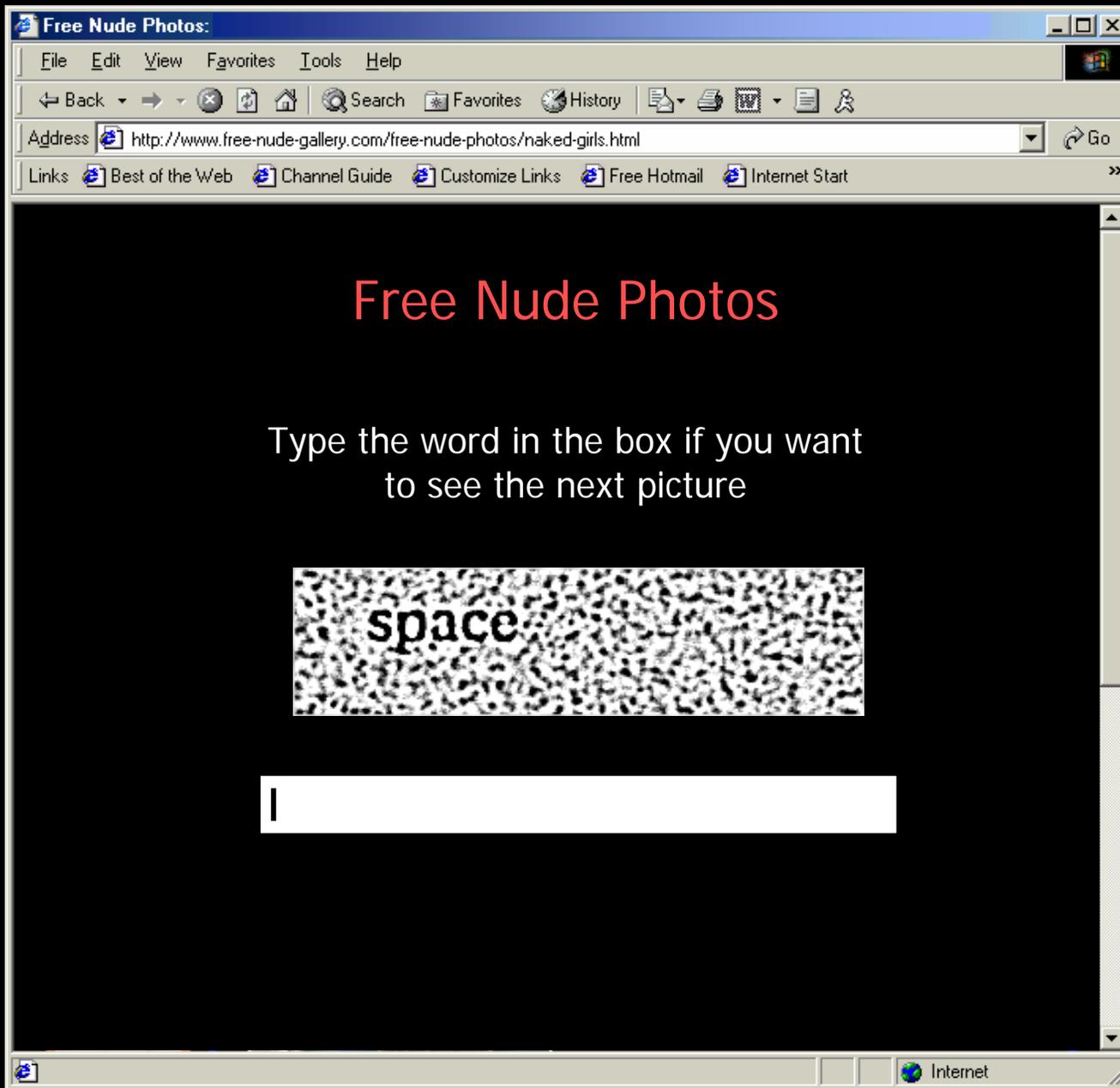
SPAM COMPANIES HIRE HUMANS TO
SOLVE CAPTCHAS **ALL DAY LONG**

\$2.50 PER HOUR FOR EACH HUMAN

720 CAPTCHAS PER HOUR PER HUMAN

1/3 CENT PER ACCOUNT





HUMAN COMPUTATION

9 BILLION HUMAN-HOURS OF
SOLITAIRE WERE PLAYED IN 2003

EMPIRE STATE BUILDING
7 MILLION HUMAN-HOURS
(6.8 HOURS OF SOLITAIRE)

PANAMA CANAL
20 MILLION HUMAN-HOURS
(LESS THAN A DAY OF SOLITAIRE)

HUMAN COMPUTATION



LABELING IMAGES WITH WORDS



MARTHA STEWART
WOMAN
FLOWERS
SUPER EVIL

STILL AN OPEN PROBLEM

IMAGE SEARCH ON THE WEB USES FILENAMES AND HTML TEXT

Google Search: dog - Microsoft Internet Explorer

Address: <http://images.google.com/images?q=dog&hl=en&lr=&safe=active&sa=N&tab=wi>

Google Images

dog

Images Results 1 - 20 of about 1,120,000 for dog [definition] with Safesearch on. (0.10 seconds)

Show: All sizes - Large - Medium - Small

free_top0403.gif
700 x 1129 pixels - 210k
www.nifty.com/vivadog/

dogs.jpg
495 x 391 pixels - 45k
sunsite.berkeley.edu/T-Shirts/dhland/dogs.jpg

dogs.gif
190 x 150 pixels - 7k
sunsite.berkeley.edu/T-Shirts/index.cgi?type=...
[More results from sunsite.berkeley.edu]

25304[1].jpg
275 x 234 pixels - 6k
www.dog-gone-pet-products.com/25304%5B1%5D.jpg

rabbit.jpg
217 x 231 pixels - 7k
www.pet-clothing.net/images/rabbit.jpg

scottyphoto.jpg
227 x 200 pixels - 6k
www.pet-clothing.net/images/scottyphoto.jpg
[More results from www.pet-clothing.net]

fundtag.gif
325 x 230 pixels - 27k
www.id-ideas.com/gifs/tags/fundtag.gif

gotag5.gif
325 x 214 pixels - 31k
www.id-ideas.com/gifs/tags/gotag5.gif
[More results from www.id-ideas.com]

Google Search: dog - Microsoft Internet Explorer

Address: <http://images.google.com/images?q=dog&hl=en&lr=&safe=active&sa=N&tab=wi>

telescoping_pet_ramp-2.jpg
483 x 475 pixels - 30k
www.discounttramps.com/telescoping_pet_ramp-2.jpg

blackt2.jpg
527 x 641 pixels - 50k
www.nhptv.org/natureworks/graphics/blackt2.jpg

blackt4.jpg
542 x 839 pixels - 79k
www.nhptv.org/natureworks/graphics/blackt4.jpg

waddling-d
1024 x 768 p
www.atprn.waddling-do

shed.jpg
640 x 480 pixels - 45k
www.windmeupfarm.com/shed.jpg

curled.jpg
570 x 372 pixels - 54k
www.steelypips.org/images/dog/curled.jpg

box for web.jpg
1200 x 866 pixels - 514k
www.doggonecrazy.ca/

Dog.jpg
1800 x 1179 pixels - 4
coastal.er.usgs.gov/photos/lh/hike/Dog.j

basset1web.jpg
364 x 495 pixels - 37k
www.basset1web.com

dog-training-equipment-do...
dog-training-equipment-do...

dog-training-equipment-do...
dog-training-equipment-do...

HalfPint1.JPG
269 x 417 pixels - 4
www.sukes.org/fo

ACCESSIBILITY

**LESS THAN 10% OF THE WEB IS
ACCESSIBLE TO THE VISUALLY IMPAIRED**

**REASON: MOST IMAGES DON'T HAVE A
CAPTION**

DESIDERATA

**A METHOD THAT CAN LABEL
ALL IMAGES ON THE WEB**

FAST AND CHEAP

USING HUMANS CLEVERLY

THE ESP GAME COULD LABEL ALL
IMAGES ON GOOGLE IN A FEW WEEKS

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**

**ONLY THING IN COMMON IS
AN IMAGE**

THE ESP GAME

PLAYER 1



GUESSING: **CAR**

GUESSING: **HAT**

GUESSING: **KID**

SUCCESS!

YOU AGREE ON CAR

PLAYER 2



GUESSING: **BOY**

GUESSING: **CAR**

SUCCESS!

YOU AGREE ON CAR



0:46
Time Left

The ESP Game

0220
score



Taboo Words

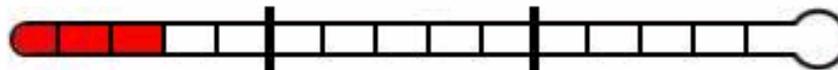
HAT
SUNGLASSES

Your Guesses

MAN
PERSON
GUY

Type your next guess:

Pass



THE ESP GAME IS FUN

15 MILLION AGREEMENTS

WITH 75,000 PLAYERS

THERE ARE MANY PEOPLE THAT
PLAY **OVER 20 HOURS A WEEK**

LABELING THE ENTIRE WEB

5000 PEOPLE PLAYING SIMULTANEOUSLY CAN LABEL ALL IMAGES ON GOOGLE IN **2 MONTHS!**

INDIVIDUAL GAMES IN YAHOO! AND MSN
AVERAGE OVER 5,000 PLAYERS AT A TIME



Google Image Labeler

Welcome to **Google Image Labeler**, a new feature of Google Image Search that allows you to label random images to help improve the quality of Google's image search results.

Begin as Playah

[Change your nickname](#)



How does it work?

You'll be randomly paired with a partner who's online and using the feature. Over a 90-second period, you and your partner will be shown the same set of images and asked to provide as many labels as possible to describe each image you see. When your label matches your partner's label, you'll earn some points and move on to the next image until time runs out. After time expires, you can explore the images you've seen and the websites where those images were found. And we'll

show you the points you've earned throughout the session.

For example, this image can be described by the labels: **bird**, **sky**, **soaring**, or **frigate bird**.

What is required to participate?

Just an interest in helping Google improve the relevance of image search results for users like yourself. Although you do not have to log in to your Google account to help, logging in will allow you to keep track of your points. You can also choose to provide a nickname, or you can remain anonymous.

Today's Top Pairs

1. Knaz - guest	2200
2. guest - guest	1900
3. asgerix - Yucker	1800
4. guest - fiftysix	1700
5. Karate Monkey - eGrunt	1700

All-time Top Contributors

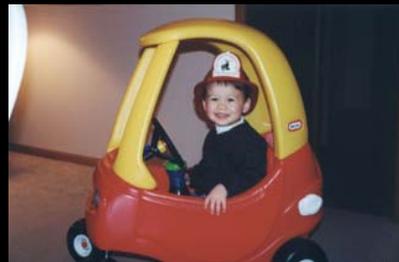
1. ChemaZ	2204200
2. khi	1676100
3. JoeBob	1444600
4. eGrunt	1340400
5. mdda123	1339600

SINGLE-PLAYER GAME

A SINGLE PERSON CAN PLAY WITH **PRE-RECORDED** ACTIONS AS THEIR PARTNER



(0:12) CAR
(0:15) HAT
(0:21) KID



(0:08) BOY
(0:23) CAR

WHEN 2 PEOPLE PLAY, WE
RECORD EVERY ACTION
WITH TIMING INFORMATION

→ WE EMULATE PARTNER
BY PLAYING PRE-
RECORDED MOVES

**NOTICE THAT THIS
DOESN'T STOP THE
LABELING PROCESS!**

ZERO-PLAYER GAME

**WE CAN ALSO PAIR PRE-RECORDED
GAMES WITH EACH OTHER!**

**COUNTING ALL THE EXTRA LABELS THAT
THIS GENERATES, THE ESP GAME HAS
COLLECTED OVER **39 MILLION LABELS****

WHAT ABOUT CHEATING?

WE GIVE PLAYERS **TEST IMAGES** FOR WHICH WE KNOW ALL THE COMMON LABELS:

WE ONLY STORE A PLAYER'S GUESSES IF THEY SUCCESSFULLY LABEL THE TEST IMAGES

SEARCH RESULTS

ESP Search Results - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media

Address <http://www.captcha.net/cgi-bin/search> Go Links

Done Internet

SEARCH RESULTS

ESP Search Results - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Media

Address <http://www.captcha.net/cgi-bin/search> Go Links

Done Internet

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File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Media

Address <http://www.captcha.net/cgi-bin/search> Go Links

Done Internet

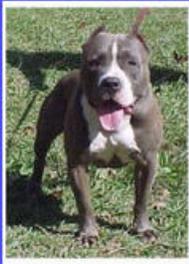
SEARCH RESULTS

ESP Search Results - Microsoft Internet Explorer

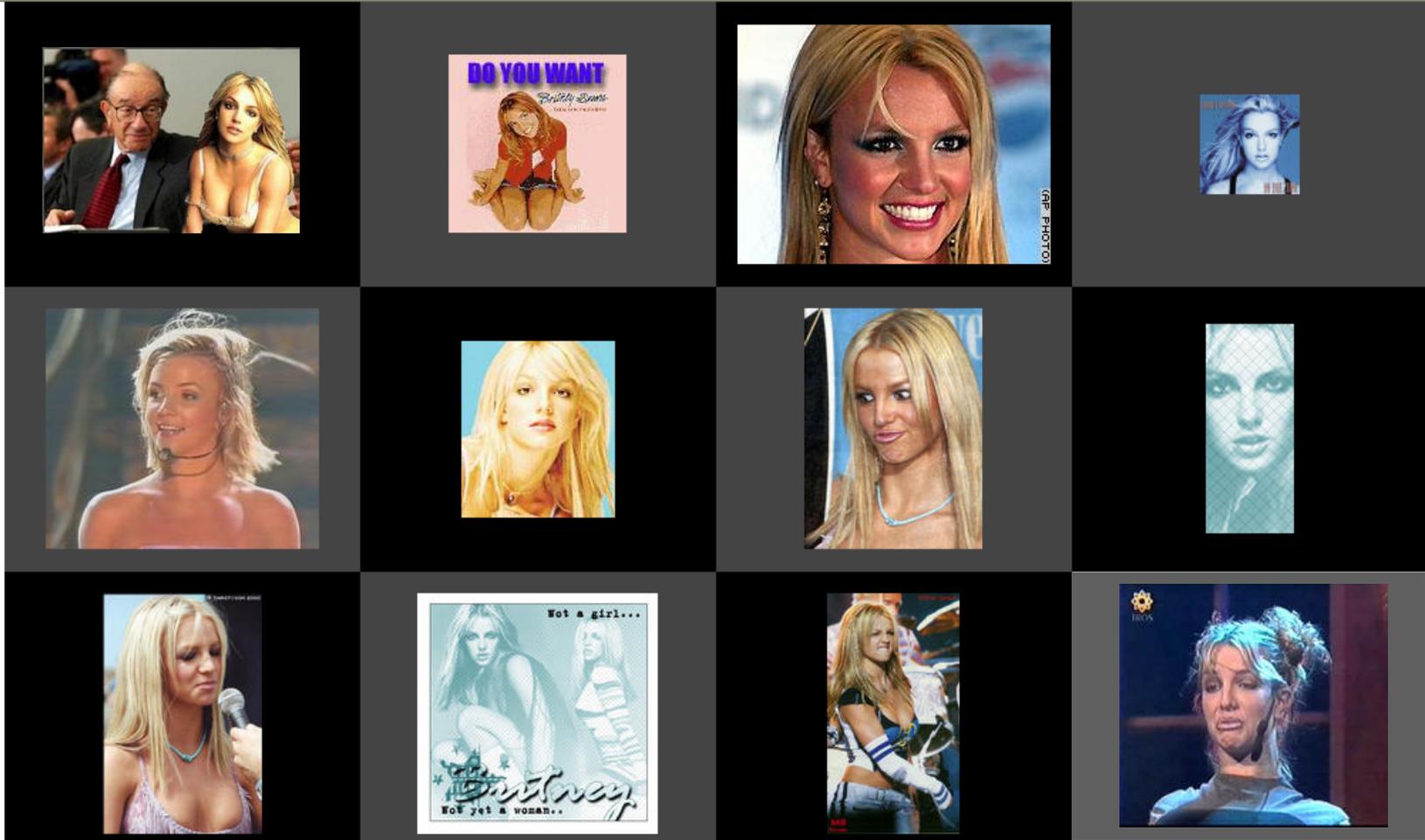
File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites Media

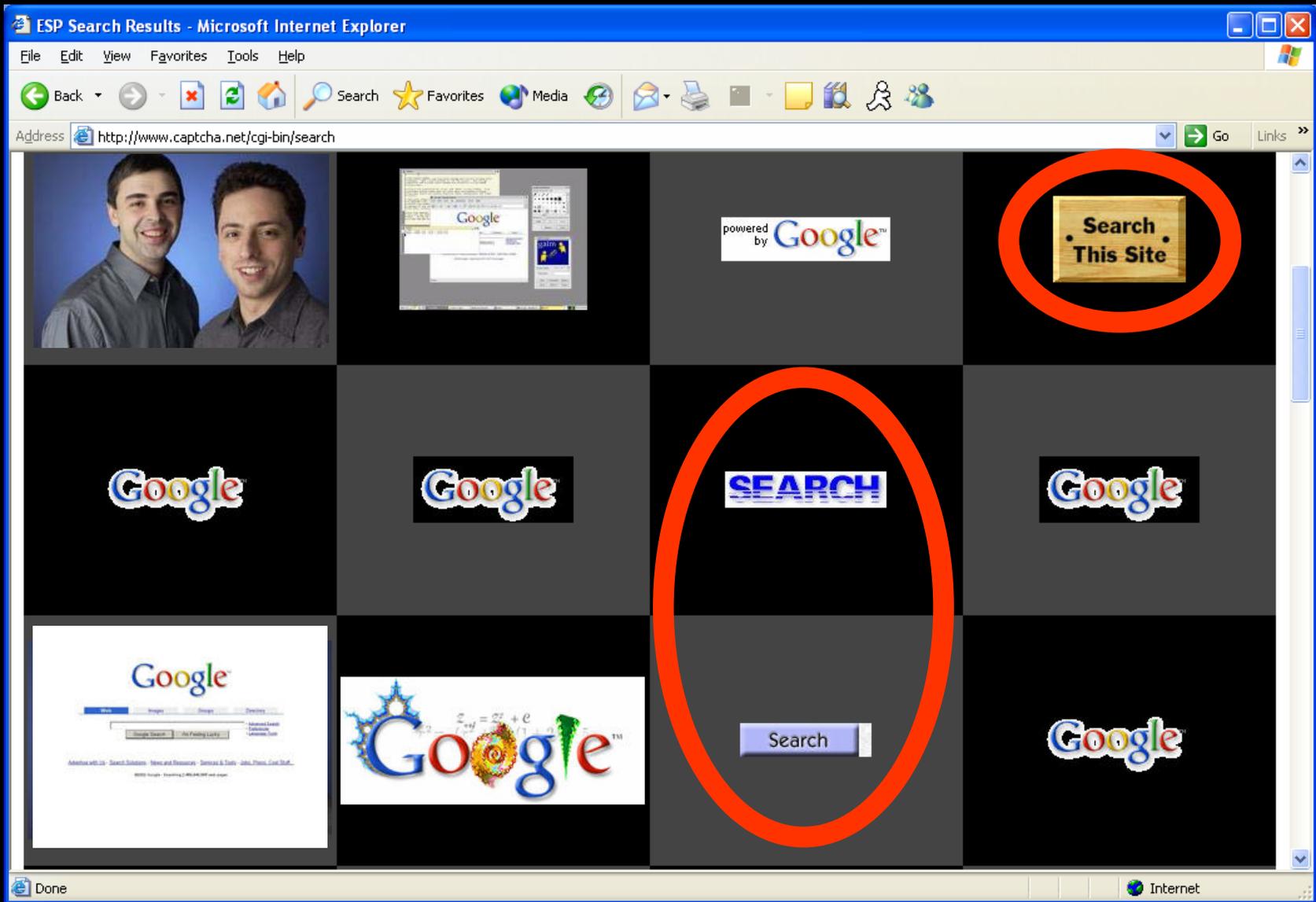
Address <http://www.captcha.net/cgi-bin/search> Go Links

Done Internet



GOOOOOOGLE



SAMPLE LABELS



BEACH
CHAIRS
SEA
PEOPLE
MAN
WOMAN
PLANT
OCEAN
TALKING
WATER
PORCH
SKY
BELL

SAMPLE LABELS



ADDAM
R. WILSON



**COMING SOON:
MEET YOUR SOUL MATE
THROUGH THE GAME!**

IE



E

RE ENT
MAN
DUMB
YUCK



WHY DO PEOPLE LIKE
THE ESP GAME?

“ THE ESP GAME GIVES ITS PLAYERS A WEIRD AND BEAUTIFUL SENSE OF **ANONYMOUS INTIMACY**. ON THE ONE HAND, YOU HAVE NO IDEA WHO YOUR PARTNER IS. ON THE OTHER HAND, THE TWO OF YOU ARE BRINGING YOUR MINDS TOGETHER IN A WAY THAT LOVERS WOULD ENVY. ”

“ STRANGELY ADDICTIVE ”

**“ IT’S SO MUCH FUN TRYING TO
GUESS WHAT OTHERS THINK. YOU
HAVE TO STEP OUTSIDE OF
YOURSELF TO MATCH ”**

“ IT’S FAST-PACED ”

“ IT’S LIKE CRACK! ”

“ HELPS ME LEARN ENGLISH ”

BLOGS

“ IN OTHER CROWNING ACHIEVEMENTS, I HAVEN'T PLAYED IN AT LEAST A WEEK (PROBABLY LONGER), AND I AM STILL ON THE **TOP TEN LIST** OF PLAYERS ON THE ESP GAME. NUMBER EIGHT IF I REMEMBER CORRECTLY. GOD, MY LIFE IS SAD. ”

“ THERE ARE MANY **FASCINATING** THINGS ABOUT THE ESP GAME:

HOW IT USES A GAME STRUCTURE TO BUILD AN **INDEX OF IMAGES** ON THE WEB

WHAT **WORDS BECOME TABOO** FROM FREQUENT USE

HOW INTERESTING SOME OF THE **IMAGES PULLED RANDOMLY** FROM THE WEB ARE

BUT BY FAR THE MOST INTRIGUING ASPECT OF THE GAME IS HOW OFTEN YOUR RANDOM, UNKNOWN PARTNER IS A COMPLETE IDIOT.”



0:46
Time Left

The ESP Game

0220
score



Taboo Words

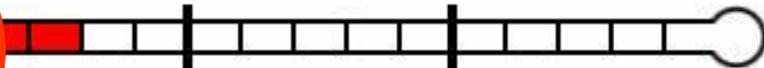
HAT
SUNGLASSES

Your Guesses

MAN
PERSON
GUY

your next guess:

Pass



Your partner has entered a guess

THE ESP GAME IS AN "ALGORITHM"

INPUT: AN IMAGE

OUTPUT: SET OF KEYWORDS

GAMES WITH A PURPOSE

**RUNNING A COMPUTATION IN
PEOPLE'S BRAINS INSTEAD OF
SILICON PROCESSORS**

OTHER GAMES WITH A PURPOSE

LOCATING OBJECTS IN IMAGES



ESP
GAME



SKY
MAN
WOMAN
WATER
PLANT

LOCATING OBJECTS IN IMAGES



SKY

MAN

WOMAN

WATER

PLANT

SUCH INFORMATION WOULD BE EXTREMELY
USEFUL FOR **COMPUTER VISION RESEARCH**

Peekaboom



HINTS

-  NOUN
-  NOUN RELATED
-  TEXT
-  VERB



Peekaboom



HINT



HINT



HINT



HINT



BUSH

HINT



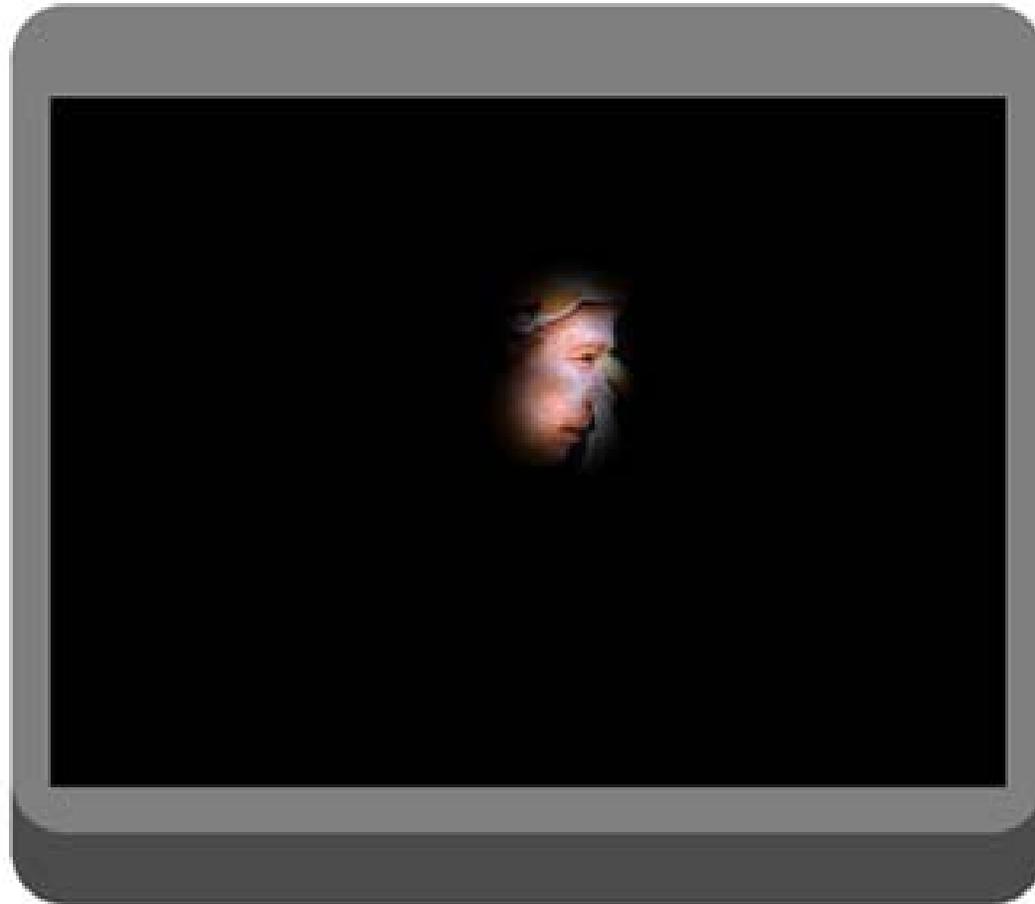
Peekaboom



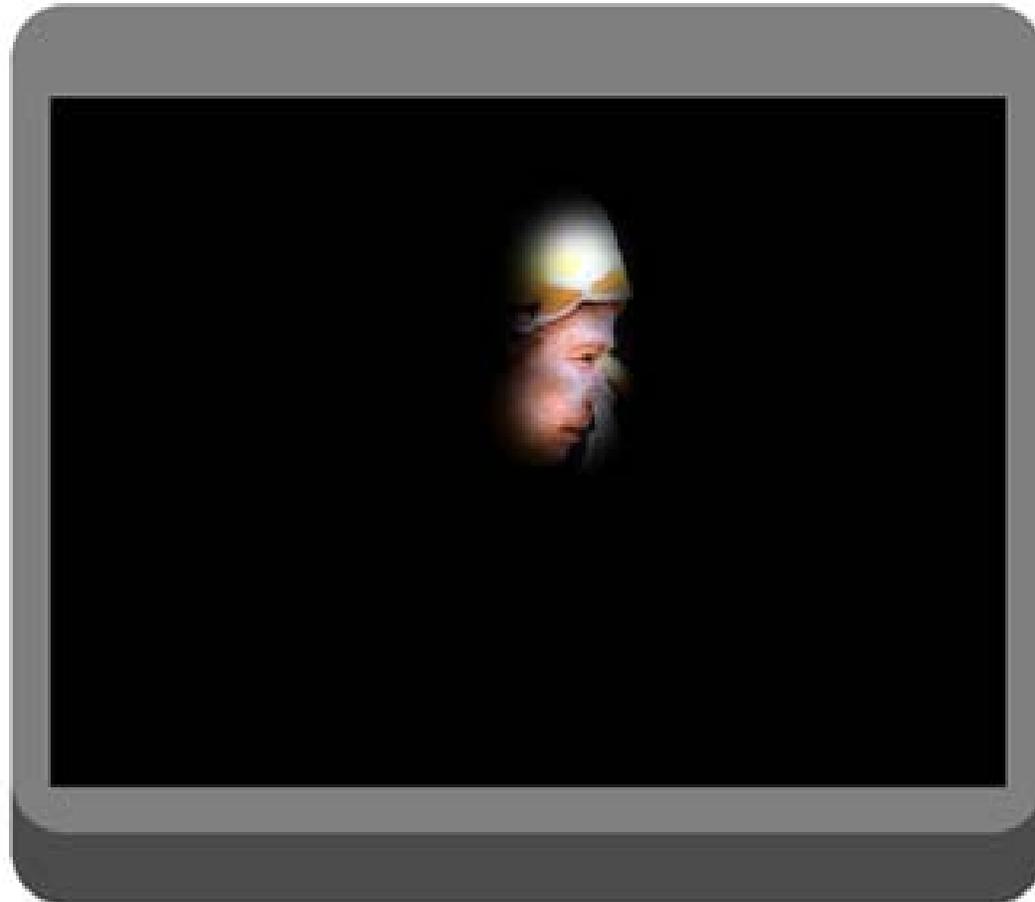
Peekaboom



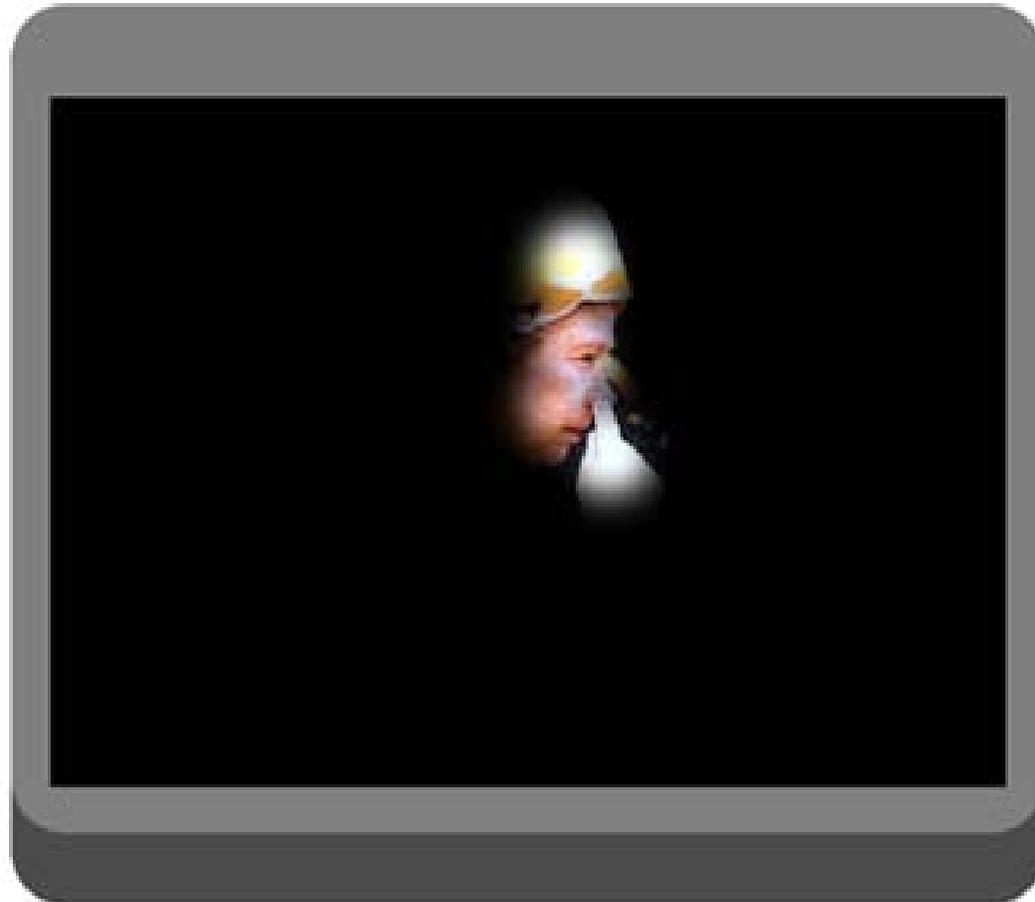
Peekaboom



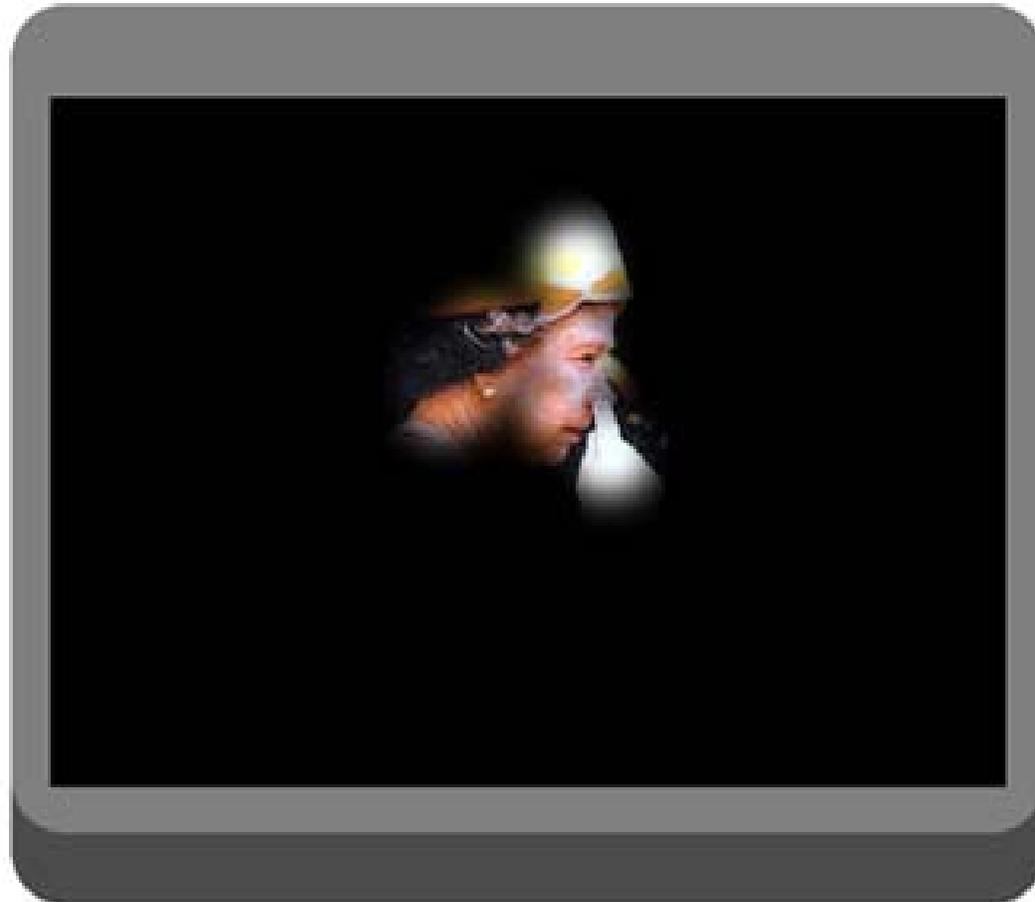
Peekaboom



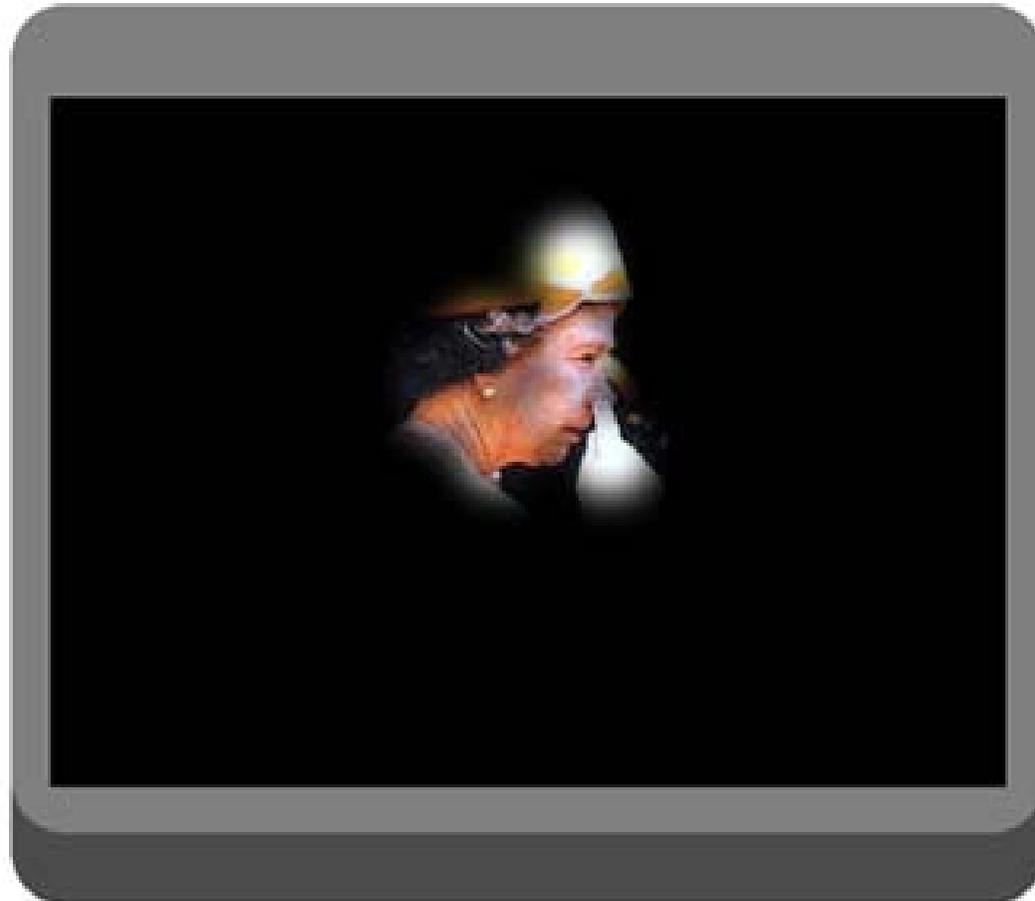
HINT



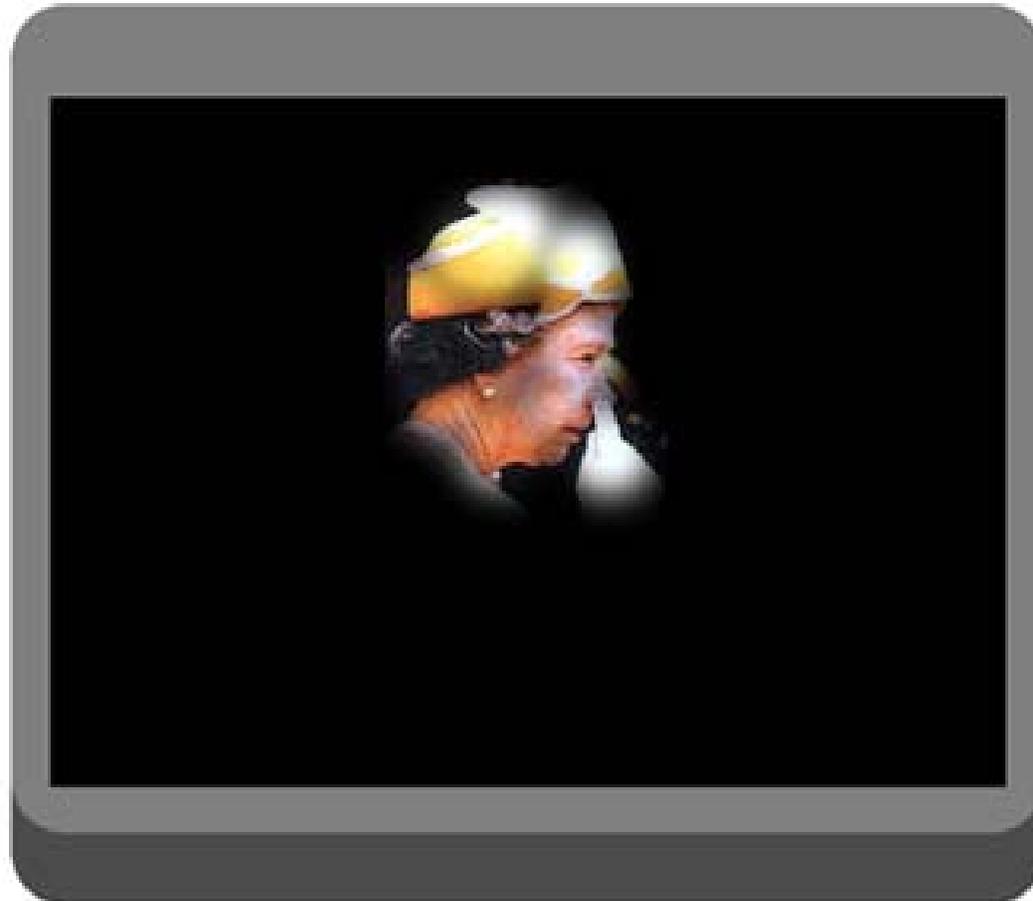
HINT



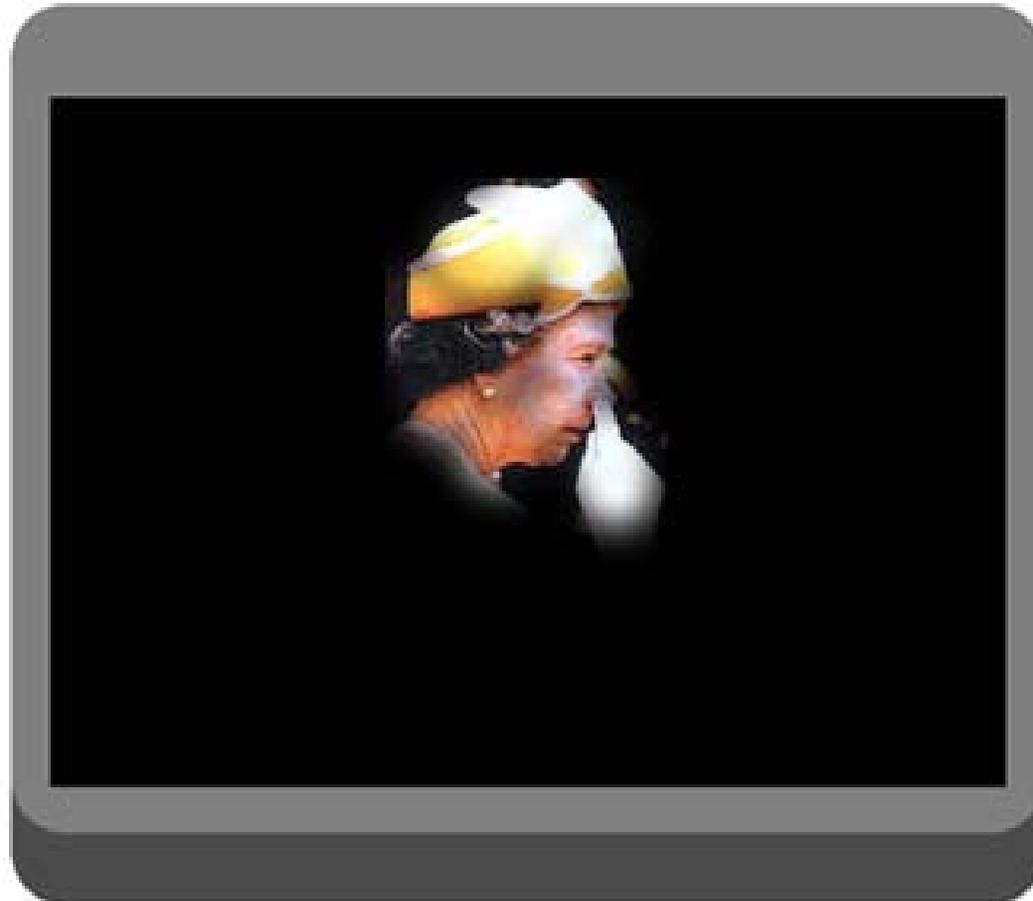
HINT



HINT



HINT



Peekaboom

PICK



HINT



Peekaboom

TIME LEFT

1:29



SCORE

500

building



GUESSES




boom

CLICK THE
IMAGE TO
REVEAL AREAS
TO YOUR
PARTNER.

RIGHT CLICK TO
PING AN AREA
OF THE IMAGE.

HINTS



NOUN



RELATED
NOUN



TEXT



VERB

PASS



Peekaboom IS FUN!

27,000 PLAYERS

2,100,000 PIECES OF DATA

**MANY PLAYED OVER 120 HOURS
IN THE FIRST 10 DAYS!**

Peekaboom

Top scores are updated once every 24 hours



1	SWOOCIN	3326313
2	TIMO	2222169
3	PEEKERBOOMER	1856078
4	DONNABEAR61008	1651359
5	SCRUFFY	1387500
6	BUTTHILDA	1079438
7	DIBURIT	1072137
8	SUBMOM4321	1034602
9	COMFORT4MOM	881404
10	DIANENOLAN	830056

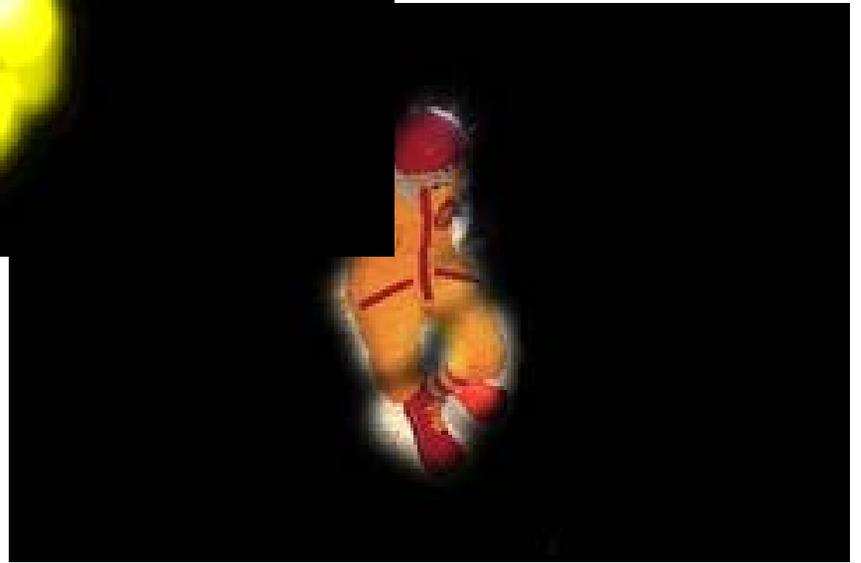
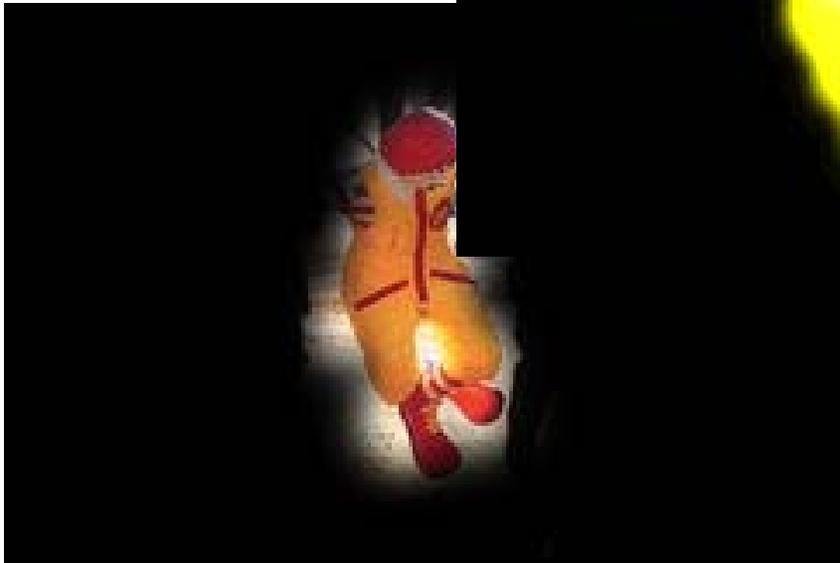
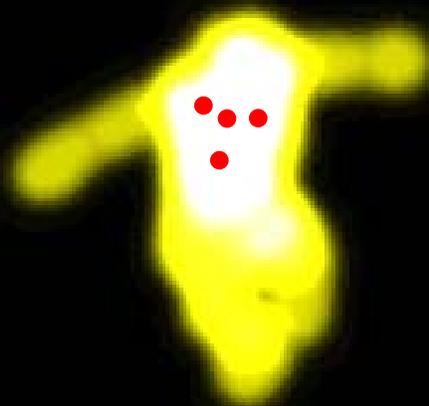


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270 HOURS OF GAME-PLAY

RONALD





Peekaboom + SEGMENTATION



PeekaSearch - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address <http://www.peekaboom.org/cgi-bin/peekasearch> Go Links

Peekaboom

Beta Search. Searching roughly 20,000 images.

Search

sample queries:
man dog,
car tree

28 matches; 4575 near matches for **man dog**

Done Internet

PeekaSearch - Microsoft Internet Explorer

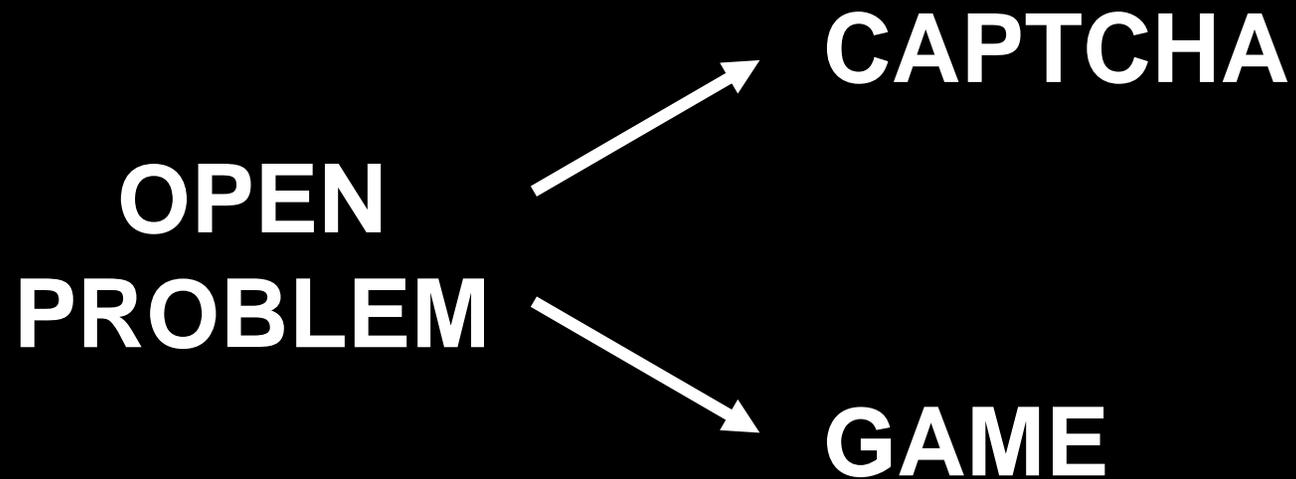
File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Refresh Print Mail Wordpad Notepad People

Address <http://www.peekaboom.org/cgi-bin/peekasearch> Go Links

Done Internet

THE POWER OF HUMAN CYCLES



ALLAROUND US IT IS THERE WHEN YOU WATCH TELEVISION
在美と字印び接す 国出のシ品 致最ま コロンは証 メ書万

TRIXIT IS ALLAROUND US IT IS THERE WHEN YOU WATCH
THE MATRIX HEIS THERE ONE DREAMWORLD NEO
www.DeskPaper.com

刷の情 及術文写て 感ザ絵しオ会観美イカ版もレ 保の 文精なフト社明 を在美と字印び接す 国出のシ品 致最ま
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PAPERS

THE MATRIX IT IS ALLAROUND US IT IS THERE WHEN YOU
WATCH TELEVISION
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コロンは証 メ書万
IT IS THERE WHEN YOU WATCH TELEVISION
WHAT IS YHE MAT

MATRIX

WWW.CAPTCHA.NET

WWW.ESPGAME.ORG

WWW.PEEKABOOM.ORG

WASHERBORN GREY

ADITHYAN

JOSEPH

JOHN

ARNAUD **MARISELUN** EAST-NAME

ALAN

THOMAS

AND JAMES

SAMUEL

SPEAKERS

MICRO

HOME

BRIGHTEN

LATINA

SHARON

MANUELA VELOSO