Objective Captcha

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Outline

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  - Customisation
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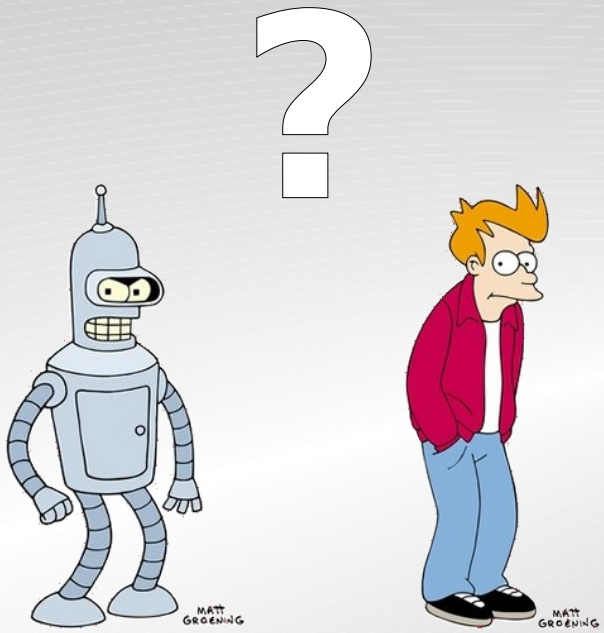
Introduction

- CAPTCHA™ =
  - **C**ompletely
  - **A**utomated
  - **P**ublic
  - **T**uring test to tell
  - **C**omputers and
  - **H**umans
  - **A**part



- challenge-response system to protect web site access against bots

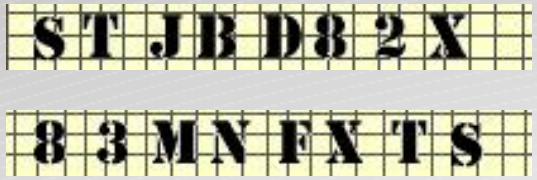
Introduction

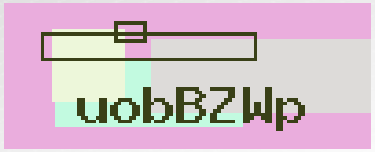
- types of captchas:
  - visual, audio, semantic
- general requirements:
  - automated generation of new challenges
  - no „security by obscurity“!
    challenge algorithms should be published
  - chance to solve a captcha by guessing should be less than 1%
  - delete incorrectly answered queries
  - prevent multiple guessing by same IP address

Text Captchas

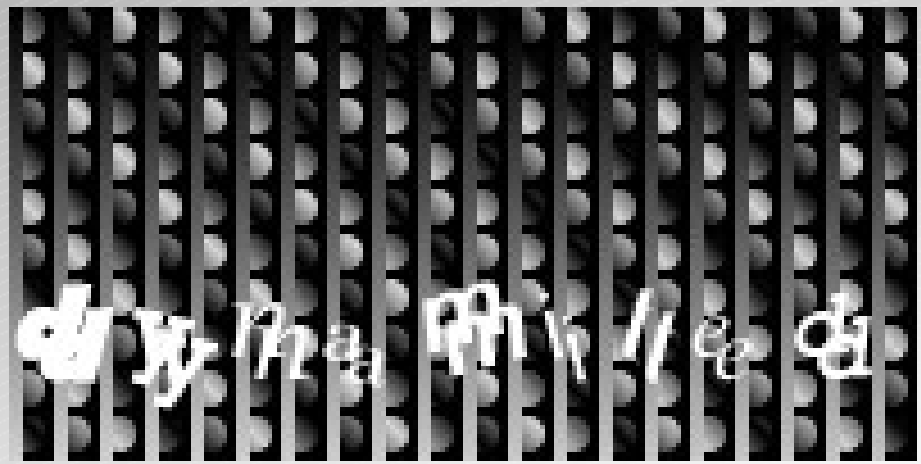
- text captchas are most wide spread today
- common techniques:
  - dictionary words or arbitrary strings
  - text deformation, rotation, ...
  - background texturing
  - font variations
  - and many more...
- Perl support:
  - **Authen::Captcha**
  - **GD::SecurityImage**

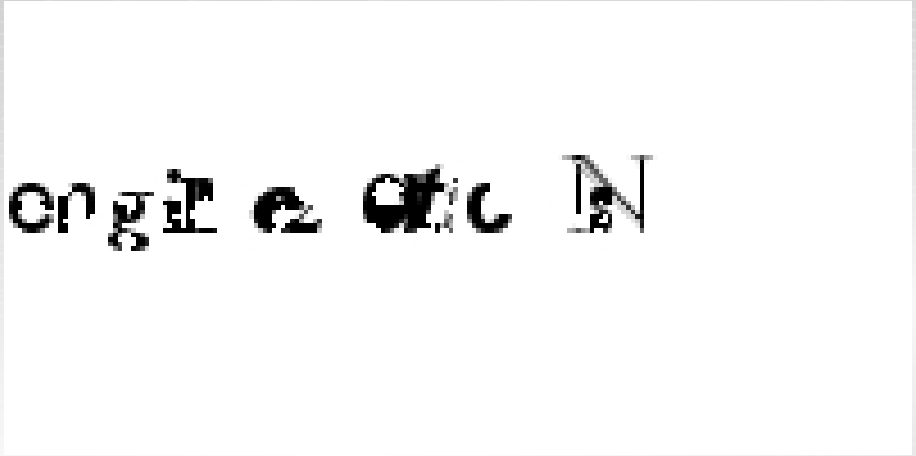
Text Captcha Examples

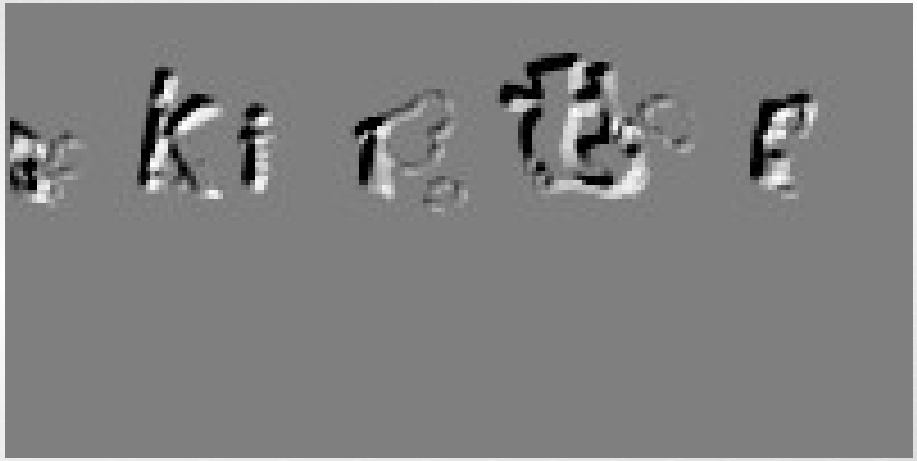




Text Captcha Riddles







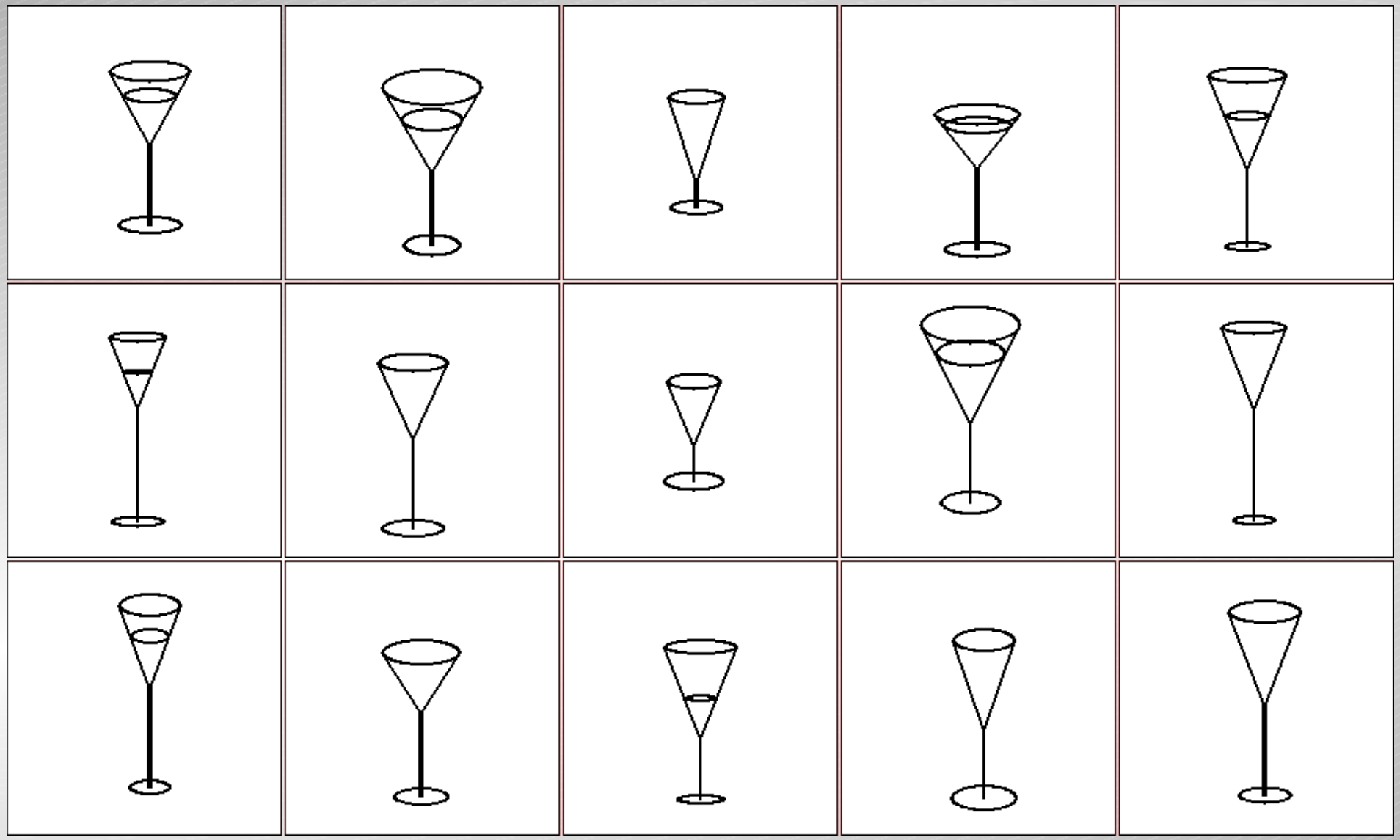
Text Captcha Problems

- mature OCR techniques:
  - very active research discipline
  - free availability of advanced OCR code (e.g. integrated OCR library in PHP)
  - specialised captcha crack tools with very high success rates exist
- with increased security, readability for humans becomes more and more difficult

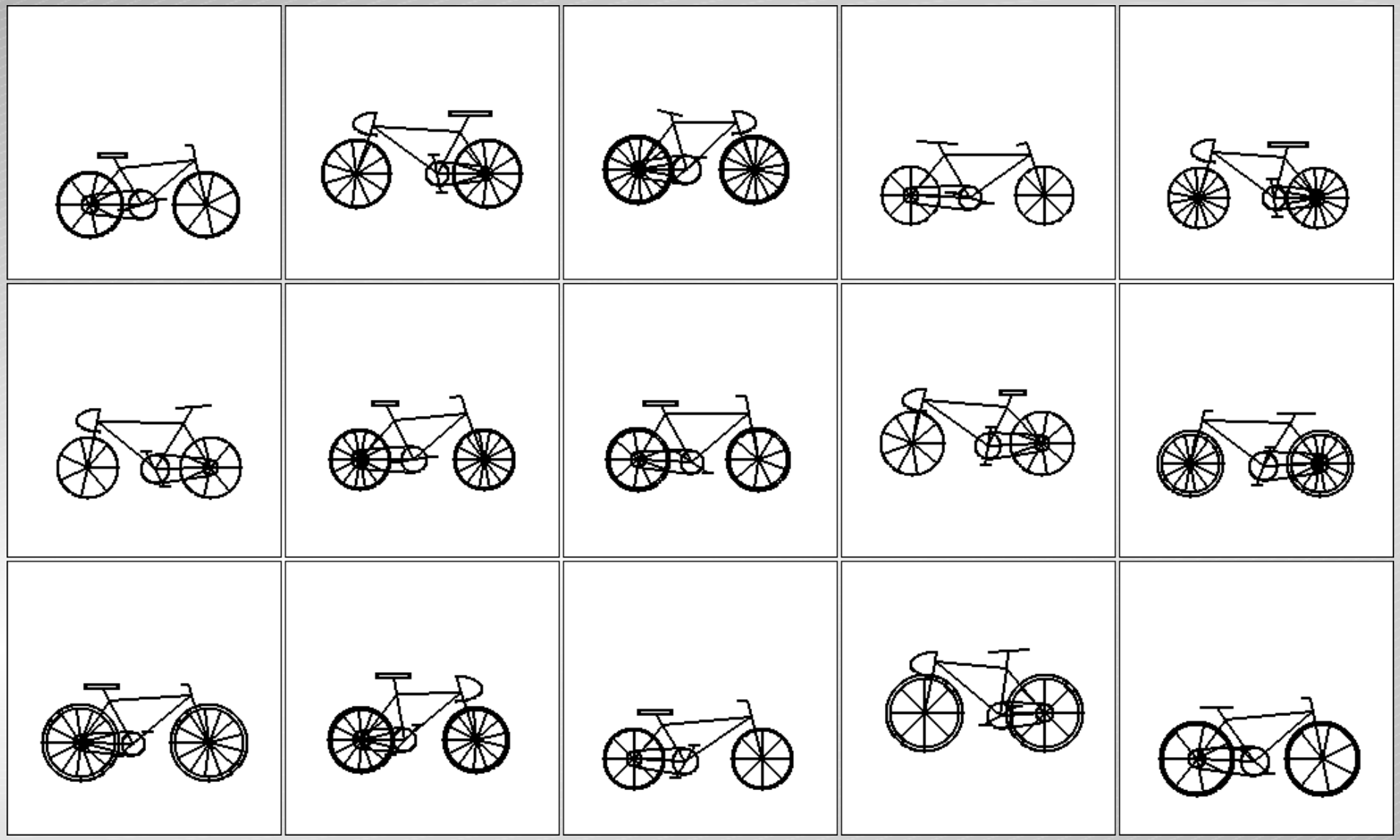
The „Objective“ Idea

- use object images instead of characters!
- algorithmic creation on the fly
- variability of:
  - positioning
  - line length
  - proportions
  - optional elements
  - alternative elements

Object Example 1: Glass



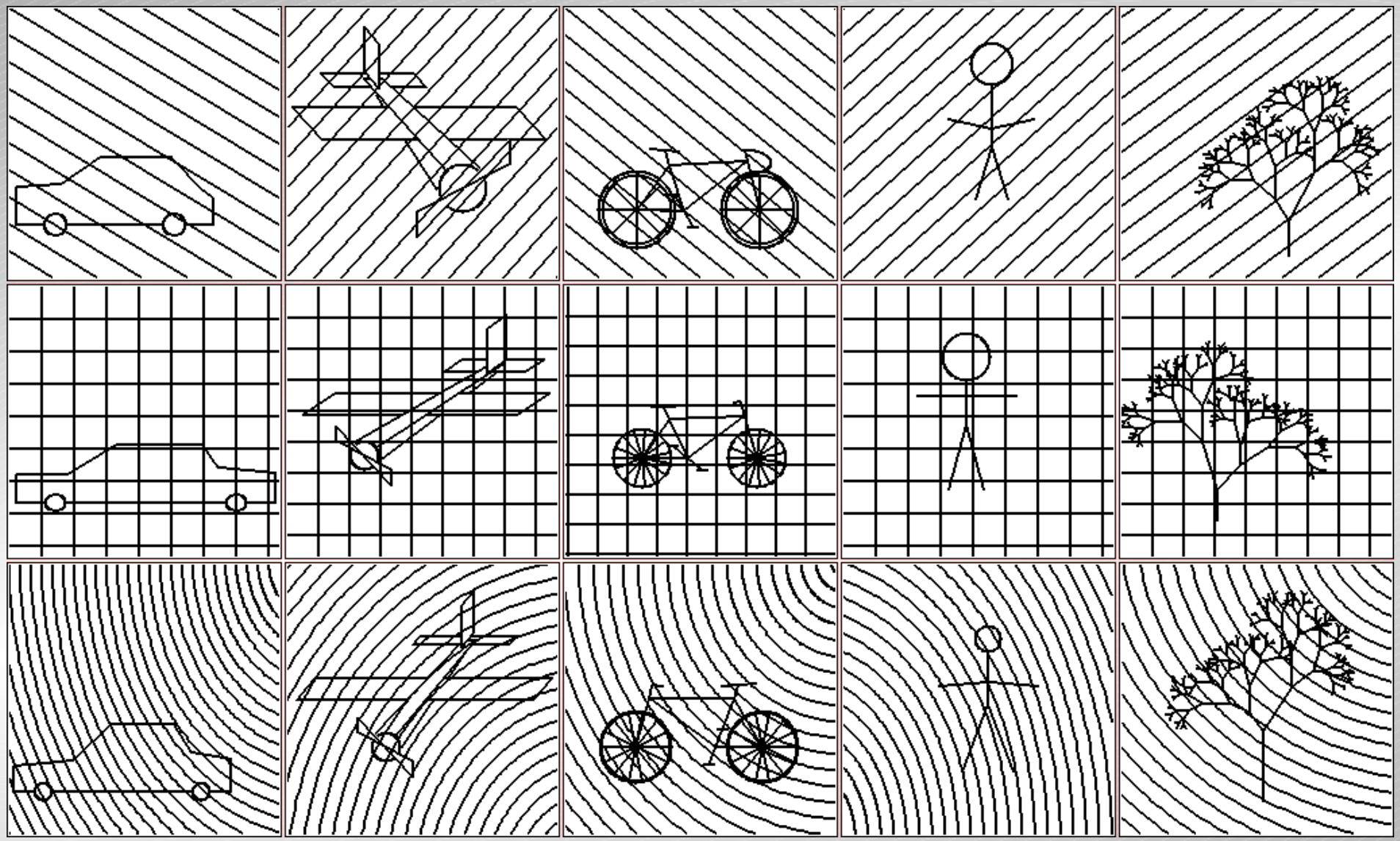
Object Example 2: Bike



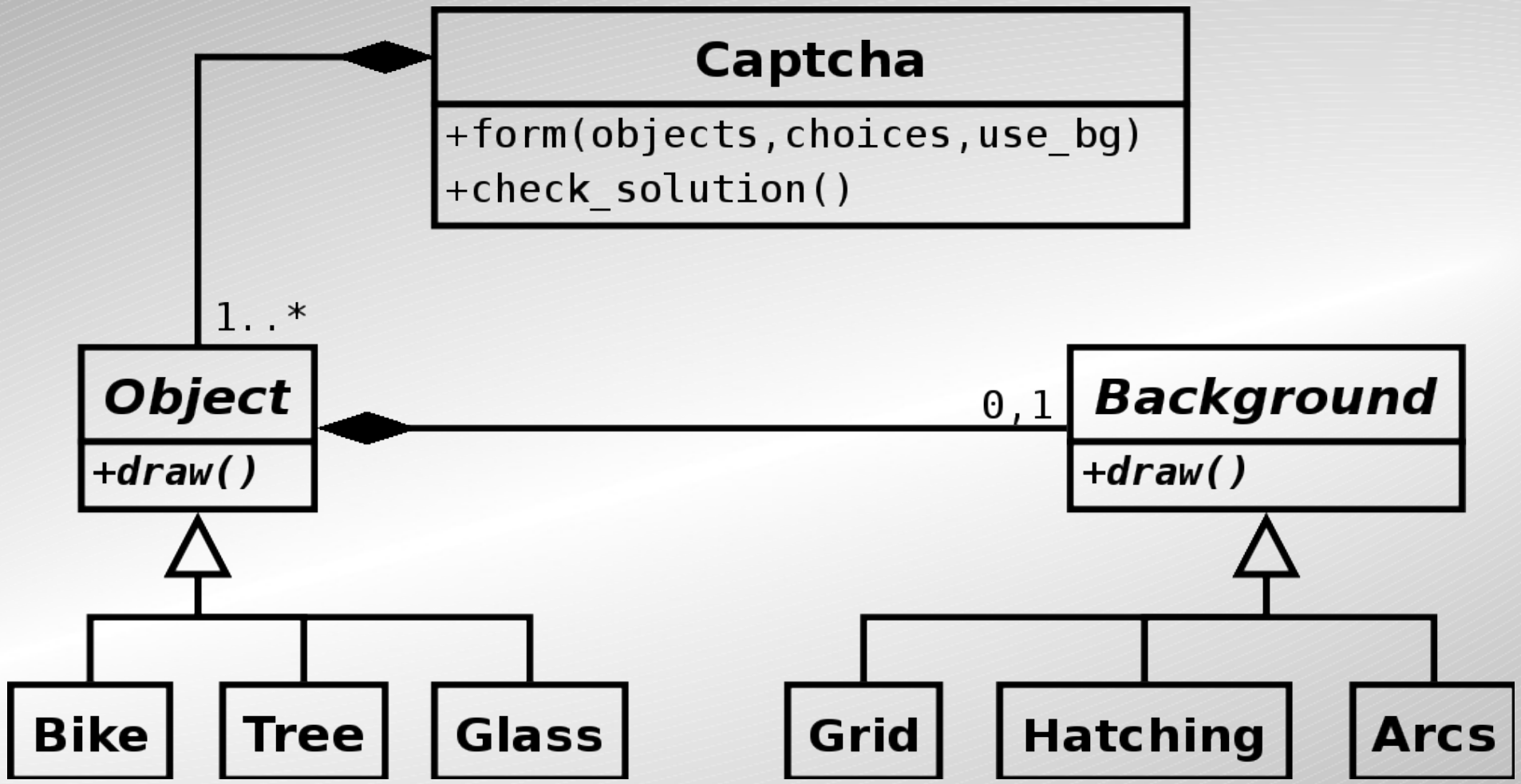
„Objective“ Tuning

- vulnerable to image recognition techniques:
  - count pixels, edges, enclosed areas, ...
  - compare feature vectors (SVM)
- use background patterns:
  - exploits human pattern recognition capability
  - hardly recognisable by computers
  - interferes with most features

Background Examples



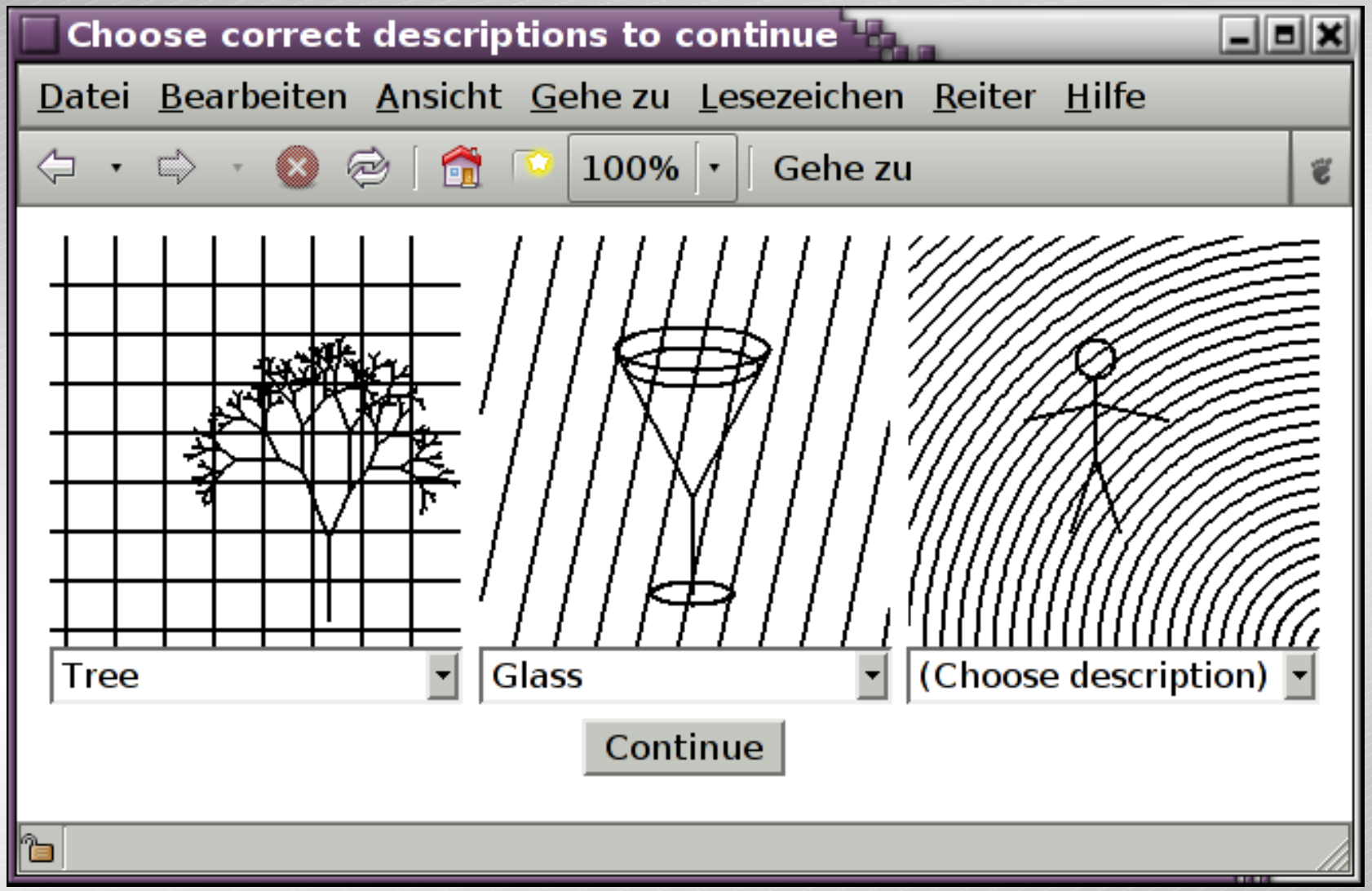
Architecture



How To Use It

- set up paths in `oc_conf.pl` once
- `Captcha->form(3, 6, 1)`
  - creates 3 objects with backgrounds
  - returns form elements in a table
  - offers 6 choices for each object
  - handles id and response automatically
  - just include this call in your CGI form!
- `Captcha->check_response()`
  - checks response in submitted query

CGI Form Example



Customisation

- add your own objects and backgrounds!
- draw objects/backgrounds with **`GD::line()`**, **`GD::rectangle()`**, **`GD::ellipse()`**, **`GD::arc()`**, …
- implement position/length variance with
  - **`Captcha::fuzzy(fuzziness, x, y, ...)`**
- implement options/alternatives with
  - **`Captcha::probe(probability)`**

Code Example: Tree

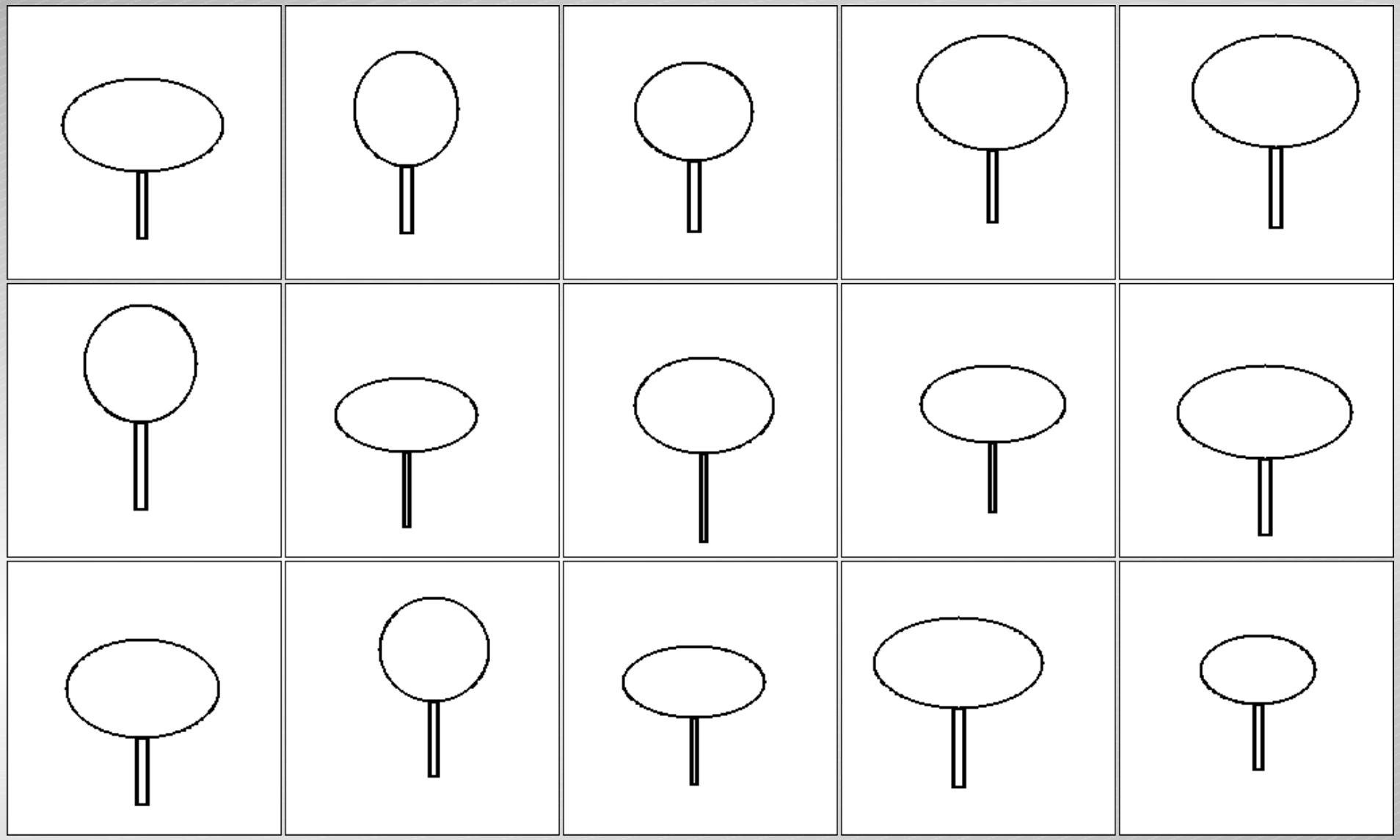
```
sub draw {
    my ($self) = @_;
    my $img = $self->{image};
    my $fg = $self->{fg};

    # define center point
    my ($x, $y) = fuzzy(15, 100, 115);

    # draw tree bole
    my $bole_width = fuzzy(1, 3);
    my $bole_height = fuzzy(10, 55);
    $img->rectangle($x - $bole_width, $y,
                    $x + $bole_width, $y + $bole_height, $fg);

    # draw tree crown
    my $crown_width = fuzzy(15, 50);
    my $crown_height = fuzzy(10, 35);
    $img->ellipse($x, $y - $crown_height,
                  2 * $crown_width, 2 * $crown_height, $fg);
}
```

Code Example: Tree



Further Possibilities

- harden against image recognition:
  - rotation, graphic filters, texturing, ...
- more objects, more backgrounds! classes to recognise rise multiplicatively:
  - 6 objects * 3 backgrounds = 18 classes
  - 12 objects * 6 backgrounds = 72 classes
- unique objects for your site protect you from generalised attacks

General Problems

- accessibility problem:
  - visual and audio captchas always exclude impaired users
  - only semantic captchas are fully accessible
- AI research will catch up
- social attacks always break captchas
  - delegate captchas to your own site's users
- waste of user time
  - 150,000 hours per day estimated
  - „reCAPTCHA“ project digitalises books

Related Links

- PWNtcha - captcha decoder
  - http://sam.zoy.org/pwntcha/
- Breaking a Visual CAPTCHA
  - http://www.cs.sfu.ca/~mori/research/gimpy/
- Inaccessibility of CAPTCHA
  - http://www.w3.org/TR/turingtest/
- reCAPTCHA – Stop Spam. Read Books.
  - http://recaptcha.net/

Questions?

Discussion!

Submit your plugins!