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Year 1 Contact Forum Report

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Report of the First Annual Contact Forum

1. Introduction

The PROSECCO project aims to enlarge the community of Computational Creativity researchers, and to facilitate increased communication between different areas and genres within this community, though the use of annual *contact fora*.

The 1st contact forum of the coordination action was scheduled to be held in **El Escorial**, Spain, from February 21st to 23rd inclusive. Our goals for this first event were to invite as relevant yet diverse a group of researchers as possible while maximizing the use of the available budget. The Colegio Real at El Escorial proved to be an ideal setting for the event: welcoming, comfortable (yet not too comfortable) and cloistered from the outside world. A scholastic air was maintained throughout, and guests contributed actively to a very full schedule.

Budget considerations led us to invite the following academics across a variety of research areas, all of which are directly relevant to the discipline of Computational Creativity:

- **Penousal Machado**, University of Coimbra, Portugal
- **Lucas Nijs**, Sint Lucas School of Arts, Antwerp, Belgium
- **Oliver Deussen**, University of Konstanz, Germany
- **Konstantinos Zachos**, City University, London, UK
- **Jaime Munarriz**, Universidad Complutense de Madrid, Spain
- **Tarek Besold**, University of Osnabruck, Germany
- **Mark Turner**, Case Western University, USA
- **John Barnden**, University of Birmingham, UK
- **Carlo Strapparava**, University of Trento, Italy
- **Walter Daelemans**, University of Antwerp, Belgium
- **Paolo Rosso**, Universitat Politècnica de Valencia, Spain
- **Mariët Theune**, University of Twente, The Netherlands
- **Licínio Roque**, University of Coimbra, Portugal
- **Georgios N. Yannakakis**, University of Malta, Malta
- **Georgi Stojanov**, American University of Paris, France
- **Bob French**, CNRS/University of Burgundy, France
- **Ursula Martin**, Queen Mary University of London, UK
- **Stefan Rieger**, Open University, UK
- **Jullan Togelius**, ITU Copenhagen, Denmark

- **Rafael Perez y Perez**, Universidad Autónoma Metropolitana, Mexico
- **Francisco Fernandez Vega**, University of Extremadura, Spain
- **Agnar Aamodt**, Norwegian University of Science and Technology, Norway
- **Dan Ventura**, Brigham Young University, USA
- **Tijl De Bie**, University Of Bristol, UK

In addition, two members of the PROSECCO advisory board were invited to the event: **Dan Ventura** of Brigham Young University in Utah (representing a U.S. perspective) and **Oliviero Stock** of FBK, Trento (representing a European perspective).

2. Schedule of the event

The first annual contact forum adhered to the following schedule:

Friday, February 21st

Attendees arrive in El Escorial and get settled in their accommodation. Meet for a social mixer of drinks and dinner in the evening at Meson Restaurante La Cueva.

Saturday, February 22nd

This will be a day of short talks to introduce attendees to each other's work and research interests. The day will comprise four sessions, two before lunch and two after.

8.15am	Breakfast (Dining room)	
9.00am	Opening words by local host	Pablo Gervás (UCM) – PROSECCO
9.30am	Introduction of PROSECCO partners and summary of aims of the coordination project	Tony Veale (UCD) – PROSECCO Project Coordinator
Session 1 (Moderator/Respondent: Simon Colton, Goldsmiths UK)		
10.00am	Computational Design and Visualization Lab	Penousal Machado, University of Coimbra, Portugal
10.15am	Computational Stylometry	Walter Daelemans, University of Antwerp, Belgium
10.30am	EMRG /research between art, design & science	Lucas Nijs, Sint Lucas School of Arts, Antwerp, Belgium
10.45am	A Computational Model of Analogical Reasoning in Dementia Care	Konstantinos Zachos, City University, London, UK
11.00am	Emergence, synchronicity and generative processes in visual and sound creativity	Jaime Munarriz, Universidad Complutense de Madrid, Spain
11.15am	Analogy, Concept Blending, and Computational Creativity	Tarek Besold, University of Osnabruck, Germany
11.30am	Coffee break (Dining room)	

Session 2 (Moderator/Respondent: Geraint Wiggins, QMUL, UK)		
12.00 noon	Computational Creativity through Conceptual Integration	Mark Turner, Case Western University, USA
12.15pm	Creativity in Metaphor and Mind	John Barnden, University of Birmingham, UK
12.30pm	Creative Natural Language Processing	Carlo Strapparava, University of Trento, Italy
12.45pm	Universality and Creativity in Language: Author profiling and Irony	Paolo Rosso, Universitat Politècnica de Valencia, Spain
13.00pm	Story generation and co-creation with the Virtual Storyteller	Mariët Theune, University of Twente, The Netherlands
13.15pm	Visit to Monastery Gardens before lunch	
2pm	Lunch at Real Colegio María Cristina (Dining room)	
Session 3 (Moderator/Respondent: Amilcar Cardoso, Uni. Coimbra)		
3.00 pm	Interfacing Imagination	Licínio Roque, University of Coimbra, Portugal
3.15 pm	Applying Computational Creativity Approaches to Developmental Robotics	Georgi Stojanov, American University of Paris, France
3.30 pm	Computational Temperature: the most underexploited mechanism of computational creativity	Bob French, CNRS/University of Burgundy, France
3.45 pm	Mathematics and creativity: an empirical approach	Ursula Martin, Queen Mary University of London, UK
4.00 pm	Is it possible to measure the aesthetics of photographs?	Stefan Rieger, Open University, UK
4.15pm	The potential of memorized experiences for creative problem solving and learning	Agnar Aamodt, Norwegian University of Science and Technology, Norway
4:30pm	Coffee break (Dining room)	
Session 4 (Moderator/Respondent: Martin Znidarsic, IJS, Slovenia)		
5.00pm	Computational Creativity in Games (I)	Julian Togelius, ITU Copenhagen, Denmark
5.15pm	Computational Creativity in Games (II)	Georgios N. Yannakakis, University of Malta, Malta
5.30pm	The ER Model: from plot generation to visual composition	Rafael Pérez y Pérez, Universidad Autónoma Metropolitana, Mexico
5.45pm	Experimenting Human Creativity by means of Unplugged Evolutionary Algorithms	Francisco Fernandez Vega, University of Extremadura, Spain
6.00pm	Computational creativity & surprise in data mining / Music informatics & computational creativity	Tijl De Bie, University Of Bristol, UK
6.15pm	Conclusions for the day	

6.30pm	Personal time before group dinner
7.30pm	Meeting in the entrance hall to go to the dinner venue
8.00pm	Group Dinner and drinks at Hotel Botánico

Sunday, February 23rd

This last half-day of the event will be given over to a round-table discussion about collaborative opportunities, research synergies, new directions, needs of the field, shared resources, EC calls/Horizon 2020, etc.

8.30am	Breakfast (Dining room)
9.30am	Welcome to the round-table session (Tony Veale and Pablo Gervás)
9.40am	Summary by Moderators/Respondents, and open question session
10.40am	Discussion
11.30am	Conclusions
12.00 noon	Bus leaves for airport / Visit Monastery
2pm	Lunch at Real Colegio María Cristina (Dining room)
3pm	Departure

3. Report on the event

All invitees attended the event, with the exception of Oliver Deussen (who was unfortunately ill just prior to the event and who thus sent his apologies in advance). The PROSECCO project was represented by Pablo Gervás, Tony Veale, Simon Colton, Geraint Wiggins and Amilcar Cardoso. Nada Lavrač and Hannu Toivonen sent their apologies, having prior family commitments that they could not re-schedule. Both invited members of the international advisory board were in attendance.

3.1. Report of Day 1

As shown in the above schedule, Day 1 of the event was opened by Pablo Gervás and Tony Veale, who each presented informal remarks without slides or formal presentations. It was our goal in this event to stress the importance of *listening* to the broader community, and feeling it would have been counter-productive to formally lecture to the guests on the topics and goals of Computational Creativity, we resisted the temptation to do so. Instead, the goals of the field and the goals of the PROSECCO action were briefly presented to serve as conceptual landmarks and talking points for the discussions to follow. Each guest was then invited to briefly present on his/her research interests as they relate to computers and creativity, while discussions of what constitutes a definition creativity – for humans or computers – were carefully avoided, as these have proved to be contentious and less than useful on past occasions.

The remainder of the day was divided into four sessions of talks. Each session was moderated by a different member of the PROSECCO project: Simon Colton, Geraint Wiggins, Amilcar Cardoso and Martin Znidarsic (representing PROSECCO member Nada Lavrač). Each modera-

tor also served as a rapporteur for their session, and presented a summary of key issues at the round table session on the following day.

It is a credit to the invited guests that such a crammed schedule of talks proceeded largely on schedule, with little signs of fatigue on the part of either the speakers or the audience.

3.2. Report of Session 1 (Moderator / Rapporteur: Simon Colton)

Simon Colton moderated the first session of the day, and noted the following points in his subsequent report to the meeting on Day 2.

Penousal Machado described a new laboratory that has opened in the last year with lots of ongoing projects, in areas such as nature inspired computing, computational aesthetics, computer art and design, and information visualization. Expanding on the first, nature inspired computing, he introduced evolutionary art projects with his NEvAr system, including technical details such as graph-based genetic programming, context-free design grammars and non-photorealistic rendering of images. This led him into a discussion of computational aesthetics, where various approaches were mentioned, including hardwiring fitness functions into search mechanisms, machine-learning such fitness considerations, feature extraction and responsive user interfaces. Building on these aspects, Dr. Machado described how there are several designers in his lab working on projects such as the visualization of music, the generation of book covers, and computational typography, i.e., the analysis and organization of fonts. In his final section, he covered various projects in information visualization, including the visualization of data from transport systems and networks. With an emphasis on story telling, he described a recent MoMa exhibition which used visualization of the traffic in Lisbon, urban mobility and Wi-Fi network traffic. He finished his talk with an interesting commissioned video visualizing the formation and decline of the empires of Britain, Spain, Portugal and France.

Walter Daelemens described aspects of the research undertaken in his CLIPS laboratory, with specific attention paid to psycholinguistics and information extraction from text. He described various methods for profiling people based on their writings, including the use of meta-data about the author. He drew on an example tweet from Richard Dawkins, showing how a word graph can connect to databases, and how cues from natural language processing, such as named identities, can be used in profiling. He went on to describe some methods pertaining to personality detection in text. In the next section, Dr. Daelemans described automated approaches in stylometry, including methods for language variation detection, using psychological and sociological analyses. He described applications of this work to literary science, forensics, diagnostics and possibly to Computational Creativity. He demonstrated the Stylen online application which analyses text lexically and can assign gender to the author with high accuracy, in addition to putting the author into context with famous authors. He also mentioned applications to the detection of lies in text.

Lucas Nijs from the Experimental Media Research group profiled work by colleagues in his group. He first described the work of Tom de Smedt in generative art, where only fundamental blocks are defined, with software doing the rest - which is described in de Smedt's book on modeling creativity with case studies in the Python language. Dr. Nijs described a system called *Flowerewolf*, by Tom de Smedt, which produces poems automatically, and which even invented its own palindromic name. This system using so-called perceptionyms to help guide the software in making decisions. de Smedt's work on producing paintings using nature-

inspired algorithms was also described, as was his work on web mining. Concentrating on the web mining application, the Pattern Python software was described as a web service, and applications to the presentation and analysis of tweets about upcoming elections, and the analysis of newspaper articles were given. Dr. Nijs then described the work of colleague Frederik de Bleser, on the impact of graphics applications on graphic designers. He described the Nodebox MAAK system, where blocks of code are represented as functions. A commercial application to wallpaper design using spam email was presented, and a description of how students can quickly master the controls was provided. In addition, an experiment with children controlling the system via a helmet, turning brain waves into art was described. Dr. Nijs ended his talk by describing other projects, including a selfie-drawing robot which produces self portraits, and is a very cheap but very popular application of robotics.

Konstantinos Zachos from the Centre for Creative Practice talked about dementia care as a Computational Creativity service. He described Computational Creativity in terms of human level creativity, and described perspectives in his group about creativity through design programs which enhance human creativity. He described the Carer Mobile application which has been developed for dementia care applications, which supports creative thinking to manage challenging behaviours with descriptions of other worlds. He gave details of experiments with this approach in a care home environment, where carers describe a situation and a server-side application creates new scenarios which help the situation. Dr. Zachos described how this is achieved through matching and retrieving non-dementia cases from domains such as teaching and policing, using lexical extraction rules expressed as relation predicates, which are expanded using VerbNet and then matched.

Jaime Munarriz described how design and other digital technologies found their place in the fine art faculty of his university, via their usage by visual and sound artists. He described an emphasis on emergence and synchronicity in generative approaches with applications to visual and audio arts. Going into further details about the generative systems employed, Dr. Munarriz described A-life ponds, where the aim for emergent behaviours triggers sounds, and other work on ecological modeling for generative design, including the modeling of arthropods. In these models, the ecosystem evolves with morphological studies, the modeling of sexual selection. In addition, projects involving discussion of urban drift, experimental music communities and geometric rhythms were described. Towards the end of the talk, Dr. Munarriz described a generative text art project, where fake talking heads were employed, and where glitches were simulated, to make people realize it was a computer-generated simulation. The approach used Markov-based generation of micro-sequences of sound, via the Processing framework. He described how such frameworks are used in the teaching of masters and doctoral students, and how part of the artistic process is the curation of generated texts.

Tarek Besold described the relationships between analogy, conceptual blending and Computational Creativity. Focusing first on analogies, he gave examples of analogy in the wild, such as in various advertisements. He described how these examples can have different analogical interpretations, based on the human ability of retrieving mappings from source and target domains. He described heuristic driven theory projection, a method for computing analogical relations using anti-unification over a many sorted first order language. He described this with an example of the solar system analogy to atomic structure by Rutherford. Focusing next on conceptual blending, Dr. Besold presented the foundations of theory blending, with an example which modeled the discovery of the complex plane as a geometric interpretation. To do so, he reconstructed Argand's argument to model the invention of complex arithmetic and the

complex plane. Dr. Besold ended his talk by giving details of the COINVENT EC-funded project where a novel, computationally feasible model of conceptual blending is being derived, with applications to concept invention in mathematics and music, with a focus on modeling situations in which serendipitous events may occur.

Summing up in the plenary session later, Simon Colton made some suggestions linking the talks to each other and to Computational Creativity in general. Firstly, a difference in prioritizations was suggested, whereby researchers think about analytical projects being used in simple generate-and-test generative projects, which can lead to more sophisticated Computational Creativity applications later. Colton also pointed out the differences between modeling individual creative acts (especially famous, ground-breaking ones), which can be hard, and modeling creativity in the same domain, which may be more fruitful. He finished by suggesting political art as a new domain for Computational Creativity, inspired by the talks in the session, because generation of such artworks requires language understanding and manipulation in addition to visual generation and reasoning, which can draw on data visualization methods.

3.3. Report of Session 2 (Moderator / Rapporteur: Geraint Wiggins)

Geraint Wiggins moderated the second session of the day, and noted the following points in his subsequent report to the meeting on Day 2.

Mark Turner summarized the Red Hen lab. He talked about the blending theory - a technique for creativity and how blending can e.g. solve the Riddle of the Buddhist monk. He highlighted the importance of taking things we know and putting them together into new things that have emergent properties. He noted that children can cope with bizarre imaginary scenarios, even if contradictory to reality. He described Aptima, an initiative to try to achieve computational creativity through blending engines. e.g. 1. A negotiator in military field doesn't have full cultural context: it is necessary to build a system to identify cultural faux pas. 2. What happens when a robot doesn't have a plan for its situation? 3. Can it blend existing plans?

John Barnden talked about Creativity in Metaphor and Mind, i.e., creative understanding of metaphor leading on to metaphor creation. Metaphorical creativity is often not about creating new analogical mappings, but exploiting existing ones. He elaborated open-ended elaborations of clichéd metaphors and how it was not always necessary to map everything between source and target. He discussed the correspondence between inaccessibility in physical space and inaccessibility in mental space and how to build software to follow reasoning chains in parallel in source and target, as opposed to novel parallels that have to be worked out. This applies not just in linguistic metaphor, as metaphor is a fundamental mental phenomenon, not just a feature of communication.

Carlo Strapparava explored areas of natural language processing traditionally outside the scope of computational modeling such as emotion. He also talked about witty language, affective text, persuasive NLP, creative naming (branding) and brainstorming for creative sentence generation. Carlo also addressed the humour of ambiguity in jokes and headlines to persuasive speech from political campaigns, asking whether the elements of persuasion can be detected and, as regards *virality* in social networks, what makes a message go viral?

Paolo Rosso, talked about systems for plagiarism detection, addressing author profiling and irony detection in language in the context of Information Retrieval and Natural Language Processing.

Mariët Theune talked about story generation and co-creation with *The Virtual Storytellers*, a system that aims to generate stories in Dutch. She uses a simulated story world where characters are autonomous BDI agents in a character-driven approach. Simulation generates narrative *fabula*, which is then narrated as actual stories. Character agents can, interestingly, decide to act *out of character*. She described an interactive system, based on the original autonomous system, using a multi-touch table. She also discussed effective stimulation of creativity in children and how to apply this to more serious purposes such as the training of police officers.

The key impressions extracted from these talks are a strong unanimity on what is important in this general area of analogical/metaphorical/linguistic reasoning, and how strongly it relates to computational creativity and several other related issues (particularly regarding specific linguistic effects). A particular point that impressed was that of John Barnden, regarding the exploitation of metaphor and its creative content: metaphor is not just a matter of finding new analogies/metaphors, but also of using them in creative ways.

3.4. Report of Session 3 (Moderator / Rapporteur: Amilcar Cardoso)

Amilcar Cardoso moderated the third session of the day, and noted the following points in his subsequent report to the meeting on Day 2.

Licinio Roque presented an overview of his current research in interaction design, game and media design and context engineering, with a view to their interaction with computational creativity. He described a *Dynamic Soundscape Composition Engine* based on a set of patterns of sound design, built from the analysis of snippets of video and sound in games. Two approaches to game modeling were also presented: a Petri Net-based application, for design and behavior rewriting, and a *Participation-Centered Gameplay Experience Design Model*, where Participation integrates such aspects as playfulness, embodiment, challenge, sense-making, sensorial appreciation and sociability. The speaker also reported recent work in an architecture for an author-centric approach to PCG (Procedural Content Generation), where designers evolve designs by monitoring players' activity and iteratively reconfiguring designs accordingly. Along similar lines, the study of interactivity within PCG techniques in the context of designing creativity-support environments was also identified as a current focus of interest, which leads to the idea of "interfacing imagination", i.e., to understand how people can co-create together in domains such as design and engineering.

In the discussions that followed with the audience, automatic content generation for games (e.g., design, storytelling, characters, graphics, music and sound) was identified as a promising field for CC collaboration, with the possible sharing of responsibilities between humans and machines (from fully machine creation to mere support to human creativity).

Georgi Stojanov presented the main concepts and rationale behind *Developmental Robotics*. The idea is to resort to computational models of Piaget's notions of schema and stages to promote skill and knowledge transfer by analogy in the training of anthropomorphic physical robots. The goal is thus to find a good learning algorithm that will allow a robot to come up with a feasible high-level description of its own environment. Recognition and tracking of objects are two examples of tasks where these techniques are applied. Current robotics research approaches the problem by abstracting from the sensory-motor flux to crisp symbols suitable for manipulation. Several issues (e.g., heavy bias towards looking for structures in the senso-

ry-motor flux, high computational cost) have lead to modest results so far.

The speaker proposed to borrow inspiration from CC to reverse the current approach: that is, to set up a rich vocabulary of innate structures (e.g., squares, circles, rectangles, etc.) and behaviors, together with rich representations thereof, and to associate them with low-level sensory-motor flow in a weakly supervised manner, in a process of *Projection* (related to the Piagetian notion of *Assimilation*). Further discussion with the audience highlighted a need to explore creative behavior to improve cognitive development; highlighted the use of a developmental approach to implement basic creativity components such as curiosity, pretense play, cognitive fluidity and imitation; and highlighted the need to explore structural and functional analogy for creativity, as used by children playing with bricks as imaginary cars and planes.

Bob French proposed the exploration of the concept of *Computational Temperature* in CC. In his view, CC results from continuous interaction between bottom-up ideas and top-down constraints, complemented with information chunking and decision-making mechanisms. For the latter, the speaker proposed a *temperature* function, defined as a measure of how sure we are of a specific choice. As highlighted by the audience, it is worth contrasting the concept of temperature with other concepts in vogue in CC, such as entropy.

Ursula Martin described a project that seeks to explore the information provided by a blog, called *Polymath*, where mathematicians collaborate “to solve important and difficult mathematical problems by coordinating many mathematicians to communicate with each other on finding the best route to the solution” (see http://en.wikipedia.org/wiki/Polymath_Project). The speaker argued that the analysis of the information provided by the collaborative process gives new opportunities for studying mathematical practice and for learning how mathematicians solve problems. Such knowledge may lead to the development of creativity-support computer tools for mathematicians, and this was acknowledged as an opportunity for CC research. The importance of computer-supported social environments such as the above blog for the advance of mathematics was also stressed. The speaker finished her intervention by advocating for a greater involvement of women in CC.

Stefan Rüger presented research towards the development of classifiers for assessment and prediction of the aesthetics of photographs by using machine-learning (ML) techniques. The speaker presented these methods in the context of suitable datasets, for selecting features (global and local), and for comparing the suitability of three ML techniques to the task. The comparison of results with other works was positive. The relevance to CC of automatically predicting the aesthetical value of photographs was acknowledged. The audience also pointed out the strong relationship to existing work on aesthetical evaluation in art and music.

3.5. Report of Session 4 (Moderator / Rapporteur: Martin Znidarsic)

Martin Znidarsic moderated the final session of the day, and noted the following points in his subsequent report to the meeting on Day 2.

Agnar Aamodt presented his view of computational creativity opportunities from the perspective of research in AI and knowledge-based systems, and in particular that of Case-Based Reasoning (CBR). Such systems, he noted, employ a particular pipeline or cyclic process: *retrieve-reuse-revise-retain*. CBR systems exploit the intuition that “*similar problems have similar solutions*”. Agnar noted that there is considerable potential for creativity in both data-intensive CBR and in knowledge-intensive CBR, where creative solutions are needed to explain and to justify a system’s actions to its users. Additionally, CBR has an obvious relationship to creative analogy-making, as the latter can be viewed as cross-domain CBR.

Questions from the audience noted that the explanation task is related to work on narrative creation, while the treatment of analogies as cross-domain CBR is also a potential field of methodology reuse.

Julian Togelius strongly advocated the case for computational creativity in computer games. Games are complex multifaceted objects that bring together graphics, music, sound, levels, maps and stories, and also increasingly rely on personalization. The game domain is thus rich in opportunities to exploit computational creativity. Julian noted that several of the key challenges are still very new and still under-researched. The games industry is also in great need of large amounts of creative content, which may be automatically generated.

Georgios Yannakakis ran with the topic of computer gaming and pointed to the importance of properly orchestrating of all the previously mentioned facets of game design. These are artifacts that are rich in interaction: multiple collaborating (and competing) players that frequently generate (and even sell) their own game content. There is a place for computational creativity both within experimental games research and for artifact design in computer games. Some specific examples of relevant EC projects were presented. **C2Learn**: mixed initiative (human-machine) co-creativity. Evaluated through Sketchbook. Examples of map creation and construction of objects were also shown, as well as some illustrative experiments in co-design done with cooperation of children.

Audience questions highlighted the following points in this talk: We can only agree that computer games are a promising playground for computational creativity. It is also interesting to think of computer games as experimental environments for computational creativity. What was shown in the talk is more a human-machine *co-production* than true *co-creation*. Georgios responded that co-creation should here be taken as generation, not as creativity.

Rafael Perez y Perez provided an explanation of the *Engagement* (e.g. day dreaming) & *Reflection* (e.g. evaluation) cyclic model (ER) of narrative production. He presented a computer model of this kind, MEXICA, which creates original stories involving Aztec protagonists. Experiments in collaborative production (combining two processes of this kind) were presented. One of more important inputs into MEXICA is a corpus of past stories. Rafael's group is concerned with automatic story evaluation. He also highlighted the need for the automated generation of images to accompany a computer-generated story. The ER model was this also applied to the domain of visual design to understand the generation of visual compositions. Rafael also highlighted the importance and the influence of social norms on storytelling.

Audience questions further explored the obvious relation to narrative-oriented CC work.

Francisco Fernandez Vega described his efforts to foster collaboration between computer scientists and practitioners of the fine arts. Examples were shown of applied interactive genetic programming for families of terrains for computer games. Francisco listed several important issues facing the collaboration of computer creativity and art community. Interactive implementations of genetic algorithms can put the human in the loop as an evaluation process. An actual (and quite laborious) experiment of human-developed populations of transformations from two images was presented in this talk.

Audience questions highlighted the relation with computer game development in CC (e.g. terrain production) and other fields where genetic algorithms are used (e.g. paintings).

Tijl De Bie showed his *ScoreAHit* system, a tool for musical "hit" prediction. This tool has gained a considerable amount of media attention, and modest (but statistically significant) success has been achieved with it. *ScoreAHit* uses features of only six kinds. A sample study was presented in which lyrics were analyzed together with the actual audio stream.

Tijl also addressed the topic of *surprising-ness* in data-mining. Standard approaches target objective interesting-ness, but Tijl's approach also targets subjective interestingness, which is modeled as a function of both the pattern and the user.

Audience questions noted that the **ScoreAHit** methodology is of use to, and can benefit from, other CC work on audio/music analysis. The targeting of subjective measures of performance has a strong connection with the planned evaluation models to be used in the EC project WHIM (the What-If Machine).

4. Abstracts

Each invited attendee was requested to submit a tentative abstract of their presentation to the event. These abstracts were gathered into an information booklet that was distributed to all attendees *before* the event, so they might adapt their presentations accordingly and/or prepare appropriate questions and demonstrations. We reprint the submitted abstracts, in a largely unedited form, below.

Computational Design and Visualization Lab

Penousal Machado, University of Coimbra, Portugal

This presentation will make a short overview of on-going research at the CDV Lab. of the University of Coimbra, including topics such as: computational art and design, computational aesthetics, nature-inspired computing, information visualization.

EMRG /research between art, design & science

Lucas Nijs, Sint Lucas School of Arts, Antwerp, Belgium

EMRG research activities include individual PhD dissertations funded by the St Lucas University College of Art and Design and the University of Antwerp, cutting-edge art & science projects with competitively acquired funding, and shorter projects involving external partners and companies.

EMRG develops its own software, e.g. Nodebox1, NodeBoxOpenGL, NodeBox3, NodeBox MAAK and Pattern to enable artists and/or scientists to develop projects otherwise inaccessible to them without prior programming skills. In the latest version, NodeBox MAAK, it combines a node-interface and a programming interface to enable both non-programmers and programmers in creating art, design or data visualisations. NodeBox MAAK is a web-based application in JavaScript and will allow for easy Web services integration (e.g. Pattern).

e-David painting robot

Oliver Deussen, University of Konstanz, Germany

Based on an one-arm industry robot we built a painting machine that is able to create paintings with acrylic paint. The machine supervises itself and is able to create even subtle details. In my talk I will speak about our motivation for building the machine and our experiences with art production

Oliver was be unable to attend the Contact Forum due to an illness so his talk will not be scheduled.

A Computational Model of Analogical Reasoning in Dementia Care

Konstantinos Zachos, City University, London, UK

A practical application of a computational model of analogical reasoning to a pressing social problem, which is to improve the care of older people with dementia. Underpinning the support for carers for people with dementia is a computational model of analogical reasoning that retrieves information about cases from analogical problem domains. The model implements structure-mapping theory adapted to match source and target domains expressed in unstructured natural language. The model is implemented as a computational service invoked by a mobile app used by carers during their care shifts.

Emergence, synchronicity and generative processes in visual and sound creativity

Jaime Munarriz, Universidad Complutense de Madrid

Generative audio-visual systems based on:

- A-life : autonomous agents, morphology (form/function), evolution, connections
- Node networks : pulses, micro-sequencers, synch, evolving morphology
- Emergence (desired)

- Generative language: collage/remix, tweeter derive, Markov chains
- Associative content: text / sound / images. Direct - conflicting – evocative. Evolutionary systems as an associative content creation mechanism for live performance.

Analogy, Concept Blending, and Computational Creativity

Tarek Besold, University of Osnabruck, Germany

Analogy and concept blending are often considered crucial parts of concept invention and creative processes in general. In this presentation I will shortly outline the basics of the Heuristic-Driven Theory Projection (HDTP) computational analogy framework, show how the approach can be expanded to also perform concept blending, and provide a rough sketch of the computational cognitive model envisioned to serve as core for the COINVENT project.

Computational Creativity through Conceptual Integration

Mark Turner, Case Western University, USA

I will sketch an approach to computational creativity through conceptual integration, also called "blending," as outlined in Turner, Mark (2014) , *The Origin of Ideas: Blending, Creativity, and the Human Spark* (Oxford University Press).

Creativity in Metaphor and Mind

John Barnden, University of Birmingham, UK

I will comment on various types of creativity in metaphor, and mention how the ATT-Meta approach to metaphor understanding handles some types. One key feature of the approach is the downplaying of the importance of creating new analogical mappings. Another key aspect is the handling of metaphor compounds of various different sorts. I like the idea that metaphor is used within the mind, not just in communication, and therefore could/should be within AI systems' minds too. Metaphor-in-mind may contribute to creativity more broadly than implied by theories that implicate analogy creation in creativity.

Creative Natural Language Processing

Carlo Strapparava, University of Trento, Italy

Dealing with creative language and in particular with affective, persuasive and even humorous language has often been considered outside the scope of computational linguistics.

Nonetheless it is possible to exploit current NLP techniques starting some explorations about it.

We briefly review some computational experiences about these typical creative genres.

Computational Stylometry

Walter Daelemans, University of Antwerp, Belgium

I will give a brief overview of work at CLiPS (University of Antwerp) on Computational Stylometry: detecting psychological and sociological properties of the author of a text (age, gender, personality, education level, psychological health etc.) on the basis of linguistic properties of the text. I will also discuss some possible applications in Computational Creativity.

Universality and Creativity in Language: Author profiling and Irony

Paolo Rosso, Universitat Politècnica de Valencia, Spain

I will give a brief overview of work at NLE Lab (PRHLT research centre of the Technical University of Valencia), especially focussing on what we did in irony detection in social media and on what we started recently doing with respect to author profiling in social media in order to discuss how the use of language, including figurative devices such as irony, varies among classes of authors and depends on authors' demographics such as age and gender.

Story generation and co-creation with the Virtual Storyteller

Mariët Theune, University of Twente, The Netherlands

The Virtual Storyteller is an emergent narrative system, in which stories emerge from the interactions of autonomous intelligent agents in a simulated story world. The actions of the agents are captured in the form of a causal network, from which story texts can be generated. Human players can take over control of the characters, enabling a form of co-creation with the system. We have performed experiments with children interacting with the system.

Interfacing Imagination

Licínio Roque, University of Coimbra, Portugal

This presentation will give a quick overview of our on-going research in game design and media design, including topics such as game design, sound design, author-centric gameplay generation, procedural content generation in games, and personalized game-based learning, the goal of participatory media and how it relates to creativity and the idea of interfacing imagination.

Applying Computational Creativity Approaches to Developmental Robotics

Georgi Stojanov, American University of Paris, France

In Developmental Robotics the main goal of the researchers is to find a good learning algorithm which will allow an anthropomorphic physical robot (usually highly complex system with high-dimensional sensory-motor space) to come up with a feasible high-level descriptions of their environment. These algorithms tend to be heavily biased towards looking for structures in the sensory-motor flux, very expensive computationally, because of the high dimensionality of sensory-motor space and lacking significant collection of innate structures and/or biases.

In this context, our proposal is to reverse the current approaches in Developmental Robotics, and just like in Computational Creativity, provide the agent with a rich library of biases and behaviours (preferably not computationally expensive) which the agent will use to impose a structure on the sensory-motor flow in a weakly supervised way. Thus, instead of only looking for structures in a bottom up level (starting with the raw sensory-motor data) and essentially be at mercy of the outside world, the agent will be co-creating its various ontologies. We call this process projection and it can be related to the Piagetian notion of assimilation. There is a huge body of research from Developmental Psychology which suggests the plausibility of this approach. Ideally, the agent will have the possibility to switch from one ontology to another, depending on its goals and, more broadly, its internal state.

Computational Temperature: the most underexploited mechanism of computational creativity

Bob French, CNRS/University of Burgundy, France

Temperature almost certainly takes the cake for being both an incredibly important mechanism for computational creativity, yet at the same time, an incredibly overlooked one. We will discuss computational temperature, why it is important to computational creativity, and how it can be implemented easily in programs involving any kind of decision making. A brief example or two will be given of how to put this mechanism to use.

Mathematics and creativity: an empirical approach

Ursula Martin, Queen Mary University of London, UK

For centuries, the highest level of mathematics has been seen as an isolated creative activity, to produce a proof for review and acceptance by research peers. Mathematics is now at a remarkable inflexion point, with new technology radically extending the power and limits of individuals. "Crowdsourcing" pulls together diverse experts to solve problems; symbolic computation tackles huge routine calculations; and computers, using programs designed to verify hardware, check proofs that are just too long and complicated for any human to comprehend.

Yet these techniques are currently used in stand-alone fashion, lacking integration with each other or with human creativity or fallibility. “Social machines” are new paradigm, identified by Berners-Lee, for viewing a combination of people and computers as a single problem-solving entity.

Is it possible to measure the aesthetics of photographs?

Stefan Rüger, Open University, UK

This presentation looks at methods to recognise one aspect of human creativity, the algorithmic assessment of visual aesthetics of photographs. Once this can be done to a suitable degree of satisfaction, the computational creation of visual photographs or visual artwork, is a big step closer, for example through genetic algorithms that use the computational aesthetics model as fitness function. We will briefly look at methods to derive suitable high and low-level features from photographic theory and from machine learning that allow to assess the photographic quality of an image in terms of simplicity, realism and compositional principles.

Computational Creativity in Games

Julian Togelius, ITU Copenhagen, Denmark, Georgios N. Yannakakis, University of Malta, Malta

I discuss the opportunities for computational creativity in computer games, and in particular link thinking about computational creativity to the now substantial volume of on-going work on procedural content generation in games. Creativity is meaningful in the context of audio, graphics, levels, game rules and gameplay itself, but even more so in the context of complete games which are multifaceted artefacts of considerable complexity and artistic value. Moreover, I will argue that games is one of the few domains where there is a clear commercial case for computational creativity.

I will start giving a general introduction and Georgios talks about some more specific project.

The ER Model: from plot generation to visual composition

Rafael Pérez y Pérez, Universidad Autónoma Metropolitana, Mexico

My work on CC has mainly focused on plot generation based on the ER Model. In the last years I have also started to develop computer models for visual composition. In this presentation I will summarize 15 years of research on CC and I will describe our current efforts in the production and evaluation of narratives and visual compositions.

Experimenting Human Creativity by means of Unplugged Evolutionary Algorithms

Francisco Fernandez Vega, University of Extremadura, Spain

It is not easy to find examples of artistic collaboration aiming at generating an artwork that smoothly integrates individual influences from all of the artists. This experience, that embodies Evolutionary Algorithm (EA) rules, has allowed a team of artists to generate a collective work; Yet, each of the individual artwork is the result of individual artist characteristic creative experience that helps the team to enhanced the creative process: an iterative process that includes concepts such as crossover and mutation, has helped artist to express their creativity in a collective framework. This specific unplugged and heterodox version of an Evolutionary Algorithm provides new means for artist inspiration while allowing researchers more deeply studying the underlying principles of human creativity from an evolutionary perspective.

Therefore, this artistic experience shows how artists inspiration can benefit from an EA based methodology while artist's creative methods, knowledge and experience expressed along the work, may help in the future to develop better EAs devoted to art and design.

The potential of memorized experiences for creative problem solving and learning

Agnar Aamodt, Norwegian University of Science and Technology, Norway

Memory-based, or case-based, reasoning makes use of past, concrete experiences in understanding present situations and solving current problems. Several case-based approaches to creativity have been suggested, including the tweaking of a specific experience or pattern, and the combining of case-specific and generalized knowledge in novel ways. The talk will briefly summarize parts of this research and suggest some important questions to guide further investigation.

Computational creativity and surprise in data mining / Music informatics and computational creativity

Tijl De Bie, University Of Bristol, UK

In the first half of this presentation I briefly will talk about my work on formalising interestingness of data mining patterns by quantifying the amount of surprise this pattern elicits in the data miner. I will speculate about possible connections between creativity and surprise, and thus how this work could inform computational creativity research.

In the second half, I will talk about my work on music informatics, in particular on past work on quantifying the potential of a song to become a chart hit, and on on-going work to create an artificial DJ.

4. Financial Information

The following table provides a high-level breakdown of the major costs of the event. In all the event was successfully staged within the original allocated budget, in large part due to the Trojan efforts of volunteers and support staff at UCM.

Description	VAT-free (€)	VAT (%)	Total (€)
Dinner in <i>La Cueva</i>	1050€	10%	1155 €
Dinner in <i>Hotel Botánico</i>	1728 €	10%	1900 €
Visit to the Monastery	112 €	-	112€
Miscellaneous costs	23.10 €	-	23.10 €
Taxis	85 €		85 €
Housing at Real Colegio	3797.27 €	10%	4177 €
Buses	269.38 €	10%	296.32 €

Total local costs (without VAT) for the event came to 7065 €, or 7749€ with 10% VAT. Total travel costs for all attendees came to an additional 8597€, yielding a total overall cost for the contact forum of 16.346 €.

5. Conclusions

The Contact Forum proved to be an enriching experience for all participants. The talks provided very interesting material in themselves and triggered interesting discussions. In addition, frequent coffee breaks allowed for extended interaction between the participants that facilitated an exchange of comments and impressions beyond the moderated exchanges that were part of each session. To further enhance this effect, ice-breaking activities in the form of simple creativity-themed games were organized during the social mixer and dinner on Friday evening, and these prompted significant informal interactions between participants. After dinner on Saturday a further activity was scheduled to help participants explicitly identify possible lines of collaboration with each other. As a result of this activity, a number of expressions of intent concerning collaborations between participants were collected.

Finally, all participants expressed an interest in being informed of further activities related to Computational Creativity, and gave permission for their names to be added to a mailing list for project-related information. The presentations used by all participants were collected and they will be made available on the PROSECCO web site.