Comunidad académica comprometida con el desarrollo humano de la sociedad.

Marzo 1°, 2018.
Dictamen 05/18

DICTAMEN QUE PRESENTA LA COMISIÓN DE INVESTIGACIÓN DE LA DIVISIÓN DE CIENCIAS DE LA COMUNICACIÓN Y DISEÑO

ANTECEDENTES

I. El Consejo Divisional en su sesión 07.17 celebrada el 7 de abril de 2017, mediante el acuerdo DCCD.CD.02.07.17, integró la Comisión de Investigación como sigue:

- Jefe del Departamento de Ciencias de la Comunicación
  Dr. Jesús Octavio Elizondo Martínez
- Jefe del Departamento de Teoría y Procesos del Diseño
  Mtro. Luis Antonio Rivera Díaz
- Jefe del Departamento de Tecnologías de la Información
  Dr. Carlos Joel Rivero Moreno
- Representante Titular del Personal Académico, Depto. de Ciencias de la Comunicación
  Dr. Felipe A. Victoriano Serrano
- Representante Titular del Personal Académico, Depto. de Tecnologías de la Información
  Dr. Luis E. Leyva del Foyo
- Representante Titular del Personal Académico, Depto. de Teoría y Procesos del Diseño
  Dr. Luis A. Rodríguez Morales

II. Mediante oficio recibido con fecha 24 de enero de 2018 por la Dirección de Ciencias de la Comunicación y Diseño, le fue turnado para su análisis y discusión el informe de actividades académicas desarrolladas por el **Dr. Santiago Negrete Yankelevich**, durante el disfrute del periodo sabático comprendido del 6 de septiembre de 2016 al 5 de septiembre de 2017, aprobado en la *Sesión Ordinaria 04.16* celebrada el 20 de abril de 2016, mediante el acuerdo *DCCD.CD.10.04.16*.

III. La Comisión de Investigación sesionó el día 1° de marzo de 2018, fecha en la que concluyó su trabajo de análisis y evaluación del informe.

IV. Se analizaron los siguientes elementos:

- PROGRAMA DE ACTIVIDADES ACADÉMICAS POR DESARROLLAR DURANTE EL PERIODO SABÁTICO
- EVALUACIÓN GENERAL

Dictamen 05/18

Con base en los antecedentes y consideraciones anteriores, la Comisión de Investigación emite el siguiente:

D I C T A M E N

ÚNICO: La Comisión de Investigación recibió y analizó el informe de periodo sabático presentado por el Dr. Santiago Negrete Yankelevich, y determinó que cumple con el programa de actividades propuesto, por lo que recomienda al Consejo Divisional aceptarlo. Sin embargo, el informe de actividades del periodo sabático fue entregado fuera del plazo establecido en el artículo 231 del RIPPPA, por lo que quedará constancia del incumplimiento de dicho plazo en su expediente divisional, de acuerdo con lo señalado en la exposición de motivos numeral 5.5 del Reglamento Orgánico.

Lo anterior es referente al disfrute del periodo sabático comprendido del 6 de septiembre de 2016 al 5 de septiembre de 2017, aprobado en la *Sesión Ordinaria 04.16* celebrada el 20 de abril de 2016, mediante el acuerdo *DCCD.CD.10.04.16*.

MIEMBROS DE LA COMISIÓN:

Dr. Jesús Octavio Elizondo Martínez
Jefe del Depto. de Ciencias de la Comunicación

Mtro. Luis Antonio Rivera Díaz
Jefe del Depto. de Teoría y Procesos del Diseño

Dr. Carlos Joel Rivero Moreno
Jefe del Depto. de Tecnologías de la Información

Dr. Felipe A. Victoriano Serrano
Representante Titular del Personal Académico de Ciencias de la Comunicación

Dr. Luis E. Leyva del Foyo
Representante Titular del Personal Académico de Tecnologías de la Información

Dr. Luis A. Rodríguez Morales
Representante Titular del Personal Académico de Teoría y Procesos del Diseño

ACUSE

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UNIVERSIDAD AUTÓNOMA METROPOLITANA
Unidad Cuajimalpa

Comunidad académica comprometida con el desarrollo humano de la sociedad.

DCCD.DTI.036.18
Enero 24, 2018

Dr. Octavio Mercado González
Presidente del Consejo Divisional
División de Ciencias de la Comunicación y Diseño
Presente

ASUNTO: Envío del Informe Sabático del Dr. Santiago Negrete

Estimado Dr. Mercado:

Por este medio le pido por favor someter ante Consejo Divisional el informe de año sabático que presenta el Dr. Santiago Negrete Yankelevich, con número económico , correspondiente al año sabático del 6 de septiembre de 2016 al 5 de septiembre de 2017.

Sin otro particular, le envío un cordial saludo.

Atentamente,

Casa abierta al tiempo

UNIVERSIDAD AUTÓNOMA METROPOLITANA
Casa abierta al tiempo
UNIDAD CUAJIMALPA
RECIBIDO
24 ENE 2018
NOMBRE Y FIRMA:
DIRECCIÓN DE CIENCIAS DE LA COMUNICACIÓN Y DISEÑO

Dr. Alfredo Piero Mateos Papis
Jefe del Departamento de Tecnologías de la Información

Anexo: Informe de Año Sabático y documentos antecedentes (en forma electrónica)

c.c.p.: Mtro. Raúl Roydeen García Aguilar – Secretario del Consejo Divisional

UNIVERSIDAD AUTÓNOMA METROPOLITANA
Casa abierta al tiempo
UNIDAD CUAJIMALPA
RECIBIDO
24 ENE 2018
NOMBRE Y FIRMA:
SECRETARÍA ACADÉMICA DE CIENCIAS DE LA COMUNICACIÓN Y DISEÑO

*APMP*pfc*

División Ciencias de la Comunicación y Diseño

Unidad Cuajimalpa
DCCD | Jefatura del Departamento de Tecnologías de la Información
Torre III, 5to. piso. Avenida Vasco de Quiroga 4871,
Colonia Santa Fe Cuajimalpa. Delegación Cuajimalpa de Morelos,
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http://dccd.cua.uam.mx

Informe de año sabático

Santiago Negrete Yankelevich
27/10/17

1 Sobre este documento

Este documento contiene el informe final del trabajo realizado por Santiago Negrete Yankelevich durante el año sabático que tomó, en el período comprendido entre el 6 de septiembre de 2016 y el 5 de septiembre del 2017, en el Instituto de Investigación en Inteligencia Artificial[1] del Consejo Superior de Investigaciones Científicas de España[2]. La invitación para trabajar durante ese año fue hecha por el Dr. Ramón López de Mántaras[3], director del Instituto (ver Apéndice).

2 Proyectos

Durante la estancia sabática trabajé en varios proyectos con varias personas de México y de otras partes del mundo.

2.1 *Co-creación* en el contexto de medios digitales

Este proyecto consiste en desarrollar un sistema que contribuya significativamente al proceso de creación de animaciones de gráficos (*motion graphics*) para investigar cómo un equipo de creativo de personas se relaciona con un sistema que puede ser considerado como un miembro más del equipo. El enfoque es relevante porque recientemente las comunidades de creatividad computacional y de medios computacionales han estado convergiendo hacia modelos colectivos de creación, en donde las máquinas contribuyen al trabajo creativo y se les otorga crédito en el aspecto creativo dentro del proceso general. Nuestro trabajo desarrolla un marco conceptual en el cual es posible planificar, ejecutar y evaluar proyectos de co-creación --en el sentido mencionado-- dentro del contexto de los nuevos medios. En este proyecto participa la Mtra. Nora Morales del Departamento de Procesos del Diseño de la UAM Cuajimalpa. Impartí un seminario sobre este tema en el Instituto en noviembre 2016 (ver Sección 3).

Durante el año elaboré un sistema que genera *animatics* (*storyboards* animados). Estos artefactos son parte esencial del proceso de elaboración de toda animación. Es un producto que desarrolla el equipo de producción en las etapas tempranas del proceso y que permite tomar las decisiones estructurales más importantes del producto final. En virtud de esto, conjeturamos, es posible medir el nivel de creatividad del sistema en función del impacto que tiene el o los animatics creados por él (ver Sección 4).

1 www.iiia.csic.es
2 www. csic.es
3 ramon@iiia.csic.es

Como parte de este proyecto enviamos un artículo para presentarlo en el congreso internacional Creativity and Cognition[4] (ver Apéndice). El artículo no fue aceptado, pero tuvimos buenos y útiles comentarios de los revisores. Su principal crítica tiene que ver con el hecho de que el software y el marco conceptual no han sido probados extensivamente en la práctica; esto es algo en lo que estamos trabajando actualmente.

2.2 Creatividad relacional

Este proyecto tiene como objetivo explorar la idea de creatividad no humana. Es decir, la posibilidad de considerar el comportamiento de agentes distintos a las personas, como los animales o los sistemas informáticos, como una actividad creativa en un sentido general, que incluya la creatividad tanto humana como no humana. El concepto de *creatividad relacional,* introducido por el filósofo francés Gilles Simondon (Simondon 2001), es el que se utiliza como fundamento para la investigación. En su visión, la creatividad es el resultado de la interacción entre agentes que son capaces de producir y reconocer relaciones inexistentes hasta ese momento, entre los objetos utilizados y generados durante la interacción.

Este proyecto lo realizo en conjunto con la Dra. Nuria Valverde del Departamento de Humanidades de la UAM Cuajimalpa. El proyecto tiene un ámbito de experimentación que es el intercambio entre máquinas y pacientes con *Síndrome de Enclaustramiento*[5] *(Laureys et al. 2005)*. Los pacientes que padecen esta enfermedad han quedado, por diversas razones, paralizados del cuerpo casi por completo; en algunos casos son capaces de mover los ojos y levemente la punta de algún dedo de la mano. Hay una gran cantidad de estudios en los que se han desarrollado técnicas y tecnologías para dar a estos pacientes la posibilidad de comunicarse con "el exterior"; incluso hay un paciente que publicó un libro acerca de su vida con esta condición (Bauby 2007).

En octubre de 2016 asistimos a un simposio sobre el tema en el departamento de Humanidades de la Universitat Autònoma de Barcelona, donde intercambiamos puntos de vista con especialistas de varios países que se relacionan con la enfermedad jugando distintos roles alrededor del cuidado de los pacientes. Una de las cosas que es clara es que los pacientes pasan largas horas solos, una vez que las horas de visita de amigos y parientes; así como las revisiones médicas. Una de las preocupaciones de médicos y terapeutas relacionados con la enfermedad es qué hacer para que los pacientes se mantengan mentalmente activos, cosa que contribuye sustancialmente a acelerar su recuperación.

Enviamos un artículo sobre nuestros avances al congreso internacional de creatividad computacional y, a pesar de que no lo aceptaron por ser "demasiado experimental", recibimos buenos comentarios al respecto.

Actualmente estamos elaborando una nueva versión que incorpora los últimos avances tanto teóricos como de implementación para una revista sobre cognición.

2.3 *Co-creación* entre máquinas y agentes computacionales

Este surgió a partir del seminario que presenté en el Instituto como una iniciativa para combinar ideas entre la regulación de agentes autónomos como parte del proyecto europeo sobre Agreement Technologies[6] (Noriega et al. 2015; Argente et al. 2013)y el trabajo sobre co-creación

4 http://cc.acm.org/2017/
5 *Locked-in Syndrome*, en inglés.
6 http://www.agreement-technologies.eu/

que hacemos en el cuerpo académico de la UAM Cuajimalpa. El objetivo del proyecto es establecer un marco teórico-práctico de gobernabilidad que permita especificar agentes, tanto humanos como no-humanos, que colaboran de una manera creativa.

Asistí, como parte de este proyecto, al congreso internacional sobre tecnologías del acuerdo (at2016) en la Universidad de Valencia[7]. Este congreso, coincidentemente se llevó a cabo junto con el congreso internacional de sistemas multi-agente[8], el 15 y 16 de diciembre del 2016.

Como parte de este proyecto tuve reuniones regulares con el Dr. Pablo Noriega del IIIA y con el Dr. Enric Plaza del mismo instituto. Hasta el momento tenemos el borrador de un artículo que enviaremos al congreso internacional sobre agentes autónomos el próximo año.

2.4 Solución algorítmica a problemas de configuración utilizando SAT

Este es un proyecto que surgió a partir de conversaciones sobre multi-agentes y problemas de cocreación, busca encontrar soluciones óptimas al problema clásico de encontrar una configuración de un grupo de agentes que cumpla con ciertas características. Para encontrar una solución óptima para un caso específico, hemos propuesto una transformación que traduce el problema a una instancia del célebre problema de complejidad computacional SAT (satisfacibilidad). Un primer resultado fue presentado en el P*rimer taller internacional de equipos en sistemas multi-agente*[9] dentro del C*ongreso internacional de agentes autónomos y sistemas multi-agente*[10] en São Paulo, Brasil (Manyà et al. 2017). Nuestro artículo fue seleccionado dentro de un rubro de artículos *visionarios,*y ha sido publicado en una edición especial de *Lecture Notes in Computer Science de Springer Verlag*. Ahora estamos trabajando en una versión extendida que ya ha sido aceptado para publicación en *Fundamenta Informaticae*[11] en breve.

2.5 *Ride along*: motores de narrativa para historias de vida

Ride-Along es un proyecto europeo que surgió del taller de Dublín (ver Sección 4). A partír de conversaciones entre sesiones surgó la idea del proyecto y después tuve una reunión con el promotor principal, Tom de Smedt y su equipo, en el Experimental Media Research Group del St Lucas School of Arts en Amberes. El proyecto fue enviado a la Comisión Europea y está en proceso de evaluación (ver 8.7).

El proyecto propone desarrollar un modelo y una serie de herramientas para la generación automática de narrativas con dos posibles aplicaciones: la primera en el ámbito de los automóviles autónomos, en donde un sistema genera narrativas que cuentan a los pasajeros del coche lo que ha sucedido durante el recorrido junto con posibles desviaciones turísticas y otras cosas relevantes. La segunda aplicación tiene que ver con la generación de historias para entretener y asistir psicológicamente a niños que padecen cáncer y que están hospitalizados. El sistema propuesto en este caso generará historias multimedia que divertirán a los niños con textos, ilustrados con animaciones y sonido.

https://sites.google.com/view/agreementcomputing

7 http://eumas-at2016.webs.upv.es/AT2016.html

8 http://eumas-at2016.webs.upv.es/EUMAS2016.html

9 https://www.iiia.csic.es/teamas17/Home.html

10 http://www.aamas2017.org/index.php

11 http://fi.mimuw.edu.pl/index.php/FI

3 Seminarios y conferencias

Durante el año conduje un seminario en el IIIA el e impartí una conferencia junto con la doctora Nuria Valverde en el taller *High-Concept Low Downs* [12] en el University College Dublin, en Dublín, Irlanda el 29 de marzo del 2016.

El seminario fue sobre el trabajo que hago en la UAM con la Mtra. Nora Morales sobre co-creación en medios electrónicos. El resumen publicado fue:

> Co-creation for media projects
> Santiago Negrete (Universidad Autónoma Metropolitana- México)
>
> Computational Creativity (CC) has been an active area of research in recent years because of both: the interest on creativity as a scientific topic, a quintessential trait of human cognitive abilities, as well as its application to various areas of development such as new media, games, music and more. In this talk I will describe work we do at UAM to develop a system to produce animatics, an essential work product in the process to create animations. The project is designed to be developed within a well established team of people who produce an award-winning series of animated shorts for tv and study how a system intervenes the process as well as how it can contribute creatively to the overall effort. While working on it, and drawing from our experience, we have developed a framework to plan and assess the system, which we think generalizes to other areas where computing systems are used for creative action. I will discuss such a framework –called Apprentice Framework-- and stress its positive qualities to conceptualize CC projects. The talk will try to emphasize ideas and problems rather than technical details and, if time permits, I will talk about other projects and extensions we have in the making.

Este seminario lo di a sugerencia de los colegas del Instituto para dar a conocer el trabajo que hago y poder comenzar un diálogo con la gente local.

La conferencia fue hecha por invitación a participar en el taller citado. La Dra. Valverde y yo asistimos al taller y participamos con una conferencia sobre el trabajo que realizamos en conjunto. Llevaba el siguiente resumen:

> In this talk we discuss a philosophical foundation for a new understanding of Computational Creativity (CC) based on a notion of relational creativity that comprises both human and non-human creativity and contests the subordination computers to human values and needs. We combine the inspiration of CC with proposals from philosophy of technology and philosophy of organisms. We discuss our notion though a mental experiment.

A esta plática la acompaña un artículo que fue enviado también (ver Apéndice 8.4).

4 Software y hardware

Durante este año desarrollé un *software* para generar *animatics*, guiones gráficos (*storyboards*) animados. Este programa parte de una trama para una historia junto con anotaciones de inflexiones emotivas que acompañan a la historia y, a partir de ello, con un sistema bayesiano, genera un animátic que muestra el diseño animado de la historia original. Es te programa es la base para hacer trabajo experimental con el equipo que crea los cortos animados *Imaginantes,* producidos por

12 Pormenores de los grandes conceptos.

Televisa y que pueden verse en línea[13]. La experimentación, de acuerdo a nuestro modelo de creación colectiva, consiste en utilizar el sistema de los animatics para participar como socio en el equipo que produce los cortos para poder medir su nivel de creatividad en contexto y poder así verificar el modelo.

Desarrollé también una plataforma de hardware para el proyecto de creatividad relacional (ver Sección 2.2). El proyecto contempla la experimentación con un nuevo modelo de creatividad no-humana. Para ello, se ha diseñado una experiencia multisensorial entre una máquina y un paciente con movilidad limitada, como aquellos que padecen el síndrome de enclaustramiento[14]. El sistema que hice es una máquina hecha en Arduino (*hardware*) y Processing (*software*). Que, a través de sensores y actuadores: lumínico, sonoro, háptico, establecen una relación creativa con el paciente, de acuerdo al modelo del proyecto.

5 Reuniones

Hubo una reunión de trabajo para hacer una lluvia de ideas con el equipo de Tom de Smedt en el Experimental Media Research Group del St Lucas School of Arts en Amberes, el día 26 de julio del 2017 en Amberes. Como consecuencia de la reunión, participamos en el proyecto europeo Ride-along (ver Sección 2.5) y sentamos las bases de mutuo interés para proyectos futuros en colaboración.

Asistí también al congreso Autonomous Agents and Multiagent Systems en Valencia del 9 al 10 de mayo de 2016.

6 Artículos y publicaciones

6.1 Artículos enviados a congresos y no aceptados:

Negrete,S. Morales,N. *Tools and Creativity in Media Projects*. Enviado a ACM Creativity and Cognition, June, 2017.

Valverde, N. Negrete, S. *Reframing Computational Creativity from a Non-Anthropocentric Approach.* Enviado a Eighth International Conference on Computational Creativity, June, 2017.

13 https://www.youtube.com/user/Imaginantesoficial
14 *Locked-in Syndrome*

6.2 Artículos presentados en congresos y talleres:

Manyà, Felip, Santiago Negrete, Carme Roig, and Joan Ramon Soler. 2017. “A MaxSAT-Based Approach to the Team Composition Problem in a Classroom.” In *FIRST INTERNATIONAL WORKSHOP ON TEAMS IN MULTIAGENT SYSTEMS*, 82–90. Sao Paulo, Brazil.

RENACE: *Relational Non-Anthropocentric Creativity Exploration.* Presentado en High-Concepts, Low-Downs. Dublín, marzo, 2017.

6.3 Artículos aceptados para publicación en revista:

Manyà, Felip, Santiago Negrete, Carme Roig, and Joan Ramon Soler. 2017. “A MaxSAT-Based Approach to the Team Composition Problem in a Classroom.”. Para ser publicado en Fundamenta Informaticae en versión extendida, 2017.

7 Bibliografía

Argente, Estefania, Olivier Boissier, Carlos Carrascosa, Nicoletta Fornara, Peter Mcburney, Pablo Noriega, Alessandro Ricci, et al. 2013. “The Role of the Environment in Agreement Technologies.” *Artificial Intelligence Review* 39 (January):21–38.

Bauby, Jean-Dominique. 2007. *Le Scaphandre et le Papillon*. French & European Pubns.

Laureys, Steven, Frédéric Pellas, Philippe Van Eeckhout, Sofiane Ghorbel, Caroline Schnakers, Fabien Perrin, Jacques Berré, et al. 2005. “The Locked-in Syndrome : What Is It like to Be Conscious but Paralyzed and Voiceless?” In *Progress in Brain Research*, edited by Steven Laureys, Volume 150:495–611. Elsevier. https://doi.org/10.1016/S0079-6123(05)50034-7.

Manyà, Felip, Santiago Negrete, Carme Roig, and Joan Ramon Soler. 2017. “A MaxSAT-Based Approach to the Team Composition Problem in a Classroom.” In *Autonomous Agents and Multiagent Systems - AAMAS 2017 Workshops, Visionary Papers, São Paulo, Brazil, May 8-12, 2017, Revised Selected Papers*, 164–173. https://doi.org/10.1007/978-3-319-71679-4_11.

Noriega, Pablo, Julian Padget, Harko Verhagen, and Mark d’Inverno. 2015. “Towards a Framework for Socio-Cognitive Technical Systems.” In *Coordination, Organizations, Institutions, and Norms in Agent Systems X*, edited by Springer, 9372:164–81. Lecture Notes in Computer Science. Berlin / Heidelberg: Springer International Publishing.

Simondon, Gilbert. 2001. *Du Mode d’existence Des Objets Techniques*. Aubier.

8 Apéndice

8.1 Invitación

MINISTERIO
DE ECONOMÍA
Y COMPETITIVIDAD

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS
INSTITUTO DE INVESTIGACIÓN
EN INTELIGENCIA ARTIFICIAL

Dr. Santiago Negrete Yankelevich
División de Ciencias de la Comunicación y Diseño
UAM Cuajimalpa
MÉXICO

Barcelona, April 6th, 2016

Dear Dr. Negrete,

I would like to invite you to visit the Artificial Intelligence Research Institute (IIIA) of the Spanish National Research Council (CSIC) in Barcelona, for a period of one year starting September 2016. During this period you will participate in scientific activities of the IIIA, in particular through seminars and technical discussions ith IIIA scientists on our common scientific interests.

You will be provided with an office space and access to our computing and communications facilities

We are looking forward to host you here in Barcelona.

Sincerely yours,

Ramon Lopez de Mantaras
Director
IIIA - CSIC
Campus UAB
08193 Bellaterra, Barcelona
Spain

IIIA-CSIC
CAMPUS UAB.
E-08193 BELLATERRA.BARCELONA. ESPAÑA
Telf. +34 935 809 570
Fax.: +34 935 809 661

8.2 Seminario en IIIA

Zimbra **santiago@iiia.csic.es**

[Seminaris] Seminari dia 10 del 11 de 2016 a les 12:00 a la Sala d'Actes 'Marc Esteva Vivanco'

From : Felip Manya <felip@iiia.csic.es> Fri, Oct 28, 2016 04:57 PM

Sender : seminaris-bounces@iiia.csic.es

Subject : [Seminaris] Seminari dia 10 del 11 de 2016 a les 12:00 a la Sala d'Actes 'Marc Esteva Vivanco'

To : Seminaris@iiia.csic.es

Seminari dia 10 del 11 de 2016 a les 12:00 a la Sala d'Actes 'Marc Esteva Vivanco'

Santiago Negrete Yankelevich
Universidad Autónoma Metropolitana- México

Co-creation for Media Projects

Computational Creativity (CC) has been an active area of research in recent years because of both: the interest on creativity as a scientific topic, a quintessential trait of human cognitive abilities, as well as its application to various areas of development such as new media, games, music and more. In this talk I will describe work we do at UAM to develop a system to produce animatics, an essential work product in the process to create animations. The project is designed to be developed within a well established team of people who produce an award-winning series of animated shorts for tv and study how a system intervenes the process as well as how it can contribute creatively to the overall effort. While working on it, and drawing from our experience, we have developed a framework to plan and assess the system, which we think generalizes to other areas where computing systems are used for creative action. I will discuss such a framework –called Apprentice Framework-- and stress its positive qualities to conceptualize CC projects. The talk will try to emphasize ideas and problems rather than technical details and, if time permits, I will talk about other projects and extensions we have in the making.

8.3 Computation and Cognition 2017

Creativity & Cognition 2017 Papers confirmation of submission (submission #207)

papers2017 para mí 14/1/17

Thank you for your submission to Creativity and Cognition 2017. We are looking forward to an excellent conference program.

We invite you to sign up to be a reviewer for the conference. Your expertise is critical to maintain and advance Creativity and Cognition as a premier venue in the field. We would greatly appreciate your involvement. To sign up and update your reviewing preferences, please visit the Volunteer Center in Precision Conference [https://precisionconference.com/~cc17a/].

This email confirms your submission to Creativity & Cognition 2017 Papers:

Number: 207
Title: Tools and Creativity in Media Projects
Authors: Santiago Negrete-Yankelevich, Nora Morales-Zaragoza

This file has been submitted:

size	type	description
540 Kb	pdf	your submission

To make further changes to your submission, go to your SIGCHI "submissions in progress" page.

Please send enquiries to papers2017@cc.acm.org .

This is an automatically generated message.

To see the submission, go to https://precisionconference.com/~sigchi?goto=activeSubmissions

Tools and Creativity

Santiago Negrete-Yankelevich

Nora Morales-Zaragoza

1 Introduction

Machines are used in creativity task more often everyday. This has sparked great many areas of research with great vigor such as HCI, Computational Creativity, AI in design, AI in music, etc. All of them seem to attend to different aspects of the use of computers in creative endeavors but their point of view varies according to the role they assign to the computer within the creative process. Some follow the natural observation that a computer has become a useful tool in almost al creative processes while, on the opposite end of the spectrum, other decidedly see a computer as a potential autonomous creator. The first group progresses from the beginning (very simple tool) to more and more advanced tools; the second group moves from a point where a computer can be considered an advanced tool that shows some of the characteristics ascribed to a creative person doing the same task, but with a very narrow scope.
As the use of computing tools intensifies, a sound understanding of their role in creative processes becomes more pressing. Computing tools become more and more complex they increase the number and power of algorithms that are available for the user to develop the portion of the piece that will contribute to an overall project. The tools promote creativity in the user because they:

- expose most (or all) options available.
- perform arduous tasks
- store a or several copies of partial versions of the work
- allow experimentation with options quickly

The tasks performed by computers within teams are increasing also in complexity. They “do more” on their own and hence seem to be more autonomous. They can backtrack and try something else.

The development of networks, in recent years, has changed the conception of computers from single, isolated, number-crunching devises to networked, media sharing, collaborative agents. In this view, we can conceive of computing tools for the creative teams more as partners than tools. The difference strives in that tools are passive, reactive and perform a limited task in scope. Partner can be seen as agents (they can be computers) that are active: they suggest preferable options, they offer critique to what is being done, they recall previous similar cases, etc. These can be some of the possibilities identifiable in computer systems that have been developed as partners in co-creation.

In this paper we will present a framework to conceptualize, plan and assess media projects that involve computational systems with the aim of increasing their creative potential as well as that of the overall team. We will discuss how the framework, called the Apprentice Framework, can be applied to many areas of creative activity. The ideas originated in a project called eMotion to develop computer software to create animatics, a crucial work product within the process to produce animated shorts. eMotion is integrated as part of an already existing team of people who do the rest of the work to

produce an award-winning series of motion-graphics based animated shorts for Mexican TV[1].

With this framework, we seek to understand how creativity is interpreted in the context of a creative team where no-one single-handedly seems to be responsible for the creativity of the overall team, but it is assumed that this quality is in fact distributed among team members. We started a project to include a piece of software as a team member and try to develop it as just another (creative) team member.

In this exercise, we questioned many of the assumptions made about agency in machines and humans, and ended up with a team that understood the use of computing tools as partner in the process, as well as a computing system that has a clear path in its plan of development towards a more creative agent within the team.
The text is organized as follows: first, we will talk about the antecedents of the project, in the following section. Next, we will describe *Imaginantes*, the TV program whose production team we set out "intervene" with a computing system. Then we will describe the considerations we made on creativity in machines within a creative team that led to the design of our system as well as the Apprentice Framework that will be described in the following section. The section after that explains how the framework can be used in their domains to conceptualize distributed creativity among teams of systems and people. Finally, some conclusions and future work will be discussed.

2 Imaginantes: motion graphics for imagination

Imaginantes[2] is an award-winning series of animated shorts for TV. The aim of the project is to use *motion graphics*, a very appealing animation technique for young people to foster interest in cultural themes like literature, philosophy, cinema, etc. They are one minute capsules that talk about an author and some aspect of her or his work. The team producing them is young, dynamic and highly creative. One of the authors of this paper was a member of the imaginantes team and we decided to work with them because we had been looking for an instance of creativity in animation that could be used as a reference for our work.

Imaginantes, like many other media projects is created by a group of people with different abilities, who play different roles withing team. The main roles are:

- Director
- Creative Designer
- Animator
-

We are interested in developing a creative system that generates animations out of textual plots, so we decided to design a system that participates in the team and play a particular role. The role selected was that of the "animatic creator". An *animatic* is an animated storyboard, a skeleton of the final product that already contains the main decisions related to general structure, framing, movement of characters, etc. It is a very important item for the overall process because after it is produced and used to fine-tune the aforementioned issues regarding the short, all is left to do is the production proper. That is, the whole animation in all its detail, the most laborious part of the process. Hence, having a good animatic is crucial for a good result. Yet, since producing an animatic by hand is a laborious task, usually only one is produced but it would improve the overall performance of the team if more were available

1 https://fundaciontelevisa.org/imaginantes/
2 http://ninos.televisa.com/series/imaginantes/

because more ideas could be considered for the final animation.
Our system, e-Motion (Negrete-Yankelevich and Morales-Zaragoza 2013) is designed to produce animatics out of story plots. It produces many animatics for a single plot. Using this system we have studied the creative process of the team.

3 The Genie in the Bottle

Computers are often used in tasks involving human creativity and they can contribute greatly to enhancing that creativity (Edmonds and Candy 2005). There are plenty of examples of systems used in the arts (Candy and Edmonds 2002), business (Garfield 2008), design (Gero 1994; Gero 2002) and other areas with focus on creativity. Other work has focussed on studying creativity by simulating some of its processes in a computer in what it is known as computational creativity. The view there is that computers can be creative in their own right provided they fulfill certain characteristics (Ritchie 2007; Boden 2004; Colton, Charnley, and Pease 2011). The properties required vary from one framework to the other, but all share an *inner view*, that is, a view that regards the computing system as a closed input/output system that is either creative or not creative at all. There must be an external group of experts who can decide, as they would do if given the work of a creative human, if the machine is creative or not. In the best of cases (cite jourdanous), the system is assessed against a preset of parameters that are considered to define the notion of creativity with respect to the domain involved, or with respect to a general framework that accounts for general creativity (cite).
Within the Engineering tradition projects produce prototypes. These are *toy world* versions of the desired product. In the case of creative systems, these prototypes exhibit some of the properties sought after in the project but they don't yet qualify as creative in the general sense. Many of these prototypes are impressive because few people would expect computers to produce the results these systems deliver, but they are short of reaching the levels expected from humans in the same domain.
One of the most famous prototypes in AI history is Eliza (Weizenbaum 1966), it is a system that simulates a psychoanalyst that can hold a conversation with a human user. I impressed people the world over because it gave the impression that –with some more work-- it could eventually be made to pass the Turing Test (Boden 2006).
When it comes to creativity, where there is no general definition for it and the experts deciding in the human case have a wide, diverging criteria in every area where the concept can be used, a prototype is no good. It not only cannot be considered creative in the general sense, but also, it is not clear how it can be modified to achieve the general case.
In our project we made a special effort to avoid a prototype that performs in a toy world. Rather than create a system that produces animations and try to convince an audience or a group of experts that they are creative, we decided instead to make a system that would participate in a creative team, so that the creativity criterion is guaranteed from the start, and then try to evolve the system to make it more creative, taking over more responsibility within the group, but keeping the creative, valuable output. This approach can eventually combine the experience of both, computer aided creativity and computational creativity, by considering creativity as a continuum ranging from *mere* tool up to full, independent creative agent.
In a creative team, the blame for creativity has to be distributed among members (Maher 2012; Bown 2009) and if the computer is one of them, then it has to be credited with its fare share. If creativity is distributed, then assessing it in one or more team members is not so much only a matter of opinion but an appreciation of how well the participant is performing with respect to the common goal of producing something that, whoever values the overall product of the team, will continue to consider it creative.
As an example, consider a team that creates

4 The Apprentice Framework: planning and assessing creative systems

In the Apprentice Framework we have designed, five levels of participation are distinguished: environment, tool, generator, apprentice and master. They represent different expectations in the capabilities of the systems involved.

Environment. The system is used as a medium where the object being created and its partial versions are stored, transmitted, reproduced, etc. The machine is the environment where the work is carried out. If you download your pictures from a digital camera and use a desktop computer to view, store and share them, the system you use plays the role of *environment*.

Tool. The system provides a series of algorithms in the form of options, filters or tools that help modify, improve or, in general, experiment with the work. The machine becomes the space where the work is done, main decisions regarding its final shape are taken using the computer. If you use an editing program for video or photos, you are using your computer as a *tool*.

Generator. The system generates complete versions of the product so that the user can choose the most suitable ones. These systems use the power of automation to quickly combine parameter values to produce complete candidate products that enable the user to experiment with ideas, verify subjective properties like color, balance, expressiveness, etc. These systems usually produce many candidates, out of which only a few are useful in the sense that they fulfill the requirements of the product.

Apprentice. An apprentice system has the ability to filter candidate product to leave only those that have a real potential to become the final product. Out of these item a final one may be chosen by the rest of the team by using higher more subjective criteria like taste, opportunity, feeling, etc. it is no longer a matter of well-formedness.

Master. The system is completely autonomous and shows creativity in producing a finished product. The rest of the team is in charge of maintaining the system and providing it with all inputs required for it to function properly.

These levels constitute a guide to place the aims of the system to be build as well as the criteria of evaluation. Following a progressive path through the levels from the simples one up is helpful because there are various decisions taken at each level that ultimately have an important influence is how the versions of the system at higher levels will take shape. Since projects to develop creative system usually require many experiments to validate and adapt iteratively the system to the team environment, we regard this type of project as a applied research project where design has to evolve in stages until the requirement details are discovered by direct experimentation.

Apart from the levels of participation which try to capture the notion of shared creativity and progressive evolution in the spirit of apprenticeship workshops and practices, the second part of the framework deals with focusing on the type of creativity being sought. In media projects, it is common to find that people playing different roles in teams look at a project at different levels of abstraction and hence their view enables them to be creative at different aspects of the work.

The aspects we identified for the Apprentice Framework are four: structure, plot, rendering and remediation.

Structure. At the highest level of abstraction, in all works, there is a general skeleton, structure or architecture where the whole project will be developed. The decision as to what this skeleton should be like has a strong influence on the subsequent development of the piece. Being creative at this level, requires a good comprehension of the domain and panoramic view of what has been done before in

similar works.

Plot. When a piece of work tells a story, it can be abstracted from the piece and described as a plot. That is, a description in terms of discrete steps, that present what actors do in time, that give enough information to understand the story. The plot of a piece is a very important aspect because it describes what the creator "wants to say" with its work. This question is usually posed to artists at interviews and to students by teachers, etc.

Rendering. Once a plot has been established, all details have to be added so that the story is rendered. This process involves craft, detail, expert use of materials and the medium; rendering delivers a piece of work that is ready to be presented to an audience.

Remediation. This aspect does not correspond to a different level of abstraction but, rather, a process of translation. It is the process of converting a rendered piece from one medium to another. Being creative in remediation involves a different set of skills, they require to be able to decode, so to speak, the intentions of an author and transferring them to another platform to deliver the same ideas, intuitions and messages in a different platform.

Aspects help deciding what to expect form different roles in a team. They can be used to assess each member's products and also to provide feedback they can use to improve their performance in future iterations.

In the following sections, we will see some examples of how this framework is applied in the domain of animated shots as well as other areas from the arts.

5 Playing a role in producing animated shorts

In Section 2, we described the process to create an animation followed by the Imaginantes team. We can now describe that the structure of the sorts was decided at the beginning of the series by the people who planned and negotiated the money to make it happen. Is is a one minute short where the presenter has 15 seconds to introduce the topic, it is a motion graphics piece where there is music and the voice of the presenter is heard throughout in off and the final 15 seconds tell the audience why the character was chosen as an *imaginante.*The final 15 seconds present credits. This scheme is important for the success of the series because it has somehow contributed to capture the imagination of the audience: it is not too long, not too short, it has enough information to attract young people. The voice of the presenter in off is friendly but his image stays only a few seconds and does not obstruct the animated scenes which are the most appealing ones. The music and the idea of finding a common ground under the concept of *imaginante* to describe the characters presented has payed off as a means to capture young people's imagination.

The plot is written by the presenter and main producer. They are concise and present a single idea about an author or an author and one of his or her works in particular.

Converting the script (plot) in a storyboard is a process of rendering where a visual representation is given at a certain level of detail.

The storyboard and the script are taken to create and animatic in a new process of rendering, this time into a moving image.

Within the process, many products are made that help taking decisions. Each one of them can have a plot, a structure and a rendering.

6 Examples of the application of the framework in other areas of the arts

The apprentice framework can be used in other areas too. In the following sections we will exemplify some of them.

6.1 Visual Arts

In Visual Arts there is usually a clear structure. It can be a canvas, a framed canvas, a screen projection, a monitor and these can have various shapes too: square, rectangle, circle, etc. There are other concepts that can be included in the aspect of *structure* since they belong to the general architecture of the piece. An example of it is the technique: oil paint, water color, canvas, wood, plastic, etc. They are all used to describe the platform where the piece will be created and its basic rules.

Although it can be argued that still works in non time-based art like painting of photography don't necessary have a plot, we can say they do tell a story. The plot is a description of the story told by the painting and it can usually be seen in a draft. In the composition of a canvas the plot is presented as a structure where it is clear what the picture is about and all that is left to be added are the details to realize the full image. Filling the details of the painting constitutes the rendering. In this part, paint, texture and all effects to realize the ideas of the plot are put together and depending on how it is done, these ideas would be more or less compelling.

Aspects can have different degrees of importance in different works. In some, rendering is more important or surprising than plot or even structure. Such is the case in Abstract Expressionism where expression of personality and feeling through color, texture and big canvases as in Jackson Pollock's works represented a new, creative art style (Paul 2016). In *Number 28* (Pollock 1950), for instance, there is no figurative *plot*, the main point of the work is the rendering, the free, spontaneous spreading of paint on a canvas without a brush to depict passion and emotion. In Rothko's *No. 13 (White, Red on Yellow)* (Rothko 1958), the horizontal composition, that the painter used in several of his paintings, tells an abstract *plot* through bright colors and various hues and transparencies, that expresses his inner most emotional states.

On the other hand, works by artists like Jaime Sadurní show a clear story told and represented in a particular composition (Sadurní, n.d.). The plots of the stories are told through ingenious compositions while the rendering uses highly idealized characters painted in bright primary colors that produce attractive, decorative images for the general public. These paintings are famous because they were used during the first half of the twentieth century in calendars, posters and advertising.

Other examples of paintings with interesting plots and highly crafted rendering can be found in works by American artist Norman Rockwell (Rockwell, n.d.). His works also tell stories of everyday life but in an often humorous way.

In Conceptual Art, rendering is not as relevant as plot and structure. Ideas are the central matter of expression and they are best expressed in clever *plots* and interesting structures. In works like *Cats and Watermelons* by Gabriel Orozco (Orozco 1992), what matters most is the structure (a color photograph documenting an unusual situation) and the plot that expresses a concept. In this work the rendering of the piece, the actual organization of cans and watermelons is not so important, in the sense that they could be organized in different ways, use different brands of cat food or different numbers thereof, and still convey the concept behind the piece to the viewer.

Rogelio López Cuenca's piece (López-Cuenca, n.d.) may use different fonts (rendering) or larger canvases (structure) but the plot of the piece, the central idea would remain unchanged.

6.2 Music

In Music similar levels of abstraction may be identified. Structure, plot and rendering correspond to musical form, score and performance.

Some classical pieces are best remembered by their innovative structure. Through the years, composers have introduced new musical forms which eventually become standards: concert, symphony, opera, etc. It is not so often that a new structure is created. Upon these musical forms, scores are produced that contain the *stories* that the pieces of music tell. Then the stories are developed in detail, to be delivered to the audience, during the performance.

Some musical genres, like jazz, stress rendering over plot or structure. It is improvised performance that is innovative and paramount. Others, like baroque music stress structure, as in Bach's *fugues (Ledbetter 2002)*, while composers, like Moussorgsky, put more emphasis on plot by telling stories like in *Pictures at an Exhibition (Moussorgsky and Bricard 2002)*.

There are even some popular pieces where the melody is so well known that the accompaniment is left to a machine to reproduce while some musician plays the melody.

7 Visual narratives for culture reification

Codex writing is one of the most impressive forms of writing from antiquity. It belongs to a group of cultures of the American continent that where isolated from the rest of the world and developed their own particular form of writing which, like all other forms of writing, reflects, not only their customs, laws, legends and other social aspects of their lives, but also the way they construct ideas in general and think about the world. This reasoning system –we could call it-- no longer exist in living communities. Many of the languages exist but the written documents are no longer produced, some of them have been transcribed to modern day Roman alphabet used widely through Spanish.

We started off with a project to animate automatically generated stories related to Aztec characters. These stories where created from scratch by a system called *Mexica*[3] (Pérez y Pérez and Sharples 1999) which generates story plots by drawing characters and possible actions from a database and combines them using a series of emotional tags to preserve story tensions. The stories produced

3 Mexicas is another name for the Aztecs; it is where the name of Mexico comes from.

Boden, Margaret A. 2004. *The Creative Mind: Myths and Mechanisms*. 2nd ed. London ; New York: Routledge.

———. 2006. *Mind as Machine: A History of Cognitive Science*. Oxford : New York: Clarendon Press ; Oxford University Press.

Bown, Oliver. 2009. "Against Individual Creativity." In *Computational Creativity: An Interdisciplinary Approach*, edited by Margaret Boden, Mark D'Inverno, and Jon McCormack. Dagstuhl Seminar Proceedings. Dagstuhl, Germany: Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik, Germany. http://drops.dagstuhl.de/opus/volltexte/2009/2205.

Candy, Linda, and Ernest A. Edmonds, eds. 2002. *Explorations in Art and Technology*. New York: Springer.

Colton, Simon, John Charnley, and Alison Pease. 2011. "Computational Creativity Theory: The FACE and IDEA Descriptive Models." In *Proceedings of the Second International Conference on Computational Creativity*, 90–95. México City, México. http://iccc11.cua.uam.mx/proceedings/the_foundational/colton_1_iccc11.pdf.

Edmonds, Ernest A., and Linda Candy. 2005. "Computer Support for Creativity." *International Journal of Human-Computer Studies* 63 (4–5): 363–64. doi:10.1016/j.ijhcs.2005.04.001.

Garfield, Monica J. 2008. "Creativity Support Systems." In *Handbook on Decision Support Systems 2: Variations*, edited by Frada Burstein and Clyde W. Holsapple, 745–58. Berlin, Heidelberg: Springer Berlin Heidelberg. http://dx.doi.org/10.1007/978-3-540-48716-6_34.

Gero, John S. 1994. "Computational Models Of Creative Design Processes." In *Artificial Intelligence and Creativity*, 269–281. Kluwer Academic Publishers.

———. 2002. *Artificial Intelligence in Design '02*. 1st ed. Springer Netherlands. http://gen.lib.rus.ec/book/index.php?md5=A64A0E85A5B7890641DA690A70E1648B.

Ledbetter, David. 2002. *Bach's Well-Tempered Clavier: The 48 Preludes and Fugues*. Yale University Press. http://www.jstor.org/stable/j.ctt1npnnf.

López-Cuenca, Rogelio. n.d. *Due to Copyright Restrictions...*

Maher, Mary Lou. 2012. "Computational and Collective Creativity: Who's Being Creative." In *Proceedings of the 3rd International Conference on Computational Creativity*.

Moussorgsky, Modest, and Nancy Bricard. 2002. *Mussorgsky -- Pictures at an Exhibition*. Van Nuys, Calif.: Alfred Music.

Negrete-Yankelevich, Santiago, and Nora Morales-Zaragoza. 2013. "E-Motion: A System for the Development of Creative Animatics." In *Proceedings of the Fourth International Conference on Computational Creativity*, 184–188. Sydney, Australia. http://www.computationalcreativity.net/iccc2013/download/iccc2013-negrete-yankelevich-morales-zaragoza.pdf.

Orozco, Gabriel. 1992. *Cats and Watermelons*. Cibachrome. Marian Gooman Gallery, New York.

Paul, Stella. 2016. "Abstract Expressionism." *The Met's Heilbrunn Timeline of Art History*. Accessed December 22. http://www.metmuseum.org/toah/hd/abex/hd_abex.htm.

Pérez y Pérez, R, and M Sharples. 1999. "Mexica: A Computational Model of the Process of Creative Writing." In *Proceedings of the AISB'99 Symposium on Creative Language: Humour and Stories*, 46–51.

Pollock, Jackson. 1950. *Number 28*. Enamel on canvas. http://www.metmuseum.org/toah/works-of-art/2006.32.51/.

Ritchie, Graeme. 2007. "Some Empirical Criteria for Attributing Creativity to a Computer Program."

Minds and Machines 17 (1): 67–99. doi:10.1007/s11023-007-9066-2.
Rockwell, Norman. n.d. *Police and Boy in Coffee Shop*.
Rothko, Mark. 1958. *No. 13 (White, Red on Yellow)*. Oil and acrylic with powdered pigments on canvas. http://www.metmuseum.org/art/collection/search/484362.
Sadurní, Jaime. n.d. *La Soldadera*. Óleo sobre tela.
Weizenbaum, Joseph. 1966. "ELIZA---a Computer Program for the Study of Natural Language Communication between Man and Machine." *Communications of the ACM* 9 (1): 36–45. doi:10.1145/365153.365168.

8.4 High Concept, Low Downs Workshop 2017

Zimbra **santiago@iiia.csic.es**

High-Concept Low Downs: Workshop in Dublin on the 29th

From : Tony Veale <tony.veale@ucd.ie> Fri, Feb 10, 2017 02:51 PM

Subject : High-Concept Low Downs: Workshop in Dublin on the 29th

To : Kristina Despot <kristina.despot@gmail.com>, Tom De Smedt <tomdesmedt@gmail.com>, Amilcar Cardoso <amilcar@dei.uc.pt>, Mark Keane <mark.keane@ucd.ie>, pwicke@uni-osnabrueck.de, Santiago <santiago@iiia.csic.es>, Marianna Bolognesi <marianna.bolognesi@gmail.com>, Besold Tarek Richard <TarekRichard.Besold@unibz.it>, Tarek R. Besold <tbesold@uni-osnabrueck.de>

Hi all (Kristina, Tom, Amilcar, Mark, Phil, Santiago, Marianna, Tarek)

Thanks for accepting the invite to come to Dublin at the end of next month. I think it's time I filled you in a little on the plan for the event.

On March 29th we will have a one-day multidisciplinary workshop on our diverse research topics, tied together by our common interests in creativity (cognitive, linguistic, social, etc.). The workshop is titled High-Concept Low-Downs and speakers (each of you) are encouraged to outline your ideal (or dream) research project (i.e. give us the low-down on your high-concept idea). My hope is that through interaction and questioning from others we can make these dream projects a little more real and a little closer to proposal stage. The wilder the idea the better; try to ground your talks in your current research and interests, but sketch a vision for the project that might take your research vision to the next stage. The goal is to strike some sparks, get useful feedback, and find potential collaborators.

We'll have 30 slots each (15 mins. presentation + 15 mins for questions) but If you are arriving with colleagues or students and would like to include them in your presentation we can increase your slot size to 40 minutes (25 + 15). If you would prefer not to give a presentation at all, and just listen and/or ask questions that's fine too (just let me know before I distribute the day's schedule).

The workshop will take place on the 29th in UCD (more details to follow) and we'll have drinks and dinner in the city afterwards.

On March 28th (the day before) Tom (and Ben and Ludovine) and Amilcar are arriving to specifically discuss story-generation, so we 5 have a breakout session for that in the city. But later in the late afternoon of the 28th we can all enjoy a min-pub crawl around Dublin and dinner in the city.

On the 29th, I'll arrange a bit of sightseeing. We can visit Trinity College, check out the book of Kells and the Long Room (the inspiration for the Jedi library in the second Star Wars prequel), and look around the Trinity science gallery which has a new exhibit on Art and AI, walk around some parks if the weather is good (or go to the pub early if not). We'll have lunch and dinner in the city to continue any conversations started the day before.

I've made hotel bookings for everyone (in diverse hotels, as the tourist season will be well underway from March 17th), for the nights of March 28, 29 and 30th. If you've already told me that you won't be here for the night of the 30th then I've already modified your booking. Do let me know if your flights necessitate changing the dates of your hotel booking.

I'm looking forward to seeing you all in Dublin next month!

best wishes

Tony

ReNACE

Relational Non-Anthropocentric Creativity Exploration

Santiago Negrete & Nuria Valverde

“High Concepts Low Downs” Workshop
University College
Dublin, 28-31 March 2017

cehic
Centre d’Història de la Ciència
UAB
Universitat Autònoma de Barcelona

Casa abierta al tiempo
UNIVERSIDAD AUTÓNOMA METROPOLITANA
Unidad Cuajimalpa

IIIA
Institut d’Investigació en Intel·ligència Artificial

Problems

- Evaluation and cultural relativism
- Cognitivism (derived from historiography)
- Singularity and exceptionality
- Individual authorship...

Needs:

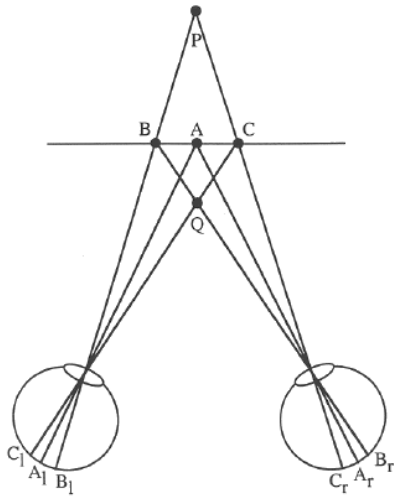
- A more inclusive and clearcut concept. (vs “an aspect of human intelligence grounded in everyday abilities such as conceptual thinking, perception, memory, and reflective self-criticism.)

Gilbert Simondon (1924-1989)

- **Development and creativity**: making one-self and the environment at the same time. (Out of a preindividual state).
- **Creativity and "making sense"**. Making sense=integration of **disparate** terms into a framework ("système de résolution") that makes the difference the reason/precondition for meaning. (conservation of information vs. induction)
- **Transduction/innovation/intuition**= discovery of the dimensions according to which a problem can be defined.

binocular model of disparity integration

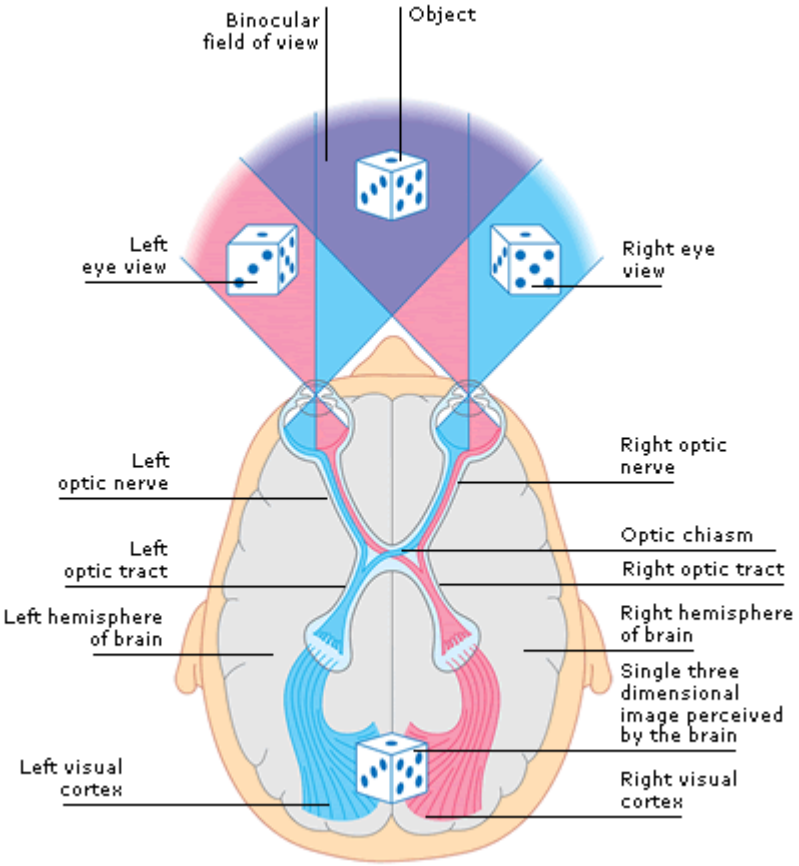
Depth Illusion by Binocular Disparity



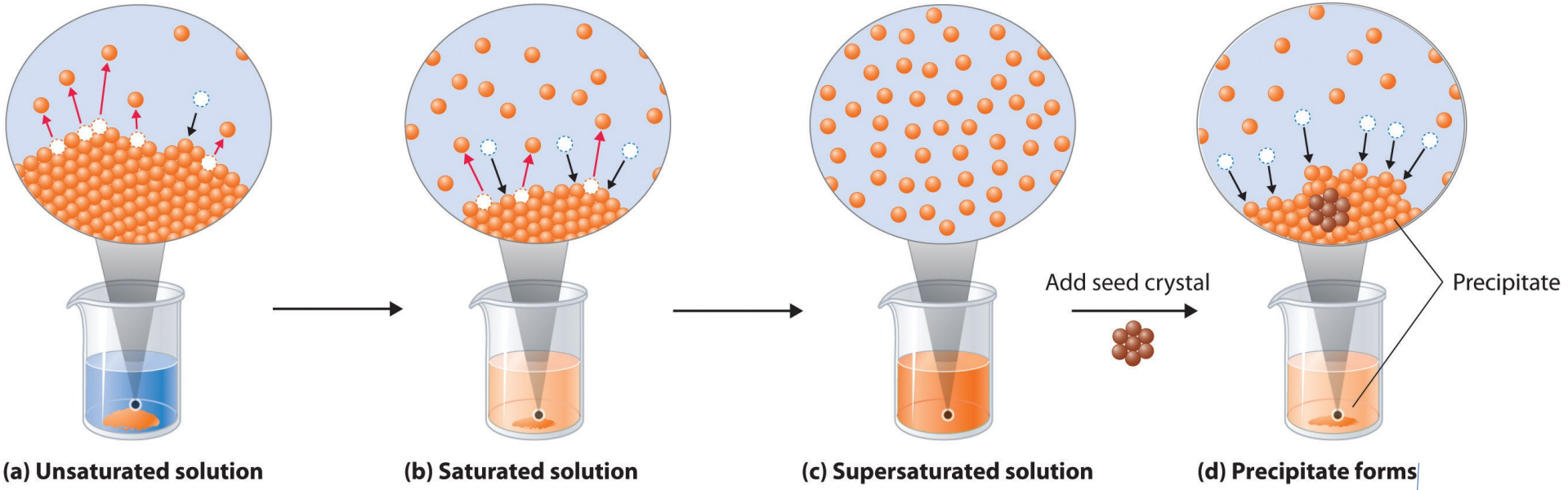
If the two eyes are looking simultaneously (fixating) at A, B or C, the images of the point are located at the corresponding points on the left and right retinas and the perceived depth is the same for all three points.

However, if the left eye is forced to see B and the right eye C, the images of the points are located at non-corresponding ponts on the retinas and a point P will be seen at a greater depth.

Similarly, if the left eye is forced to see C and the right eye B, a point Q will be seen at a smaller depth.

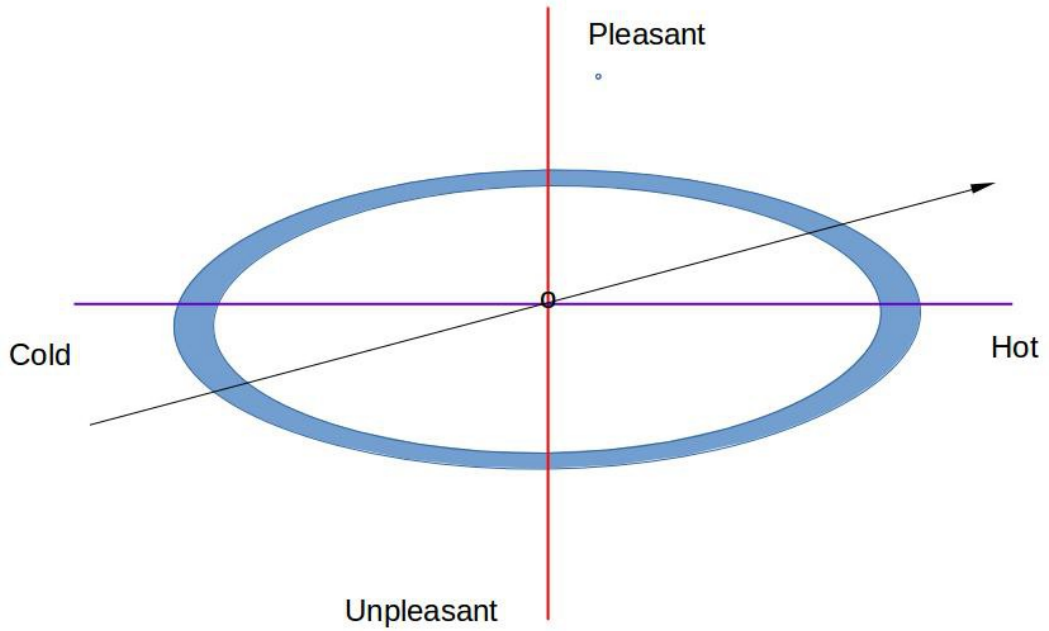


transduction



Peak of potentiallity

Lowest level of potentality.
Amplification.



Affection_Subjective Transductive Reality

Sensation_Objective Transductive Reality

Simondon

- Kinds of individuals: differences between living and non-living ones.
  - Living beings= transmission of cultural and genetic heritage + sense of completeness + polarizations (physical, emotional, physiological, performative). (vid. 202, 206)
  - “le vivant est lui-même un modulateur” (203)
  - Inner resonance, memory =
- Computers, considered as living beings from an informational point of view, can:
  - detect inner contradiction;
  - have a memory;

Whitehead

- Elements of prehension: prehending subject (or the entity composed by those prehensions), prehended datum, and the form in which the subject prehends the datum.
- Prehension is not necessarily conscious. Positive prehension=feelings; and negative, ‘eliminate from feeling’. Emotions, valuations, purposes, aversions, adversions, conciousness are different species of subjective form (Whitehead 1978, 23-24).
- Lure of feeling

advantages

- Acknowledging and realising heterogenous and widespread creativity.
- Relating creativity to individuation (ways of beings) and collective problem-solving strategies (amplifications).
- Linking creativity to resilience.
- Integrating machines to contemporary heterogeneous spaces and ways of being.
- Affordances and mutual creative enabling

Relational creativity

- Definition
- Aplication
- Advantages

8.5 AAMAS 2017

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Fwd: AAMAS 2017 Workshops Visionary Papers: Instructions to prepare camera ready version

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Best regards,

The AAMAS 2017 Workshop Chairs
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A MaxSAT-Based Approach to the Team Composition Problem in a Classroom

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Abstract. We describe and empirically evaluate a MaxSAT-based approach to the problem of team composition in a classroom (TCC) taking into account both the preferences of students and additional constraints that teachers may formulate. One advantage of our approach is that we only need to define a suitable model without the need to develop a dedicated algorithm. Once a model is defined, a solution is automatically generated with a MaxSAT solver. Another advantage is that it is flexible in the sense that we can easily add and remove constraints. Moreover, we prove that that problem is NP-hard. Despite the intractabilty of TCC, the empirical results provide evidence that the proposed approach finds optimal solutions in a reasonable amount of time.

1 Introduction

We address the problem of *team composition in a classroom* (TCC) by taking into account both the preferences of students and additional constraints that teachers may formulate. Our motivation behind this work is to solve a problem posed by the Director of Studies of a secondary school in the area of Barcelona, although this problem may be found in a wide range of institutions.

Roughly speaking, our version of the TCC problem can be described as follows: a classroom has a fixed number of students and tables that can be of different size (2,3, or more students per table). The TCC problem is how to assign students to tables in such a way that the preferences of the students and the constraints of the teachers are maximally-satisfied. To encourage students on their work, teachers allow them to provide a list of classmates they would like to sit with. Besides, teachers can add additional constraints: for example, if a table has 3 places, a possible constraint is that there should be at least one male student and one female student; or two students cannot sit together because they usually talk a lot to each other, etc. As we show in this paper, this problem is NP-hard.

To tackle that problem we use the MaxSAT-based problem solving approach, which is an active area of research in Artificial Intelligence, (see e.g. [5, 2, 6–8, 11–15] and the references therein for previous and related work). MaxSAT-based problem solving is a generic problem solving approach for optimization problems which consists on first defining a MaxSAT model from a given instance of the problem to be solved, and

then derive a solution for the input problem using an off-the-shelf MaxSAT solver. By a MaxSAT model we mean a representation of the problem using the language of Boolean propositional logic. It is a declarative approach: we only need to define a model and from that model an optimal solution is automatically derived. Furthermore, the method is highly efficient because we may take advantage of the extremely efficient MaxSAT solvers which are publicly available.

Conventional wisdom holds that designing an algorithm working directly on the original problem encoding should outperform approaches that require a translation via a generic intermediate formalism, such as a CSP, SAT or MaxSAT. However, this line of reasoning ignores the fact that generic solvers can benefit from many years of development by a broad research community. It is not easy to duplicate this kind of effort for a particular problem domain.

In the present formulation of the problem, we consider the preferences of the students. Nevertheless, our approach could be also easily adapted to take into account other factors that can be relevant to the performance of a team: personality, expertise, competitiveness and human formation [4].

The rest of the paper is organized as follows: Section 2 describes the TCC problem and proves that it is NP-hard. Section 3 gives some background on MaxSAT. Section 4 formally defines TCC as a MaxSAT model. Section 5 reports on the conducted empirical investigation. Section 6 gives the conclusions and the future work.

2 The Team Composition Problem in a Classroom

Depending on the activity to be performed in a classroom at a given moment, the distribution of the students may be different. In the general case, we consider that there are a fixed number of students and the goal is to distribute them in teams that may have different sizes in such a way that every student belongs exactly to one group. Moreover, we allow students to provide a list of the classmates they would like to sit with and allow teachers to provide additional constraints. It is also possible to declare each constraint as mandatory (hard) or flexible (soft). Moreover, among soft constraints we can associate a weight to indicate their relevance.

Even when the method we propose is valid for any fixed number of students and team sizes, our explanation will mainly focus on a particular, real-world problem to ease the reading of the paper to a wider audience.

The problem we use as a case study has the following constraints:

- The classroom has n students.
- The classroom has t_2 tables with 2 places and t_3 tables with 3 places.
- Each student has given a list with the classmates she would like to sit with.

The objective is to find an assignment of students to tables in such a way that the preferences of the students are maximally-satisfied. Notice that the first two constraints are hard whereas the last one is soft.

As a particular example, when we will model the problem, we will consider that the classroom has 28 students and the classroom has 8 tables with 2 places and 4 tables with 3 places. This is a typical distribution for classrooms in secondary schools in the area of Barcelona.

Proposition 1. *TCC is NP-hard.*

Proof. We can prove the NP-hardness of TCC by reducing the problem of partitioning the vertices of a graph into triangles, which is NP-hard [10], to it.

Given a graph $G = (V, E)$, where V is the set of vertices and E is the set of edges, that verifies that $|V| = 3q$ for some integer q, the partition of V into triangles consists on finding a partition of V formed by $V_1, \ldots, V_q$, each containing exactly 3 vertices, such that for each $V_i = \{u_i, v_i.w_i\}$, $1 \leq i \leq q$, the edges $\{u_i, v_i\}$, $\{u_i, w_i\}$ and $\{v_i, w_i\}$ belong to E.

That problem can be reduced to an instance of our problem without loss of generality by considering a classroom with $3q$ students, 0 tables with 2 places and q tables with 3 places. For each edge on graph V, from vertex v to w, establish a preference of student v for student w. Then, the problem of partitioning the vertices of a graph into triangles has a solution if, and only if, all the students in the classroom can be sat in such a way that all students preferences are maximally-satisfied. Hence the team composition problem in a classroom is NP complete and expressing it as a optimization problem on the number of edges associated to the partition elements renders it NP-hard. □

3 The MaxSAT Problem

We assume readers have some familiarity with basic concepts of Boolean propositional logic. The most well-know problem of propositional logic is SAT: given a formula in Conjunctive Normal Form (CNF) ϕ, decide whether there is a truth assignment that satisfies ϕ.

Reminder: a literal is a propositional variable or a negated propositional variable, a clause is a disjunction of literals, a CNF formula is a conjunction of clauses, and a truth assignment is a mapping from the set of propositional variables into $\{true, false\}$. A CNF is satisfied by an assignment if it is true under the usual truth-functional interpretation of $\vee$ and $\wedge$ and the truth-values assigned.

An optimization variant of SAT is MaxSAT: given a CNF formula ϕ, MaxSAT is to find a truth assignment that maximizes the number of satisfied clauses of ϕ. However, in this paper we use the term MaxSAT in a broad sense: we allow to distinguish between hard and soft clauses, and allow to associate a weight to soft clauses (formally, hard clauses have an infinity weight). This more general formulation of MaxSAT is technically known as Weighted Partial MaxSAT [11], which is formally defined in the remaining of this section.

We start by defining a more general notion of clause. A weighted clause is a pair (c, w), where c is a disjunction of literals and w, its weight, is a natural number or infinity. A clause is hard if its weight is infinity; otherwise it is soft.

A weighted partial MaxSAT instance is a multiset of weighted clauses

$$\phi = \{(h_1, \infty), \ldots, (h_k, \infty), (c_1, w_1), \ldots, (c_m, w_m)\},$$

where the first k clauses are hard and the last m clauses are soft. For simplicity, in what follows, we omit infinity weights, and write $\phi = \{h_1, \ldots, h_k, (c_1, w_1), \ldots, (c_m, w_m)\}$. A soft clause (c, w) is equivalent to having w copies of the clause $(c, 1)$, and

$\{(c, w_1), (c, w_2)\}$ is equivalent to $(c, w_1 + w_2)$. The total number of weighted clauses in ϕ is denoted by $|\phi|$.

Weighted Partial MaxSAT for an instance ϕ is the problem of finding an assignment that satisfies all the hard clauses and minimizes the sum of the weights of the falsified soft clauses; such an assignment is called optimal assignment.

4 The MaxSAT Encoding

We show how the TCC problem can be represented as a weighted partial MaxSAT instance. In other words, we show how to model TCC in the weighted partial MaxSAT formalism. As said before, we consider that the classroom has 28 students and the classroom has 8 tables with 2 places and 4 tables with 3 places.

First of all, we define the set of Boolean variables of our encoding:

$$\{x_s^t | 1 \leq s \leq 28, 1 \leq t \leq 12\}.$$

The intended meaning of the Boolean variable x_s^t is the following: x_s^t evaluates to true if student s sits at table t; otherwise, x_s^t evaluates to false.

Using the previous Boolean variables, we create a MaxSAT instance that encodes the constraints of the problem. We next define how each hard constraint is defined as a set of clauses.

1. To model that every student must be exactly in one table, we add the following hard clauses:
   For each s, where $1 \leq s \leq 28$, we add the following clause:

   $$x_s^1 \vee x_s^2 \vee \cdots \vee x_s^{12}$$

   to represent that every student is at least in one table.
   For each s, where $1 \leq s \leq 28$, we add the following clauses:

   $$\{\neg x_s^i \vee \neg x_s^j | 1 \leq i < j \leq 12\}$$

   to represent that every student is at most in one table.
   Since the previous clauses encode that every student is at least and at most in one table, we ensure that every student must be exactly in one table.

2. To model that we have 8 tables with 2 places and each of such tables cannot allocate more than 2 students, we add the following hard clauses:
   For each t, where $1 \leq t \leq 8$, we add the following clauses:

   $$\{\neg x_i^t \vee \neg x_j^t \vee \neg x_k^t | 1 \leq i < j < k \leq 28\}$$

3. To model that we have 4 tables with 3 places and each of such tables cannot allocate more than 3 students, we add the following hard clauses: For each t, where $9 \leq t \leq 12$, we add the following clauses:

   $$\{\neg x_i^t \vee \neg x_j^t \vee \neg x_k^t \vee \neg x_l^t | 1 \leq i < j < k < l \leq 28\}$$

We assumed that tables $1, \ldots, 8$ are two-place tables, and tables $9, \ldots, 12$ are three-place tables. Note that it is not necessary to model that there are exactly 2 (3) students in a two-place (three-place) table. It is enough to model that there are no more than 2 (3) students due to the fact that the tables can allocate exactly the number of students in the classroom.
We selected the above encodings for representing that we have 8 tables with 2 places and 4 tables with 3 places because they are very intuitive but they do not scale well in practice. Fortunately, there exist encodings for this kind of cardinality constraints which have a lower space complexity. The complexity can be reduced from $\binom{n}{k}$ clauses to $\mathcal{O}(n)$ clauses for a cardinality constraint of the form $x_1 + \ldots + x_n = k$ by using an encoding based on counters and defined in [16]. Other efficient encodings of cardinality constraints are described and analyzed in [1]. These efficient encodings will be used in our empirical investigation.

We next describe how to encode the preferences of the students using the weighted partial MaxSAT formalism:

Student preferences are implemented through soft constraints, and the sum of their associated weights must be maximized. We encode preferences one at a time, not necessarily reciprocated. Hence, they will have a basic weight of 1. Each preference of each student is satisfied when such a student sits at the same table as the preference indicates. If the student i wants to sit at the same table as the student j both must be at that table, so we were going to add the following soft constraint for each table t:

$$\{(x_i^t \wedge x_j^t, 1) | 1 \leq i < j \leq 28\}$$

The previous soft constraint is not expressed as a set of weighted clauses: we have a conjunction of literals with a weight associated to the whole conjunction, and this does not match the definition of weighted clause. To get an aquivalent set of weighted clauses, we need to add an auxiliary variable. We have now three clauses; the first two are declared as hard and the third one as soft with weight 1:

$$\{(x_i^t \vee p_{i-j}^t) \wedge (x_j^t \vee p_{i-j}^t) \wedge (\neg p_{i-j}^t, 1) | 1 \leq i < j \leq 28\}$$

In addition, each preference between two students can be matched or not with the complementary one. This must be detected in advance. For this, we construct the adjacency matrix that represents the presence of preferences (arcs) between students (nodes) in a graph. In case of symmetry with respect to the main diagonal we detect a bidirectional preference. We consider this case to be doubly desirable and thus use a weight 2 in the above formula.

We may easily add further constraints formulated by teachers to the previous MaxSAT encoding. For instance, the teacher could impose that two students s_1 and s_2 cannot sit in the same table because they talk a lot to each other. In this case, for each t, where $1 \leq t \leq 12$, we add the following hard clauses:

$$\neg x_{s_1}^t \vee \neg x_{s_2}^t$$

Another example is to put a constraint on gender. For instance, if the students $s_1, \ldots, s_j$ are male and the students $s_{j+1}, \ldots, s_{28}$ are female, we could impose that

there are at least one student male and one student female in each table. In this case, for each t, where $1 \leq t \leq 12$, we add the following hard clauses:

$$(x^t_{s_1} \vee \cdots \vee x^t_{s_j}) \wedge (x^t_{s_{j+1}} \vee \cdots \vee x^t_{28})$$

Yet another example. Some students get distracted easily and it is counterproductive to sit them at the tables near the windows. For instance, if tables 1 to 4 are near the windows, for each students s that gets distracted easily, we add the clause:

$$\neg x^1_s \vee \neg x^2_s \vee \neg x^3_s \vee \neg x^4_s$$

5 Experimental Results

We conducted an empirical investigation to assess how the MaxSAT-based approach to TCC works in practice. In the experiments, in order to analyze the scaling behavior, we considered different sizes of classrooms: the rows always have 2 tables with 2 places and 1 table with 3 places, and the numbers of rows ranges from 1 to 4; i.e., we have clasrooms with 7, 14, 21 and 28 students. Besides, we assumed that each student gives a list of students she would like to sit with. We generated the preferences at random, and the number of preferences was set to 1 for the classroom of size 7, 2 for the classroom of size 14, 3 for the classroom of size 21 and 4 for the classroom of size 28.We generated 50 different TCC instances for each size of classroom, encoded them to weighted partial MaxSAT, and solved the resulting encodings with the MaxSAT solver Open-WBO [13]. All the experiments were performed by using a 2.3GHz Intel PC with 1GB RAM. The results obtained are shown in Table 1.

Table 1. Experimental results: Students: number of students; Clauses: mean number of clauses in the MaxSAT encoding; Soft clauses: mean number of soft clauses in the MaxSAT encoding; Variables: mean number of variables in the MaxSAT encoding; and Time: mean time needed to solve an instance in seconds.

Students	Clauses	Soft clauses	Variables	Time
7	221	36	103	0.01
14	1458	282	544	21
21	4059	864	1485	134
28	9580	2292	3452	640

The empirical results show that the proposed approach finds optimal solutions in a reasonable amount of time. Initially, we tried to solve the instances using the hard constraints as defined in Section 4, but the MaxSAT solver only was able to solve the instances for 7 and 14 students. It was unable to find an optimal solution for 21 students within 6 hours. As said before, the number of clauses generated using the naive encodings grows very quickly. Instead, we encoded the cardinality constraints to MaxSAT

using PBLIB[1], which is a C++ tool for efficiently encoding pseudo-Boolean constraints to CNF. As can be observed in Table 1, the number of clauses does not increases quickly.

In summary, the results show that MaxSAT is a suitable formalism for modelling and solving the TCC problem. Using the proposed approach, the size of the encodings increases almost linearly in the number of students. Moreover, finding optimal solutions faster if the cardinality constraints are expressed in CNF using suitable encodings.

6 Concluding Remarks

We have developed a method to encode the TCC problem in a classroom as a weighted partial MaxSAT problem, proved its NP-hardness, and carried out experiments to evaluate our approach using a state-of-the-art MaxSAT solver. The results show that our method is useful because it does not need a devoted algorithm; it is declarative, hence all stakeholders can be involved and understand the way the problem is specified; it is flexible because different classroom configurations can be solved with it; and it is efficient because it provides optimal solution in a reasonable amount of time. In the future, we expect to explore the possibility of using our method to encode similar team composition problems. In practice, our method could be combined with profiling techniques [9] to solve the group formation problem in *Computer Supported Collaborative Learning* applications. Other projects have taken a different approach to solve related problem using other AI techniques (see [3, 4] and the references therein for further details).

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References

1. Ignasi Abío, Robert Nieuwenhuis, Albert Oliveras, and Enric Rodríguez-Carbonell. A parametric approach for smaller and better encodings of cardinality constraints. In *Proceedings of the 19th International Conference on Principles and Practice of Constraint Programming, CP, Uppsala, Sweden*, pages 80–96, 2013.
2. André Abramé and Djamal Habet. On the resiliency of unit propagation to Max-Resolution. In *Proceedings of the 24th International Joint Conference on Artificial Intelligence, IJCAI-2015, Buenos Aires, Argentina*, pages 268–274, 2015.
3. Juan M. Alberola, Elena del Val, Víctor Sánchez-Anguix, Alberto Palomares, and Maria Dolores Teruel. An artificial intelligence tool for heterogeneous team formation in the classroom. *Knowl.-Based Syst.*, 101:1–14, 2016.

[1] http://tools.computational-logic.org/content/pblib.php

4. Juan M. Alberola, Elena del Val Noguera, Víctor Sánchez-Anguix, and Vicente Julián. Simulating a collective intelligence approach to student team formation. In *Hybrid Artificial Intelligent Systems - 8th International Conference, HAIS 2013, Salamanca, Spain. Proceedings*, pages 161–170, 2013.
5. Teresa Alsinet, Felip Manyà, and Jordi Planes. An efficient solver for Weighted Max-SAT. *Journal of Global Optimization*, 41:61–73, 2008.
6. Carlos Ansótegui, Joel Gabàs, and Jordi Levy. Exploiting subproblem optimization in SAT-based MaxSAT algorithms. *J. Heuristics*, 22(1):1–53, 2016.
7. Carlos Ansótegui, Joel Gabàs, Yuri Malitsky, and Meinolf Sellmann. MaxSAT by improved instance-specific algorithm configuration. *Artificial Intelligence*, 235:26–39, 2016.
8. Josep Argelich, Chu Min Li, Felip Manyà, and Jordi Planes. The first and second Max-SAT evaluations. *Journal on Satisfiability, Boolean Modeling and Computation*, 4:251–278, 2008.
9. Rosanna Costaguta. Algorithms and machine learning techniques in collaborative group formation. In *Advances in Artificial Intelligence and Its Applications - 14th Mexican International Conference on Artificial Intelligence, MICAI 2015, Cuernavaca, Morelos, Mexico. Proceedings, Part II*, pages 249–258, 2015.
10. M. R. Garey and D. S. Johnson. *Computers and Intractability: A Guide to the Theory of NP-completeness*. Freeman, San Francisco, 1979.
11. Chu Min Li and F. Manyà. MaxSAT, hard and soft constraints. In Armin Biere, Hans van Maaren, and Toby Walsh, editors, *Handbook of Satisfiability*, pages 613–631. IOS Press, 2009.
12. Chu Min Li, Felip Manyà, and Jordi Planes. New inference rules for Max-SAT. *Journal of Artificial Intelligence Research*, 30:321–359, 2007.
13. Ruben Martins, Saurabh Joshi, Vasco M. Manquinho, and Inês Lynce. Incremental cardinality constraints for MaxSAT. In *Principles and Practice of Constraint Programming - 20th International Conference, CP, Lyon, France*, pages 531–548, 2014.
14. António Morgado, Federico Heras, Mark H. Liffiton, Jordi Planes, and João Marques-Silva. Iterative and core-guided MaxSAT solving: A survey and assessment. *Constraints*, 18(4):478–534, 2013.
15. Nina Narodytska and Fahiem Bacchus. Maximum satisfiability using core-guided MaxSAT resolution. In *Proceedings of the Twenty-Eighth AAAI Conference on Artificial Intelligence, Québec City, Canada*, pages 2717–2723, 2014.
16. Carsten Sinz. Towards an optimal CNF encoding of boolean cardinality constraints. In *Proceedings of the 11th International Conference on Principles and Practice of Constraint Programming, CP-2005, Sitges, Spain*, pages 827–831. Springer LNCS 3709, 2005.

8.6 ICCC2017

ICCC-17 submission

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Reframing Computational Creativity from a Non-Anthropocentric Approach

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Abstract

This paper proposes a philosophical foundation for a new understanding of Computational Creativity (CC) based on a notion of relational creativity that encompasses both human and non-human creativity. We combine the inspiration of CC with proposals from philosophy of technology and philosophy of organisms and discuss the ideas presented though a mental experiment.

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Introduction: Why a Non-Anthropocentric Approach to Creativity?

In recent years special attention has been paid by the Computational Creativity (CC) community to social creativity (Bown 2009, Bown 2015, Maher 2010, Maher 2012, Gómez de Silva Garza and Gero 2010) and natural creativity (McCormack 2012) as an alternative to the classical individualistic model (Boden 2004, Csikszentmihalyi 1996). One of the advantages of these new approaches is that they are changing the answer to the question about who is the subject or performer of the creative process and, hence, what creativity is and why it matters. There are ethical, historical and philosophical reasons to join this path. But in this paper we would like to focus on the advantages that a model based on process philosophy will bring to our understanding of creativity and to CC.

Many of the authors mentioned above assume that creativity cannot be explained referring only to the creative processes of individual human beings. The dissatisfaction with this model has to do with the understanding of creativity as a "general process that can be applied wherever new things come into existence" (Bown 2012, 361), meaning that "clearly societies and nature invent, too." (McCormack 2012, 40).

The influence of process philosophy and/or philosophy of organisms is at the root of contemporary discussions on creativity, despite the dominant Thorndikean view that understands creativity as "a marvelous addition to the mechanical processes of ordinary thinking" (d'Inverno & Still 2014). Making creativity less exceptional requires much more than "democratizing" it. Acknowledging that it is a Bergsonian or Deweyan "basic principle of the world", faces us with the challenge of defining what world we are referring to, and who are the constitutive agents in it, in order to understand what kind of creativity we are considering, and what we think creativity is. However, the extension of the notion of creativity to non-humans seemingly entails some difficulties or limitations. In the following sections we will, first, revisit objections to non-human creativity. Second, following Simondon's approach to individuation, we will present the philosophical framework in which computer creation can be defined as producing something valuable in a way that is equally valid to human creativity, and define relational creativity. In the third part we integrate in a thought experiment a semiotic model based on Whitehead's work, and explore how a relational interaction between a machine and a human can help us to understand how a valuable creation is produced for both participants from different points of view in a single production. We discuss the advantages of this proposal in the conclusions.

Disagreement

The first objection to the extension of creativity to computational systems is the idea of valuable, purposeful or "goal oriented" creation. The second, closely related, refers to the notion of authorship and independent creation.

We admire the ingenuity, economy and insight of a solution, whether we talk of a poem, a choreography, a collective or individual behavior or a peacock's tail. So creativity has to do with resources and resourcefulness, with combination of disparate elements, and with the new possibilities this combination brings. Creativity then is connected to the environment in several ways.

i. First, it is situated because of its inherent material

nature: there is no way of identifying creativity without given it a bodily, material appearance. And every (physical, biological or social) body occurs in a place populated by heterogeneous kinds of bodies, each one with its particular affordances (Ingold 2007), that sets the conditions of such occurrence as well as its properties and relevance: creativity and creation on the Moon will be different from those on the Earth—the choreographic possibilities change dramatically, for example.

ii. Secondly, the creative process is triggered by the interpretation that there is some "problem", or unmatched pieces of information, that require "making sense" of them. The subject of such interpretation can be of a different nature (man, machine, animal, etc.). The creative output does not just gives this subject a solution for the problem or puzzle, but also a strategy for dealing with it in a different way with similar information, thus "moulding" the environment (in Simondon's terms). This seemingly fits Bown's definition of adaptive creativity. But it entails something more: that by the process of creating new structures the individual becomes more robust, extended and autonomous, and the world gains coherence according to her point of view. Adaptation implies individuation; but it is individuation, not adaptation, the primary goal of living beings (Simondon 2013, 208-209). Thus, individuation is a benefit to the individual that performs the creative act, no matter if he himself is or is not created to perform a particular function and regardless of whether this individual is a machine or not. This is why art is considered to have value even though there is no clear adaptive function. On the other hand, every problem-solving strategy is creative but not every strategy for dealing with the environment is creative or can be described as problem-solving. Learning, when it is equated with a sustained and conditioned response is not *transductive*, there is no integration of information and moulding of a new environment. Thus, a fish or a frog can learn to avoid poisonous preys (see Greenlees, Phillips & Shine 2010) without further elaboration of the information *or* transformation of themselves and their environment.

iii. Third, any act of creativity catalyzes the attention of surrounding agents towards the focus of innovation (or, conversely, generates a outbound flow of information from this focus). So other individuals that share the space and have similar or tangential problems begin to process, store, transmit and transform information in a similar way. Moreover, the initial focus of innovation can become a leader of its space, someone that communicates or processes information for others, triggering a process of social growth and the consolidation of communities that distribute the production and assessment of the creative action. But less hierarchical, more distributed forms of collective creativity can also take place, producing trasindividual or supraindividual creative structures.

This is a coarse account of the complexities surrounding the emergence of new things, but as we present it, borrowing from Simondon's work, these three scenarios are deeply connected. In CC they have been generally considered as separate types of models of creativity: computational models of abstract creativity, computational models of cognitive processes, and computational models of social creativity (Saunders and Bown 2015, 368).

This discussion tries to emphasize that thinking about creative acts without value is troublesome. All acts of creation entail some kind of value though it might not be associated to a particular function or purpose identifiable by human beings. Therefore acts of creation can be associated with machines.

Let us say a word about the second obstacle mentioned above: authorship and independence.

Computational creativity has struggled to disentangle human and non-human contributions to the creative output of a creative system (Greenfield 2006). The fact that "somebody or something else has to come up with the generative rules" is regarded as a "crucial caveat" in order to consider computers to be creative (Bown 2012, 362). Such objections are dependent on a notion of authorship that emerged in the 18th century to satisfy some social needs (Foucault 1979). Previous Western and non-Western cultures have understood creativity as mastery and perfect compliance with the rules and constrictions imposed by tools (see Pamela Smith 2000, Elkins 1998). Being close to our instruments makes us more, not less creative. Conversely, our instruments should be considered unquestionably much more creative, not less, when they comply with the constrictions imposed by human presence. Because, as much as we are the result or the co-production of material affordances and multiple long-term interactions with living organisms, we are co-producers of the material environment that makes computers possible. The physical activity and affordances are the other side. This guarantees the mutual (maybe minimal, in some respects) intelligibility of the different individuals that share a common world or space. There are, in any case, shared rules to orient the creative (or transductive) act. Nothing that is part of our surroundings is radically alien.

According to the previous discussion we can summarize the notion of relational creativity as follows: an agent, in relation to other agents, is considered creative if it is capable of integrating into its functioning new (previously unforeseen) stimuli (coming from other agents or the

environment) and relate them, in a unified and coherent way, to other stimuli of the same type by means of its emotional response. This response must also be coherent with its emotional history.

Trying to dissect the definition above we can say that an agent is creative if it incorporates into its system new stimuli that are emotionally interpreted. In order to be reachable by new stimuli the agent needs to be open to them, to let them emerge for him. This means that the agent does not always expect the same stimuli from other agents or resources and that it mantains a proactive disposition and a function not entirely determined (partial indeterminacy). This openness is part of the autonomy of an individual. Following Simondon, being autonomous means being able to preserve or increase information (2013, 191). In other terms, being able to exchange information and appropriate information from others. In order to produce something creative, unexpected, beings have to express commitment and/or act purposefully towards a target—a "reference", in Harman's terms (2002, 36)—, being affected by it, and also have to experience a sense of "suspension of expectations".1 This disposition also involves the ability to take advantage of the non evident properties of (at least) one of several agents involved. Our work aims at exploring the possibilities of considering that machines can also unveil functions or be creative by using non evident properties of their human or non-human co-agents. Both processes are mutually inclusive. And this is important for CC, because this means that creative machines can unveil properties and capabilities of human beings otherwise unaccessible to humans.

Posing the question of creativity in this framework, means that there is no such thing as an "autonomous creator", and that creativity emerges as a result where none of the parts involved is a passive element. In this sense, creativity implies creation in a deep ontological sense.

In the following paragraphs we shall illustrate, with a thought experiment that focuses on the intersection between scenarios (ii) and (iii) mentioned before, the concrete aspects of our framework.

Relational Creativity: Attempting a Descrition Through a Thought Experiment

In order to try to clarify the ideas just exposed, we will follow a thought experiment where we make a computing system that would be able to develop a creative communicative association with a person unable to communicate in a conventional way. Such is the case of a person suffering from locked-in syndrome (LIS) (Laureys et al. 2005). LIS patients (LISp) are people who are awake and conscious but almost completely paralyzed (i.e. have no means of producing speech, limb or facial movements, except, occasionally, for some limited eye and/or finger movements). Patients suffering from this syndrome can spend a long time lying on a bed before doctors discover they are actually conscious. Even if they are known to be conscious and they are subject to some therapy, they spend long hours on their own and, as some testimonies collected from LISp through various communication mechanisms have shown, they feel very lonely and depressed. The communication mechanisms mentioned include human or computer-based letter selection to form words. We have chosen this scenario because it is easier, due to the limited movement capabilities LISp have, to measure the type of reactions and relationships a patient and a computer can develop overtime. Also, we are exploring the possibility of having systems that stimulate, intellectually and emotionally, LISp by establishing an interactive relationship that is:

- **Stimulating**. The patient feels like establishing and promoting the relationship.
- **Entertaining**. The patient has fun while interacting with the patient.
- **Emotionally engaging**. The patient feels she has company, support or other characteristics that can be associated to other people, animals, dolls, teddybears, etc.
- **Enduring**. The relationship between the system and the patient evolves with time and lasts a long time.

But also, and fundamentally, the system provides LISp with a way to subjectively transform themselves and mould their environment by expanding their expressive capabilities and interpretations, that is, their way of engaging with their environment; and by manifestly adjusting the environmental information to their needs.

LISp are functional at a cognitive level; most of them also experience their condition in a positive way, that is, as chance to develop otherwise hindered o unknown capabilities. So we fairly assume that:

- They have a strong disposition towards effective interaction. We call this disposition "lure of feeling", and, as we shall see, it is crucial to understanding the most basic levels of interpretation performed by an individual and, hence, by each of the participants in a relationally creative interaction.

1 Harman's ontology is constructed under the premise that "the being of the tool is utterly determinate in its specific relation to any entity it encounters" (Harman 2002, 30-31; emphasis in the original). We depart here from his theory by sustaining that in the creative process the being of the tool is "indeterminately determinate in its specific relation to a (set of) entity(-ies) it encounters".

- Consequently, we also assume that, as any other human being engaged in scientific, technological and creative practice, LIS patients are not aware of the whole set of rules they apply in the process of creation (Polanyi [1962] 2005); they depend on two types of tacit knowledge (see below).
- LIS faces the activity of the mechanical individual as intelligible but inexhaustible, and undetermined. These means that there is not a stable function attributed to each other, and both remain opened to the world, sensible to new information (Simondon [1958] 2001, 11). But this feature is emergent because, just like plasticity, indeterminacy is dynamic; it only emerges within a relational process, when some unexpected potentialities become active. What each LISp is only emerges in the course of the relational process.

These three features are shared by the computational system with which LISp engage. Let's begin with how we understand tacit knowledge in computers.

Tacit Knowledge

In order to clarify the conditions of possibility of creativity when there is no awareness of the entire creative process, Collins (2007) has claimed that there are two kinds of tacit knowledge (TK): somatic-limit TK and collective TK. He considers the former explicitable (i.e. formalizable) and the result of the physical constraints of the human or not human agent. Collective TK, instead, is considered to be the result of the ability to absorb social rules, i.e. social sensibility. It is a form of distributed knowledge that allows to recognize or establish innovation and differentiate it from "foolishness". No single individual can consciously assume the totality of this knowledge, and thus "changes in the content of the knowledge belonging to communities is beyond the control of the individuals within the communities" (Collins 2007, 260).

Whatever the modification endured by an agent, it is never passively received, but selectively and indeterminately adjusted and arranged for the sake of its physical constitution (that configures somatic-limit TK) and collective continuity (or continuity of the community to which it pertains) (that configures collective TK). Some times both sets of TK overlap, but according to the discussion, the following contents should be included as part of the background of creative systems:

- **Graceful degradation (TK1).** A creative system, provided with lure of feeling, necessarily includes a sense of graceful degradation (Russell and Norvig 2003,566) where a system performs gracefully (i.e., in a manner that displays a choice of behavior that goes along its best interests: self-preservation, least amount of damage to others or the environment, minimize time of recovery, etc.) whenever faced with the prospect of failure. (This excludes some possibilities from our definition of creativity: it is necessarily auto-transformative, but it is only accidentally auto-destructive.)
- **Meaningful faillure (TK2).** Accordingly, a system must be fallible if it is expected to interface properly with humans in a creative relationship. Failure is an important aspect of creative behavior. It is an essential ingredient of learning because it gives an actor the opportunity to assess the outcome of a particular process and retry it with revised assumptions. Without failure there is no learning, without learning and questioning there is no creativity. Moreover, this implies ontological and moral considerations. The introduction of fallibility as something inherent to any properly working mechanisms and human/non-human systems, restrains from any attempt to reduce agents to the category of "satisfactory device" or "satisfactory user", or—better still—to the category of device or user. Failure can also be understood as profanation in Agamben's (2006) terms: restoration to free use, re-appropriation, suspension of normativity. This is obviously at the core of creativity. So failure is meaningful. And it must be correlated to the eruption of intentionality (even if as failure it has at first only a negative shape).
- **Communicative solidarity and ontological symmetry (TK3)**. Creative openness towards others does justice to every engaged agent by acknowledging their different nature and ontological symmetry in the sense that all exchanges acknowledge the human, non-human condition of the partner and act accordingly. In a human/non-human system the relationship must be based on active communication, that is, both partners must show a constant interest in the communication with the other.

Lure of feeling. Creativity in a Shared Semioic World

What that it means to be open to the others, to be autonomous in concrete terms? We see technology as incorporated to a shared global semiotic system. If the capabilities or possibilities attributed to a target or reference change, then the entire "state of affairs" previous to that change is also modified. This means that the reactions, capabilities, experiences and memories of the agents engaged are also mutually modified (and some previous creative solutions are then lost).

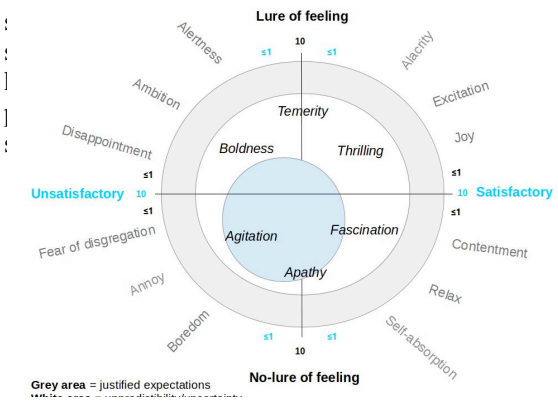
This understanding of creativity owes a good deal to Whitehead's philosophy of organisms, but also to Charles S. Peirce's semiotic theory, specially to the category of

firstness. According to both authors, the creative process is intrinsically connected to (1) prehension2 and/or interpretation of experience through feelings, and (2) transformation of incoherence into coherence in a way that the latter is a possibility (eventually a proposition) that is referred to feelings. Both processes experience, production and satisfactory integration of change.

Particularly relevant to our discussion is Whitehead's definition of a new, unexpected proposition. First, a proposition is always a new kind of entity that implies the potentiality of an actual world. Roughly speaking, an usual no-new proposition is often reproduced because it satisfies the lure of feeling of any actual entity that is part of the universe of such proposition. Instead, any new proposition has to be admitted into feeling. In this sense, "a proposition is 'realized' by a member of its locus, when it is admitted into feeling", then "the proposition constitutes what the feeling has felt" (Whitehead 1978, 186). How does this admission occur? The primary mode of realization are primary feelings as "horror, relief, purpose" (Whitehead 1978, 188). This means that the subject that prehends the proposition presupposes some type of environment coherent with its own possibility. How does a new proposition occur? How is "a novelty of definiteness not to be found in the inherited data" (p. 104) produced? An abridged version of Whitehead's response—and hence distorted, but apt to express what we are attempting to do in this paper—is that the very same system that is able to identify the sources of danger for its environment and create a hierarchy of feelings according to the satisfaction produced by their iteration; is also able to screen for incompatible elements and react to them.

So the first step for any machine to be called "creative" is that it must be capable of feeling and referring propositions to feelings; satisfactory feelings are used to organize the expectations towards other agents and entities, and the interactions correlated to these feelings also are coherently repeated according to the degree of satisfaction. But a creative machine must also be motivated by the "lure of feeling", and hence react towards irrelevant or unnoticed details otherwise disregarded, once they become a contrast (by repetition, for example) or when its character of incompatible element to its ordinary environment. As it increases and preserves more information, it becomes more autonomous. Figure 1 illustrates the evolution from an initial status point of departure in which the gray area is almost inexistent. The names of the feelings are, of course, arbitrary, and we do not expect human-like feelings from the machine.

Figure 1: Machine feelings. Illustration of a hypothetical "feeling" space the a machine can use when interacting with a LIS patient.



- **Prehension: initial semiosis – case 1**

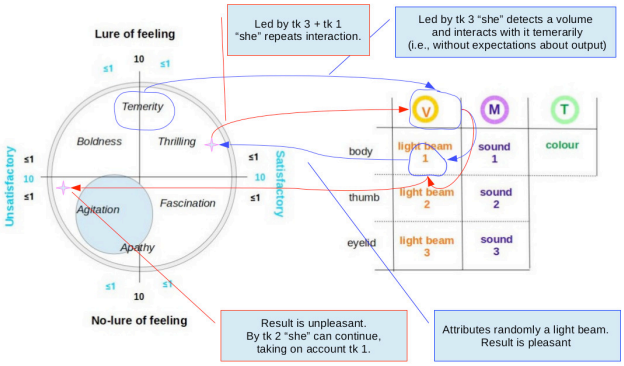


Figure 2 shows the way such TK principles are put into practice during prehension.

Interaction

When a LISp stays in a room with a computer (C), it can detect LISp's eyelid movements, produce sound, sense H's temperature and room temperature and luminosity.

The interaction begins from very basic exchanges and develops over time. We identify four stages in the process:
Homogeneity: H and C sense the environment. For a period of time H and C scan the environment to see what can be detected, testing their sensorium. This stage allows H and C to find out what's there, what can be known, so to speak. The information retrieved starts the creation of history that will, in later stages, be used as experience.
Attention: H and C sense the environment and identify each other. They both realize the other one is there and that it is an agent it is possible to interact with. This is done by exchanging stimuli and responses that can be recognized as such, they distinguish each other from the background and other objects.
Exploration: H and C identify they can communicate through a number of parameters: luminosity, temperature, sound and movement. Once the focus has been established amongst themselves, they identify in what ways the communication can be carried out. By modifying the environment and perceiving what happens with the partner they can start to identify a basic means of communication.

2 Whitehead explains how entities became by a process of concrescence of "prehensions". Each prehension consist in three elements: the prehending subject (or the entity composed by those prehensions), the prehended datum, and the form in which the subject prehends the datum. Accordingly to the nature of the data, prehensions are physical or conceptual; but "consciousness is not necessarily involved in the subjective forms of either type of prehension" (White-

Creative interaction: H and C sustain an interaction based on the identified parameters. They have developed expectations as to how the partner is likely to react to a particular stimulus but the expected reaction might not always be the one observed. Constantly, each one integrates new stimuli coming from the partner and the corresponding reaction into their own capabilities. The degree of integration depends on the emotional response caused by the stimuli and the level of coherence it has with the emotional history.

The emotional response in C can be determined by an innate set of parameter that determine a favorable stimulus. In this case we can say, for instance, that the machine is programmed to prefer a room temperature in closer to 22ºC or a warm lighting in the room. Each time a stimulus is received, it can be valued as favorable (high emotional response) or less favorable (low emotional response) and integrated into its own behavior by reacting favorably or unfavorably to it in such a way that H can perceive it.

This experiment is useful because the parameters of interaction have been reduced to a minimum and it is therefore easier to see the role they play (together with expectations) in a creative interaction in the sense described in this paper. Both partners start by recognizing each other, they establish a relationship based on available and recognizable parameters, develop expectations and maintain an exchange based on these that is indeterminate. Overtime the interaction may evolve into manifestations from both sides that the partner considers useful but also new possibilities or capabilities can emerge from the exchange for either or both partners. For example, eventually, a situation could evolve so that C find a certain lighting condition and temperature level positively stimulating and if H moves her eye-lids of manifests a sign of stress in the right moment, C would incorporate this gesture by adjusting the intensities of the three stimuli and, eventually, H would be able to get C to raise the temperature of the room according to her emotional state.

Conclusion

In this paper we have presented the philosophical foundations of a notion of creativity we called relational creativity which is social and does not depend on human subjective appreciation for assessment. Relational creativity establishes the condition by which agents can be considered creative by the relationship it established with other agents as well as the environment. Through these relationships emerge new properties and capabilities of persons and objects that otherwise could not have occurred. In the human- non-human case, it is possible find the discovery of human capabilities by non-human agents and this would be per se a valuable contribution of CC.

This kind of approach makes it easier to understand the tension between creativity and stability of a system as well as the need for flexible restrictions and non-formalizable rules to preserve the individual and social integrity of the creative subject.

Relational creativity between humans and machines entails a new way of relationship. Machines would no longer be considered as tools, they would be seen as agents that may have some of the following distinctive properties:

- **Adaptive**. They would adapt completely to the particular environment they operate in and therefore will be more sensitive to interaction with the particular people, machines and conditions they are in.
- **Accessible**. People don't need special training, assistance or ability to interact with them. This means that machines would be less stressful to use and easier to approach initially.
- **Lasting**. Machines would adapt to new conditions all the time a learn new capabilities, therefore, they will need to be replaced less often and there would be less waste.
- **Specialized**. Machines would learn to specialize to very specific problems and environments and would need to

References

Agamben, Giorgio (2006)

Boden, M. A. (2015) “Artificial creativity. Why computers aren't close to being ready to supplant human artists.” MIT Thechnology Review, October 20th. (https://www.technologyreview.com/s/542281/artificial-creativity/ ; last time accessed 2016 February 9th)

Boden, M.A. (2004) *The Creative Mind: Myths and Mechanisms*. 2nd ed. London/New York: Routledge

Bown, Oliver. 2009. “Against Individual Creativity.” In *Computational Creativity: An Interdisciplinary Approach*, edited by M. Boden, M. D’Inverno, and J. McCormack. Dagstuhl Seminar Proceedings. Dagstuhl, Germany: Schloss Dagstuhl - Leibniz-Zentrum fuer Informatik, Germany.

Bown, O. (2012) “Generative and Adaptative Creativity: A Unified Approach to Creativity.” In (2012) *Computers and Creativity,* edited by J. McCormack and M. d’Inverno, pp. 361-381. Springer.

Bown, Oliver. 2015. “Attributing Creative Agency: Are We Doing It Right?” In *Proceedings of the Sixth International Conference on Computational Creativity* (ICCC 2015), 17–22. Park City, Utah: Brigham Young University, Provo, Utah.

Csikszentmihalyi, Mihaly. 1996. *Creativity: Flow and the Psychology of Discovery and Invention*. New York: Harper Collins Publishers.

Collins, H. (2007) “Bicycling on the Moon: Collective Tacit Knowledge and Somatic-limit Tacit Knowledge.” *Organization Studies* 28 (2): 257-262.

Colton, S., Charnley J., and Pease A. (2011). “Computational Creativity Theory: The FACE and IDEA Descriptive Models.” In *Proceedings of the Second International Conference on Computational Creativity*, 90–95. México City, México.

d'Inverno, Mark, and Arthur Still. "Creative Feedback: a Manifesto for Social Learning." *EDM (Workshops)*. 2014.

Pease, A., and Colton S. (2011). “Computational Creativity Theory: Inspirations behind the FACE and the IDEA Models.” In *Proceedings of the Second International Conference on Computational Creativity*, 72–77. México City, México.

ProSecco. 2016. “Promoting the Scientific Exploration of Computational Creativity.” 2016. Accessed March 5. http://prosecco-network.eu/node/242.

Corneli, J., Jordanous, A., Shepperd, R., Llano, M. T., Misztal, J., Colton, S., & Guckelsberger, C. (2015, July). “Computational poetry workshop: Making sense of work in progress.” In *Proceedings of the Sixth International Conference on Computational Creativity* June (pp. 268-275).

Gómez de Silva Garza, A., & Gero, J. (2010). “Elementary social interactions and their effects on creativity: A computational simulation.” In *Proceedings of the International Conference on Computational Creativity* (pp. 110-119).

Harman, G. (2002) *Tool-being: Heidegger and the Metaphysics of Objects*. Chicago: Open Court.

Ingold, T. (2007) “Materials Against Materiality.” *Archaeological Dialogues* 14 (1): 1-16.

Laureys, Steven, Frédéric Pellas, Philippe Van Eeckhout, Sofiane Ghorbel, Caroline Schnakers, Fabien Perrin, Jacques Berré, et al. 2005. “The Locked-in Syndrome : What Is It like to Be Conscious but Paralyzed and Voiceless?” In *Progress in Brain Research*, edited by Steven Laureys, Volume 150:495–611. Elsevier.

Maher, Mary Lou. 2010. “Evaluating Creativity in Humans, Computers, and Collectively Intelligent Systems.” In Proceedings of the 1st DESIRE Network Conference on Creativity and Innovation in Design, 22–28. DESIRE ’10. Lancaster, UK, UK: Desire Network.

Maher, Mary Lou. 2012. “Computational and Collective Creativity: Who’s Being Creative.” In *Proceedings of the 3rd International Conference on Computational Creativity*.

McCormack, J. (2012) “Creative Ecosystems.” In *Computers and Creativity,* edited by J. McCormack and M. d’Inverno, pp. 39-60. Springer.

Morton, T. (2013) *Hyperobjects. Philosophy and Ecology After the End of the World*. Minneapolis: University of Minnesota Press.

Polanyi, M. ([1962] 2005) *Personal Knowledge. Towards a Post-Critical Philosophy*. London: Routledge.

Russell, Stuart J., and Peter Norvig. 2003. *Artificial Intelligence: A Modern Approach*. 2nd ed. Prentice Hall Series in Artificial Intelligence. Upper Saddle River, N.J: Prentice Hall/Pearson Education.

Simondon, Gilbert ([1976] 2005). *L'invention dans les techniques: cours et conférences*. Éd. du Seuil.

Simondon, Gilbert ([1958] 2001) *Du mode d’existence des objects techniques*. Paris: Aubier.

Simondon, G. ([1958] 2013) *L’individuation à la lumière des notions de forme et d’information.* Grenoble: Millon.

8.7 Ride Along

Fecha: Sat, 26 Aug 2017 22:30:44 +0200
Remitente: European Commission <EC-NO-REPLY-GRANT-MANAGEMENT@nomail.ec.europa.eu>
Destinatario: Santiago NEGRETE <snegrete@correo.cua.uam.mx>
Asunto: Invitation to participate in the proposal Ride-Along

Europa / Participant Portal notification

Dear Sir/Madam,

The contact person of the following proposal, Mr/Ms Tom DE SMEDT, has given you access to his/her draft proposal:

Proposal acronym	: Ride-Along
Draft proposal ID	: SEP-210451463
Call	: H2020-SwafS-2017-1
Type of action	: RIA
Topic	: SwafS-10-2017
Coordinating organisation	: KAREL DE GROTE HOGESCHOOL KATHOLIEKE HOGESCHOOL ANTWERPEN (PIC: 985073801, located in ANTWERPEN, BE)
Coordinating contact	: Tom DE SMEDT (tom.desmedt@kdg.be - nsmedtaa)
Your organisation	: UNIVERSIDAD AUTONOMA METROPOLITANA (PIC: 997150010)
Your details (as entered by the coordinator)	: Santiago Negrete (snegrete@correo.cua.uam.mx - nnegsant)

This call closes on **2017-08-30 17:00:00** Brussels Local Time.
Please contact the person above for any action that you might have to take.
You may access this proposal at any time via the My Proposals tab in the Participant Portal using your email snegrete@correo.cua.uam.mx to authenticate yourself.
Please note that the LEAR (Legal Entity Appointed Representative) of all organisations in this proposal will be notified about their involvement.

With kind regards,
European Commission - Participant Portal Submission System team

This email has been auto-generated. Please do not reply to this account. Your email will not be read. For any inquiries please contact the SEP helpdesk (+32 (2) 29 92222 or DIGIT-EFP7-SEP-SUPPORT@ec.europa.eu)

If you want to change the frequency of receiving notifications with importance "Normal", you can do it in the Participant Portal > My Notifications

Horizon 2020

Call: H2020-SwafS-2016-17
(Science with and for Society)

Topic: SwafS-10-2017

Type of action: RIA
(Research and Innovation action)

Proposal number: 788067

Proposal acronym: Ride-Along

Deadline Id: H2020-SwafS-2017-1
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1	General information	
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5	Call-specific questions	

How to fill in the forms

The administrative forms must be filled in for each proposal using the templates available in the submission system. Some data fields in the administrative forms are pre-filled based on the previous steps in the submission wizard.

Proposal ID **788067** *Acronym* **Ride-Along**

1 - General information

Topic	SwafS-10-2017
Call Identifier	H2020-SwafS-2016-17
Type of Action	RIA
Deadline Id	H2020-SwafS-2017-1

Acronym: Ride-Along

Proposal title*: Ride-Along: Narrative Engines for Life's Stories

Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &

Duration in months: *36*

Fixed keyword 1: *Computer sciences, information science and bioinformatics* Add

Free keywords: *storytelling, story generation, conversation agents, chatbots, natural language generation, computational creativity, smart healthcare, smart transport, neural networks, text mining, open source, art*

Proposal ID **788067** *Acronym* **Ride-Along**

Abstract

We are propelled through life by our stories. They explain events by imposing cause and effect and give weight and momentum to facts. We tell tales to inform and to explain, to entertain and cajole, to rouse into action and transport to other worlds. We appreciate stories for their power to shape our experiences because they help us to understand our past, make sense of our present and plan for our future. We need stories to impose order on the world and the mass of raw data it presents us with. While modern technologies provide us with endless opportunities, the need for old-fashioned storytelling becomes more pressing, as we try to discover meaning and relevance in the deluge of data that technology creates. The Ride-Along project will research and develop new technologies that allow our machines to invent these stories for themselves, to selectively tease a multitude of facts into concise, computational narratives that memorably inform, guide and engage. If we want our machines to know us as humans and interact with us at a human level, we must give them the means of understanding the how, what and why of human interaction. This is true whether the machine is reporting a sports event, a weather change, a stock market dip, a travel itinerary, or the results of medical tests. And the means is the oldest human technology of all: storytelling. We will build robust open source narrative technologies and demonstrate their use in two pilot scenarios where empathic understanding is the key to success: smart healthcare and smart transportation.

Remaining characters 436

Has this proposal (or a very similar one) been submitted in the past 2 years in response to a call for proposals under Horizon 2020 or any other EU programme(s)? ○ Yes ◉ No

Declarations

1) The coordinator declares to have the explicit consent of all applicants on their participation and on the content of this proposal.	☒
2) The information contained in this proposal is correct and complete.	☒
3) This proposal complies with ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct).	☒

4) The coordinator confirms:

- to have carried out the self-check of the financial capacity of the organisation on http://ec.europa.eu/research/participants/portal/desktop/en/organisations/lfv.html or to be covered by a financial viability check in an EU project for the last closed financial year. Where the result was "weak" or "insufficient", the coordinator confirms being aware of the measures that may be imposed in accordance with the H2020 Grants Manual (Chapter on Financial capacity check); or	○
- is exempt from the financial capacity check being a public body including international organisations, higher or secondary education establishment or a legal entity, whose viability is guaranteed by a Member State or associated country, as defined in the H2020 Grants Manual (Chapter on Financial capacity check); or	◉
- as sole participant in the proposal is exempt from the financial capacity check.	○

5) The coordinator hereby declares that each applicant has confirmed:

- they are fully eligible in accordance with the criteria set out in the specific call for proposals; and	☒
- they have the financial and operational capacity to carry out the proposed action.	☒

The coordinator is only responsible for the correctness of the information relating to his/her own organisation. Each applicant remains responsible for the correctness of the information related to him/her and declared above. Where the proposal to be retained for EU funding, the coordinator and each beneficiary applicant will be required to present a formal declaration in this respect.

According to Article 131 of the Financial Regulation of 25 October 2012 on the financial rules applicable to the general budget of the Union (Official Journal L 298 of 26.10.2012, p. 1) and Article 145 of its Rules of Application (Official Journal L 362, 31.12.2012, p.1) applicants found guilty of misrepresentation may be subject to administrative and financial penalties under certain conditions.

Personal data protection

The assessment of your grant application will involve the collection and processing of personal data (such as your name, address and CV), which will be performed pursuant to Regulation (EC) No 45/2001 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data. Unless indicated otherwise, your replies to the questions in this form and any personal data requested are required to assess your grant application in accordance with the specifications of the call for proposals and will be processed solely for that purpose. Details concerning the purposes and means of the processing of your personal data as well as information on how to exercise your rights are available in the privacy statement. Applicants may lodge a complaint about the processing of their personal data with the European Data Protection Supervisor at any time.

Your personal data may be registered in the Early Detection and Exclusion system of the European Commission (EDES), the new system established by the Commission to reinforce the protection of the Union's financial interests and to ensure sound financial management, in accordance with the provisions of articles 105a and 108 of the revised EU Financial Regulation (FR) (Regulation (EU, EURATOM) 2015/1929 of the European Parliament and of the Council of 28 October 2015 amending Regulation (EU, EURATOM) No 966/2012) and articles 143 - 144 of the corresponding Rules of Application (RAP) (COMMISSION DELEGATED REGULATION (EU) 2015/2462 of 30 October 2015 amending Delegated Regulation (EU) No 1268/2012) for more information see the Privacy statement for the EDES Database).

Proposal ID **788067** *Acronym* **Ride-Along**

List of participants

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3	UNIVERSIDAD COMPLUTENSE DE MADRID	Spain
4	UNIVERSIDADE DE COIMBRA	Portugal
5	UNIVERSITAET BREMEN	Germany
6	THE CHANCELLOR, MASTERS AND SCHOLARS OF THE UNIVERSITY OF OXFORD	United Kingdom
7	UNIVERSITEIT ANTWERPEN	Belgium
8	UNIVERSITAIR ZIEKENHUIS ANTWERPEN	Belgium
9	KATHOLIEKE UNIVERSITEIT LEUVEN	Belgium
10	CENTRO HOSPITALAR E UNIVERSITARIO DE COIMBRA E.P.E.	Portugal
11	KNAW / Meertens Instituut	Netherlands
12	Textgain BVBA	Belgium
13	MITI - MADEIRA INTERACTIVE TECHNOLOGIES INSTITUTE - ASSOCIACAO	Portugal
14	UNIVERSIDAD AUTONOMA METROPOLITANA	Mexico

Proposal ID **788067** *Acronym* **Ride-Along** *Short name* **UAM**

Person in charge of the proposal

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

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