Artificial Creativity

Can Robots Be Creative

What Is Creativity

Jonathan Kammerland
Alexander Reinthal
Nailpolish

Swept off my feet shop till i drop, sequin sash
Angel food adore-a-ball, a-list
Ballet slippers barbados blue, big spender
Romper room rose bowl, resort fling
Innocent in stitches, island hopping
Nice as nice need a vacation, naughty nautical
Allure adore-a-ball, a-list
Bot or not?

Correct answer: Bot

Written by Nailpolish
https://github.com/binn1e/nailpolish

60 % say Bot

40 % say not
Stanzas in Meditation

She may count three little daisies very well
By multiplying to either six nine or fourteen
Or she can be well mentioned as twelve
Which they may like which they can like soon
Or more than every which they wish as a button
Just as much as they arrange which they wish
Or they can attire where they need as which say
Can they call a hat or a hat a day
Made merry because it is so
Correct answer: Not

Written by Gertrude Stein

60 % say Bot

40 % say not
Reverse Turing Test: CAPTCHA

Completely Automated Turing test to tell Computers and Humans Apart
Reverse Turing Test: CAPTCHA

2013, CAPTCHAS beaten by Google and others with 90% accuracy [2]

2014, CAPTCHAS by google and others with 99.8% accuracy [1]
Creativity is...

... the ability to perceive the world in new ways, find hidden patterns, to make connections between seemingly unrelated phenomena and generate new solutions.
Creativity is...

“...a phenomenon whereby something new and somehow valuable is formed.”
Creative Criterions

- Autonomous Evaluation
- Autonomous Change
- Non-Randomness

Concepts introduced in an article about developing creativity in AI by Kyle E. Jennings [4]
Creativity Categories

- Combinational
- Exploratory
- Transformational

Concepts introduced in an article about creativity in AI by Margaret A. Boden [5]
Live Robot Demo

Why AI must model creativity
**Objective:** ball should be inside goal.

- **Robot**
- **Ball**
- **Goal**
- **Hypothetical obstacle**
Fulfilling the objective

- Make robot deal with every kind of obstacle?
- Potential solutions:
  - Exploit openings - “Exploration”
  - Remove obstacle - “Transformation”

**Solution**: Be creative about it.
2 Perception and Creativity in ANN
Perception is classification
Perception is classification

\[ f(x, w) = y \]
Creativity is The Inverse Cat
Creativity is the Inverse

\[ g(y, w) = x \]
Creativity is the inverse

Result from a neural network trained to recognize birds.
Example: AI in Visual Arts
DARCI in a Nutshell

Imagination
Appreciation
Skill
Creativity

Imagination

Appreciation

Skill

Creativity
Appreciation through...

- Subject of image
- Emotions evoked
- Or by association

DARCI uses appreciation through association
- **Low-level**: Light, color, texture, shape etc.
- **High-level**: Happy, sad, violent etc.
Description: cold, blue, reflective, beautiful, tranquil, glazed, pattern
Description: penciled, cold, grey, one-dimensional, icky, pastel, primitive
Demonstrate skill by rendering images to match a list of adjectives

Demonstrate imagination by creating artifacts in non-random way

Examples in next slide...
Evolutionary Algorithm
Practice Mode:
- Gene pool is randomly initialized for each known adjective
- Render one image for each adjective

Commission Mode:
- Gene pool is initialized to most fit genotype from practice mode
- Render one image as per request by user
Genotype g is defined by:
A list of image processing filters similar to Adobe Photoshop’s

Fitness Function

\[ \text{Fitness}(g) = \lambda_A \ A(g) + \lambda_I \ I(g) \]

Where A(g) is the appreciation of result and I(g) the interest in the result.
Who is DARCI?
<table>
<thead>
<tr>
<th>Summary of DARCI</th>
<th>Skilled Methods</th>
<th>Appreciates</th>
<th>Imagines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Achieves better results through practice</td>
<td>Can evaluate its own art as it evolves</td>
<td>By not using completely random methods</td>
</tr>
</tbody>
</table>
4 Conclusions
DARCI is human
Since DARCI knows, appreciates and produces art in a non-random way Darci is human.

Gertrud Stein was a robot
Since Gertrud Stein failed the reverse turing test she is a robot.
Creativity is not a special “faculty”, nor a psychological property confined to a tiny elite. Rather, it is a feature of human intelligence in general. It is grounded in everyday capacities such as the association of ideas, reminding, perception, analogical thinking, searching a structured problem-space, and reflective self-criticism.
Thanks!

Stay put for Discussion
Artificial Creativity: The difference between man and machine, Last year’s seminar by Martin Henoch & Nils Carlsson
Can a computer write poetry, TedTalk by Oscar Schwartz, 10 February 2016
How computers are learning to be creative, TedTalk by Blaise Agüera y Arcas, 22 July 2016
[1] Liam Tung Google algorithm busts CAPTCHA with 99.8 percent accuracy. zdnet.com, April 17, 2014


Creativity, music, and the fine arts

http://botpoet.com/

Presentation template by SlidesCarnival
1. Do you think researching creativity can advance the field of artificial intelligence?

2. Is researching an emotionally creative system an ethical problem? It would mean experimenting with suffering, pain, empathy and other potential feelings.

3. Will machines ever be truly creative? Or is it just some form of random behavior? If so, what would be a good test to measure this.

4. Would you value some artistic work differently if you knew it was artificially created?

5. Should we restrict artificial creativity to avoid a "creative singularity" in some areas?