

# Workshops Held at the Ninth Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE): A Report

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■ *The Ninth Annual AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE) was held October 14–18, 2013, at Northeastern University in Boston, Massachusetts. Workshops were held on the two days prior to the start of the main conference, giving attendees a chance to hold in-depth discussions on topics that complement the themes of the main conference program. This year the workshops included the First Workshop on AI and Game Aesthetics (1 day), the Second Workshop on AI in the Game Design Process (1 day), the Second International Workshop on Musical Metacreation (2 day), and the Sixth Workshop on Intelligent Narrative Technologies (2 day).*

The goal of first workshop on AI and Game Aesthetics was to address aesthetic qualities of games, such as believability, interestingness, and visual appeal, from a computational perspective. The goal of the Second Workshop on AI in the Game Design Process was to encourage the use of AI in enhancing the process of designing games and to enable new kinds of games that would be unreachable without intelligent automation. The Second International Workshop on Musical Metacreation brought together leading researchers, and practitioners investigating the design, development, and evaluation of computational systems for the autonomous generation of music. This report summarizes and highlights these three workshops.



**The Twenty-Seventh Annual Conference on Innovative Applications of Artificial Intelligence**

*The First Winter IAAI Conference*  
**January 25–29, 2015    Austin, Texas USA**

*David Gunning, Conference Chair*  
*Peter Z. Yeh, Conference Cochair*

**[www.aiide.org/iaai15](http://www.aiide.org/iaai15)**

### The First Workshop on AI and Game Aesthetics

The interactive nature of games sets them apart from other popular media such as television, film, and music. Games are unique in that their components (from the rules and goals of the game to the appearance of avatars and their dialogue) must encompass both functional and aesthetic prerequisites. Artificial intelligence usually focuses on the functional quality of such game components, for example, ensuring that an avatar can traverse a level in minimal time or that AI can win over any human in a strategy game. However, there are many different aesthetic considerations that artificial intelligence can address, such as which AI behaviors maximize player satisfaction while still being challenging, or which weapon, avatar, or level would appeal to a particular player.

The Workshop on AI and Game Aesthetics provided a forum to discuss the development both of software and of computational models pertaining to the subjective and aesthetic qualities of games, such as creativity, believability, and challenge. The workshop consisted of the presentation of five accepted papers and an invited talks session, which brought in four pieces of related work. The proceedings papers covered a wide spectrum of topics, from the aesthetic qualities of puzzle configurations to the symbolic meaning of content in games. While targeting different domains such as dance or computer-aided design, each paper put forth a computational model of aesthetic quality, including models constructed from theory, models learned from game data, and models tailored to specific users. The invited talks session included papers accepted as posters to the AIIDE conference as well as recently published work; the invited talks were well-received as a complement to the proceedings papers and covered several related areas that stimulated discussion.

A theme of contested subjectivity emerged from the workshop, as many submissions discussed com-

peting standards for subjective qualities of games, such as beauty or challenge. Granted that studying the subjectivity of game aesthetics was one of its main goals, future versions of the workshop will explore this theme and help foster further discourse. The workshop was accompanied by an evening event, DAGGER, which drew together local game developers and academic research projects. Acting both as an exhibition and as an informal gathering, the DAGGER event allowed attendees to interact directly with a wide variety of game types and technologies, as well as with their developers. As events such as DAGGER help bridge the gap between theoretical research and practical applications of it, similar events are planned to be held alongside the workshop in the future.

Antonios Liapis, Michael Cook, and Cameron Browne served as cochairs of this workshop. The papers of the workshop were published as AAAI Technical Report WS-13-19.

### The Second Workshop on AI in the Game Design Process

Game AI has grown beyond the specific application AI techniques to controlling opponents and other virtual characters in a game. There are many problems that AI is well suited to solve that arise from deeper integration of AI into the game design process itself. How can retrieval, inference, knowledge representation, learning, and search loosen bottlenecks during design? How can AI be put to use in ideation, prototyping, feedback, visualization, synthesis, and verification of designed artifacts? How can AI provide assistance to designers or share the creative responsibility?

The Workshop on AI in the Game Design Process embraced interdisciplinary approaches to game AI that are true to authentic game design concerns, operating outside of a strictly scientific perspective. The theme of the workshop, which grew from the work-

shop's first iteration held in 2011, asked participants to reflect on how to provide real-time and interactive feedback to designers during the design process. In response, participants shared systems and position papers that aligned to four main themes: (a) real-time visual feedback during design, (2) exploratory tools for designers, (3) using declarative knowledge representation and constraints, and (4) player modeling and analytics.

We saw a system that made emergent behavior visible on an interactively editable map, and heard a proposal for generic infrastructure for continuous game-play trace sampling that would keep these design-time views up to date. We saw a design exploration tool for a commercial puzzle game that leveraged exhaustive search techniques as well as a simulation-based player behavior preview tool integrated into the widely used Unity game development environment. We heard about how to use formal ontologies to validate game implementations, and saw the use of grammars and other structural constraints for controllably shaping the space of a map generator's output. We saw and discussed the use of machine-learning techniques, in contact with game analytics, for modeling player behavior and using that to provide data-informed feedback on novel designs.

Following the morning paper presentations, the afternoon session for the workshop was devoted to a lively group discussion on a variety of topics of interest to the community, which converged upon three main discussion groups addressing: evaluation and generalization, player modeling, and automated QA as a service. Outcomes from this discussion included a set of future research directions in how to evaluate creative systems, what success means for such systems, and how to design new AI systems whose role in the design process is that of a colleague with the human designer. There were also several suggestions for concrete systems that could be built, including a dynamic matchmaking system that would reason over how individuals cooperate in multiplayer online battle arena (MOBA) games in order to ensure that teams will cooperate and have fun together. Finally, there was a suggestion for creating a cloud-based automated testing service that would make computationally intensive, AI-based design automation accessible to a wider audience.

Adam M. Smith, Gillian Smith, and Mark J. Nelson cochaired the workshop. Papers from the workshop were published as AAAI Press Technical Report WS-13-20.

## The Sixth Workshop on Intelligent Narrative Technologies

Narratives are a pervasive aspect of human culture and are one of the core frameworks people use to view and understand the world. People use narratives for social interaction, education, and entertainment.

Narratives as forms of knowledge representations have long held interest among AI and cognitive science researchers alike. Imbuing technologies with narrative intelligence to represent and reason on narratives holds great promise. Narrative technologies deepen our understanding of the human mind, and enhance computational systems to more naturally communicate with human users. Further, these technologies augment the human capacity for expression to enable new forms of narrative experiences.

The Workshop on Intelligent Narrative Technologies aimed to advance research in artificial intelligence for the computational understanding and expression of narrative. Previous meetings of this workshop have brought together a multidisciplinary group of researchers including computer scientists, psychologists, narrative theorists, media theorists, artists, and members of the interactive entertainment industry. From this broad expertise, the workshop focuses on computational systems that represent, reason about, adapt, and perform interactive and non-interactive narrative experiences. This includes fundamental research in relevant fields such as natural language processing, believable agents, common-sense reasoning, and human narrative experiences.

Creating narratives through authoring tools and narrative generation was a major theme at the 2013 workshop. Authoring tools augment human capabilities for crafting narrative experiences. Tools for validating interactive narratives (Kim Dung Dang and Ronan Champagnat) and automatically converting narrative events into virtual world actions (Alexander Shoulson, Mubbasir Kapadia, and Norman I. Badler) demonstrated the range of methods for supporting authors.

Narrative generation investigates how AI systems can automatically create all or part of a narrative. The workshop participants learned methods for generating aspects of narratives including character-centered narrative plots (Bilal Kartal, John Koenig, and Stephen J. Guy), language expression for narratives (Marilyn Walker, Jennifer Sawyer,Carolynn Jimenez, Grace Lin, Elena Rishes, and Noah Wardrip-Fruin), and cognitive models of narratives (Justin Permar and Brian Magerko).

Text mining and natural language processing emerged as prominent new themes at this workshop. Online blogs and social media provide a massive repository of narratives and a rich source of knowledge for understanding and creating narratives. Several presenters discussed methods for mining personal narratives from the web (Andrew Gordon, Luwen Huangfu, Kenji Sagae, Wenji Mao, and Wen Chen) and deriving formal features of narratives such as narrative clauses (Elahe Rahimtoroghi, Reid Swanson, Marilyn A. Walker, and Thomas Corcoran) or character roles (Josep Valls-Vargas, Santiago Ontanon, and Jichen Zhu).

One of the workshop's key strengths is bringing to-

gether researchers from diverse disciplines. The workshop featured prominent discussions of how literary and cognitive models are used in narrative technologies. Michael Mateas (University of California, Santa Cruz) delivered a keynote lecture highlighting a wealth of real-world narrative craft practices that could be explored in narrative technologies. His speech also emphasized the need for intelligent narrative technologies researchers to build playable systems.

The Workshop on Intelligent Narrative Technologies also explored challenges of knowledge engineering in narrative through a panel on encoding the story of the *Iliad* in the PDDL planning domain language. Three teams discussed their experiences in encoding the *Iliad*. Panel members discussed issues in the application of knowledge representation for interactive storytelling and other narrative technology applications. The domains created will be available online in the future.

Marc Cavazza (Teesside University), Mei Si (Rensselaer Polytechnic Institute), and Alexander Zook (Georgia Institute of Technology) organized the workshop. The workshop papers were published as AAAI Press Technical Report WS-13-21.

## The Second International Workshop on Musical Metacreation

There are many forums presenting the advances in the practice and theory of computer music, or computational creativity. However, no academic peer-reviewed event focuses solely on generative music. As explicit in its name, this new workshop series was created to fill this gap, with a strong focus on musical metacreation, that is, endowing software with musical creativity. Building on the success of the first edition, the Second International Workshop on Musical Metacreation was extended to a two-day event that marked a significant step toward the formation of an international research network focused on the automatic generation of music, and its application to professional music creation, new music compositions and performance, interactive game music, and the like.

While open to the usual problems covered in computer music, such as providing computational models for music perception, representation, and cognition, the workshop focused on the challenges specific to generative music. For example, the composition problem is to generate a composition (often represented as a score), while the interpretation problem is to generate an audio rendering of a given composition. Systems that address these two canonic problems or any related ones cover the whole spectrum between: (1) symbolic computing vs. raw audio signal processing, (2) corpus-based systems that have been exposed to musical compositions or interpretations versus systems that generate from first principles,

computational heuristics, and expert knowledge, (3) individual vs. collective musical creativity, (4) entirely generative systems vs. interactive computer-assisted musical creativity.

In its second iteration, the workshop included 21 contributions selected through peer reviewing out of 34 submissions. Technical papers, position papers, and demonstrations were evenly spread across theory and practice. Topics included deep learning for music, computational music theory, the evaluation and aesthetics of automated music generation, as well as exploration of the various ways to interact with, or control, such generative systems. As a novelty in this edition, two industrial talks were included in the program that helped shape a discussion on how best to integrate these generative systems into existing music and audio production software.

As the field matures, more and more generative music systems get applied and meet their audience. This is for example the case with the MUME-WE concert series, as well as with the Algorave movement. One of the main outcomes of this year's workshop was a question regarding the best ways to present and frame these systems when they meet their audience, whether it is in live shows, on records, or as part of software systems.

This workshop was cochaired by Philippe Pasquier, Arne Eigenfeldt, and Oliver Bown, and the proceedings of the workshop were published as AAAI Press Technical Report WS-13-22.

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