IAT 888: Metacreation
Machines endowed with creative behavior

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SFU

Outline of today's lecture

- A little bit about me
- A little bit about you
- What will that course be about?
- Evaluation and deliverables
- Topics and possible topics
- Communication
- Break
- Elements on creativity
- For next week

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Philippe Pasquier?

- **Artificial intelligence and cognitive sciences:**
  - PhD in Canada, Post-doc at the Intelligent Agent Lab, Department of Information Systems, University of Melbourne, Australia.
  - Working on artificial agents and multi-agent systems,…
- **Practice in contemporary arts:**
  - Multidisciplinary involvement:
    - Phylm: experimental cinema and audio
    - P: multidisciplinary theatre and media art
    - Miji dance company: dance and new technologies
    - Robonom: analogue-electronic improvised music in France
  - Avatar: audio art in Québec, Canada
  - Bus 117: artists-run art gallery in Melbourne
  - Vancouver New Music: diffusion in Vancouver.

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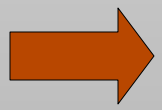
A little bit about you

- Presentation (always a good exercise):
  - Name
  - Level of study, year and supervisor
  - Background (academic, professional, artistic, ...)
  - One sentence description of your research project (eventually hypothetical)
  - How many courses do you have this session?
  - Why did you took IAT-811 (if ever you know!)?
  - What do you expect from the course (any special requests)?
  - What do you want to do in the future (ideal or more realistic answer)?

A little bit about you

- More specific questions about your background:
  - Who did study AI, A-life, Machine Learning?
  - Raise your elbow (I heard of it and kind of know what it is) or you arm (I would be able to develop/use one/it nearly straight away)?
    - A recursive algorithm
    - A LIFO/FIFO list
    - A BDI agent, A*, ID3, RL, HMM, neural network, genetic algorithm, genetic programming, SWARM, L-grammar, ...
    - C, C++, Perl, Tcl/Tk, Java, Javascript, MAX, PD, ...



Please send me an email with all this information

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Content of the course

- **Theory and practice of metacreation**
- **More precisely on:**

"Machines endowed with creative behavior"

We will focuss on software (formaly Turing Machines).
No hardware/physical machines, no biological machines, ...

External manifestation (given some internal or external stimuli)

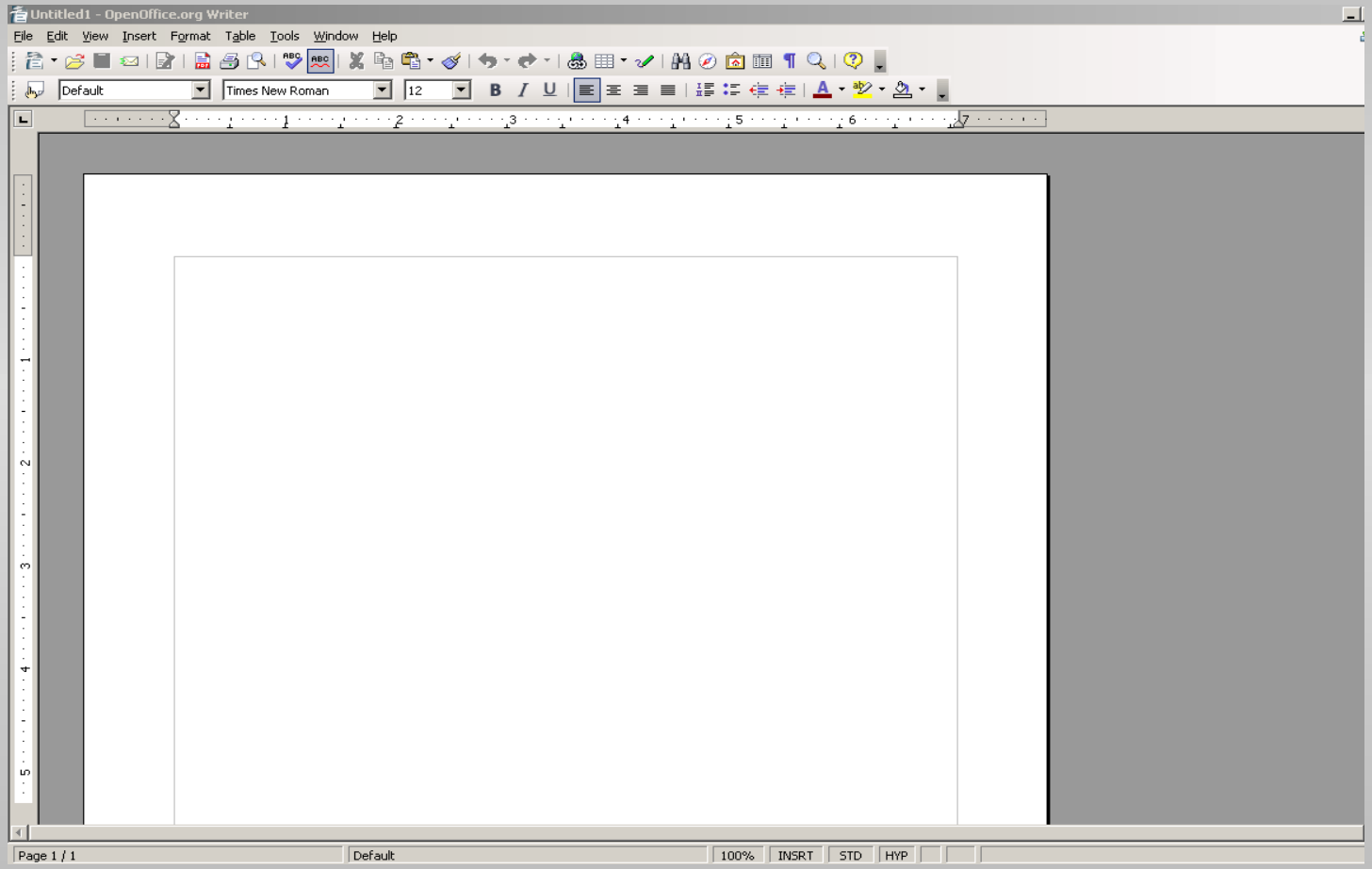
Qualified as such, intuitive meaning (to be addressed later)
The notion of creativity is not an easy one!

Content of the course

- Through the development of:
  - **Artificially creative systems** (metacreations): development of computational systems that produce or simulate creative behavior. These systems may be inspired by human creativity or by the possibilities of artificial systems beyond human capabilities.
  - **Computational models of human creativity:** construction of cognitive models of creativity that can be the basis for computational creativity.
  - **Computational systems for supporting creativity**: production of user interfaces, interaction design, decision support, and data modelling techniques that lead to the development of intelligent assistants that support the user in being more creative.

Content of the course

- What is that?



Content of the course

- What is that?

Content of the course

- **What is that?**

AARON Painting, 1991 (19 years ago!)

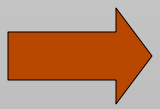
Content of the course

- AARON is a software developed by Harold Cohen
- AARON's paintings have been exhibited at the Tate Gallery in London
- Essays and bio available at: http://crca.ucsd.edu/~hcohen/
- Documented in the film: “The age of intelligent machines”
- Free (light) version available at: http://www.kurzweilcyberart.com/ (also contains presents a cybernetic poet based on machine learning)

Quick demonstration of a light version of AARON

Content of the course

- More specifically we will look at metacreation in the context of artistic practices (which are complex practices), digital media, video games, digital performance, design, ...
- We will, for example, not look specifically at metacreation in science and engineering.
- Example:
  - Metacreation: Genetic algorithms for generating electronic circuits based on their specifications
  - Validation: Patent and big money!
- However, the tools are the same and the ideas and theoretical analysis are often similar



This course has a pretty large scope of applicability and most of it will be relevant beyond art practices

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Evaluation and deliverables

- **Theoretical Research (30%):**
  - **Find an appropriate topic (for next week): it can gravitate around a particular Metacreation (ex. AARON) or a family of Metacreations (Flocks).**
  - **Find the relevant material and study it**
  - **Oral presentation in class:**
    - **Slide-based presentation**: PDF file of handout to be sent to everyone at least 48 hours before the presentation
    - It has to include a demonstration and/or some illustrations of the work studied and it has to detail the technique(s) used.
    - An important criteria here is **reproducibility** (being able to develop a similar Metacreation on the basis of what has been said)
    - 30 minutes = 20 minutes of oral presentation + 10 minutes questions/answers and discussion

Evaluation and deliverables

- Main Project (30%):
  - Can be one or several of the following:
    - Developing a new Metacreation (from scratch or by exploiting/extending an existing system)
    - Conducting experiments for the validation of an existing system
    - Addressing some theoretical aspects
  - It is recommended to do a project in relation with your own research
  - Breakdown:
    - 10% process: finding and/or refining your project topic, development/experiment/research
    - 10% result: demonstration/experimental results/significance
    - 10% presentation: Oral presentation of the project (same as for the theoretical work)

Evaluation

- **Research Paper (30%):**
  - **Publication of research articles is one of the core component of academic research: it is the standard way to document, communicate the research to the relevant community (with oral presentation in conferences) and is the most important factor behind academic careers ("publish or perish")**
  - **Goal: Refining and presenting the project as a research paper**
  - **Presentation: some precise guidelines will be given (PDF will be required, Word files are not acceptable)**
  - **Length: 8 pages (16 pages for theoretical projects)**
  - **Notice the dependency with the previous item (Project)**
  - **I will act as a reviewer (double blind revieweing is not possible in our case)**

Evaluation

- **Participation (10%):**
  - **Assiduity**
  - **Participation and pro-activity**
  - **Collaboration:** Students are encouraged to discuss with each other; talking together can be a useful method for working out difficulties and solving problems. However, it goes without saying that all individually submitted work should be the student's own. Usual rules about plagiarism apply.
- **Late Policy:** All deliverable are due on the indicated due date and time (important for presentations). Occasionally, extraordinary circumstances may make it impossible, these need to be anticipated as much as possible.
- Finally, your level of experience will be taken into account (a 1st year master is not expected to perform exactly as a 3rd year PhD student)

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Technical Topics (and possible topics)

- General AI and DAI:
  - Autonomous agents:
    - Reactive agents: subsumption architecture
    - Cognitive agents: decision theoretic agents, BDI agents, coherentist approaches
    - Hybrid agent architectures
  - Multi-agent systems:
    - Agent communication (SAT, protocols, negotiation, argumentation)
    - Emergence: Ant systems, AMAS theory
- Machines learning:
  - Connectionist approaches: ANN, SOM, Restricted Boltzman Machines
  - Instance Based learning, Statistical learning, HMM,
  - Reinforcement learning
  - Multi-agent learning (MDP, POMDP)
- A-life:
  - Evolutionary computing:
    - Genetic algorithms
    - Genetic programming
  - Swarm intelligence (flocks, ...)
  - Cellular automata, Simulation (MMAS)

Theoretical Topics (possible topics)

These are some of the theoretical topics we can address:

- Theory of creativity:
  - Creativity and computers
  - Creativity in cognitive sciences
- Contextualisation: A two dimensional analysis of new media art
- History of generative art / metacreation
- Generative arts/computer art and metacreation
- Ontology of metacreation
- Philosophy of science/technique: technophobia vs technophilia,
- Validation techniques: benchmark and experiments («Turing test »)
- Copyright issues: creation in the age of computer software
- Aesthetic of Metacreation

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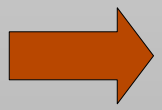
Communication

- Class meeting, every week Thursday 10-1.20, SUR-3040
- Web-page: http://www.sfu.ca/~ppa12/IAT-811/
- Mailing list (to everyone): iat888-g100@sfu.ca
- My e-mail address: pasquier@sfu.ca
- My Skype ID: pasquierphilippe
- My Phone: +1 778-989-1240
- We will meet individually a number of times during the term (and after if needed).



Please Communicate

“I also believe that academic freedom should protect the right of a professor or student to advocate Marxism, socialism, communism, or any other minority viewpoint-no matter how distasteful to the majority, ...”

Richard M. Nixon (American 37th US President (1969-74), 1913-1994)