

The 13th AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment

Brian Magerko

*With workshop contributions by Julio César Bahamón, Michael Buro,
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■ *The 13th AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE 2017) was held at the Snowbird Ski and Summer Resort in Little Cottonwood Canyon in the Wasatch Range of the Rocky Mountains near Salt Lake City, Utah. Along with the main conference presentations, the meeting included two tutorials, three workshops, and invited keynote talks. This report summarizes the main conference. It also includes contributions from the organizers of the three workshops.*

The 13th AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE 2017) was held at the Snowbird Ski and Summer Resort in Little Cottonwood Canyon, Utah, on October 5–9, 2017. AIIDE 2017 is the 13th annual conference and the 16th overall event sponsored by AAAI on the topic of AI and interactive entertainment. Brian Magerko served as the general chair of the conference. Jonathan Rowe served as the conference's program chair.

This year's offering focused on a special theme for the conference: Beyond Games. This theme suggested a broadening of the traditional games research to include a look at the relationship between artificial intelligence and computational media for entertainment, art, and expression. Along with the more traditional game AI topics addressed by accepted submissions, this year's work also featured several innovative forms of interactive digital entertainment, such as AI in improvised theater, procedural textile generation, 3D Lego model generation, and social robots. These works point to the broadening of our field as the techniques in game AI, the arts, and games continue to evolve, intermix, and influence each other.

The conference began with two tutorials (Deep Learning for Interactive Digital Entertainment; Answer Set Programming) and three workshops (Artificial Intelligence for Strategy Games; Experimental AI in Games; Interactive Narrative Technologies). Summaries of the three workshops, written by the workshop organizers, are included at the end of this report.

The main conference opened each morning with invited keynotes on the conference theme, Beyond Games: Mary Lou Maher (University of North Carolina, Charlotte), Jichen Zhu (Drexel University), and Marc Bellemare (Google Brain). The keynotes touched on a variety of topics, from curiosity, to the relationship between our field and design practice, to deep learning for game AI.

The conference program featured multiple tracks: Procedural Creativity, Agents and Robots, Narrative, and Machine Learning. It also included the announcement of the annual *StarCraft* AI competition winner, REF. The second day of the conference featured a special Founder's Panel, which invited the original organizers of the conference to join in a conversation about the past, present, and future of the conference and the field. Participating were Jonathan Schaeffer (University of Alberta), John Laird (University of Michigan), Ian Davis (Rockstar New England), Michael van Lent (Soar Technology), and R. Michael Young (University of Utah).

The acceptance rate of AIIDE 2017 was 25 percent for full oral presentations, 50 percent for poster presentations. We had an attendance of 109 registered attendees, a 25 percent increase from the previous year. Of particular note was the clear diversity of scholars in attendance, especially across gender, compared to the earlier years of the conference. Of the 19 oral presentations, at least 9 of them had one female coauthor, including 2 articles with a female senior author.

AIIDE 2017 marked the first inclusion of a Code of Conduct as part of the official conference. This document was adapted from the Code of Conduct of the ACM Special Interest Group on Computer Human Interaction and intended as a direct response to current issues faced in the games research community and beyond. Its intention was to create a "safe, respectful, and harassment-free conference environment for everyone involved" and to provide contact points for grievances.

Several awards are traditionally given at AIIDE conferences. The Best Paper award this year went to Edward J. Powley, Peter Cowling, and Daniel Whitehouse for their paper *Memory-Bounded Monte Carlo Tree Search*. The Best Student Paper award was received by Joseph Osborn, Brian Lambrigger, and Michael Mateas for their article *HyPED: Modeling and Analyzing Action Games as Hybrid Systems*. Finally, the Best Reviewer award went to cowinners Alex Zook and Stephen Ware.

The AIIDE Doctoral Consortium returned to the conference after a hiatus in the previous year. It featured ten presentations from PhD students on their current research, with a senior researcher-mentor providing guidance and feedback on their work. It also featured the Eighth Annual *Starcraft* AI Competition. Participants were given the task of building the best performing AI system for the popular real-time strategy game *StarCraft Brood War* (Blizzard Entertainment). The goals of the competition are to provide a testbed for real-time AI systems and to promote game AI research by exhibiting AI techniques such as scripting, planning, optimization, spatial reasoning, and opponent modeling in a fast-paced popular video game. This year's competition winner was Chris Coxe, a software developer from the UK and Australia.

The conference was generously sponsored by the *Artificial Intelligence Journal* and NSF Grant IIS #1747455. Thanks go to the organizing committee and to the research community at large for making this event happen. From myself and the organizing committee also — a hearty thanks to Keri Harvey, in her final year at AIIDE, who has dedicated countless hours in service over the years to this and other AAAI conferences.

Artificial Intelligence for Strategy Games Workshop

Strategy games and in particular real-time strategy (RTS) games are complex real-time war simulations in which players have to manage economies, build structures and armies, and try to win by destroying all opponents' buildings. RTS games are interesting from an AI point of view because their decision complexity — generated by vast maps, large unit numbers, concurrent durative actions, and limited state observability — precludes solutions based on brute-force search and forces us to consider problem decompositions and abstractions. This workshop's goal was to bring researchers interested in pushing the state of the art of AI systems for strategy games together to discuss current and future research directions that can get us closer to constructing programs able to defeat the best human game players. The first workshop on RTS game AI was organized at AIIDE 2012. It attracted 20 attendees and featured 9 paper presentations and a discussion that led to fruitful collaboration. This year, our workshop included 12 attendees. Three papers were presented, and the results from this year's AIIDE *StarCraft* AI competition and this year's IEEE-CIG microRTS competition were discussed. Additionally, a show and tell session took place, where attendees presented their latest work on strategy game AI. A discussion session focusing on the research agenda for the next few years closed the workshop.

The papers this year focused primarily on *StarCraft*.

The first paper compared recent reinforcement learning and search-based approaches for tactical combat. The second paper reported on the state of the art of bot participation in *StarCraft* AI competitions. The third paper discussed handling partial observability in game-tree search in the context of RTS games.

During the show and tell session, several workshop attendees showcased their latest work on strategy game AI, including a presentation from Unity Labs on building AI assets for Unity games, a report on the state of the art on the *StarCraft 2* API (including the new Command Center open source *StarCraft 2* bot), progress on A^* search in large branching factor domains, and open-handed solvers for card games. The workshop also featured live demonstrations of Facebook's TorchCraft deep reinforcement learning platform for *StarCraft*, and OpenBW, a new open source clone of *StarCraft* offering very interesting opportunities for research.

During the discussion session, three open challenges were identified as some of the most promising lines of research for the near future: (1) How do we learn forward models? Game-tree search algorithms like Monte Carlo tree search assume the existence of a forward model of the game that can be used for simulation, but in many cases (for example, *StarCraft* or the real world), such a forward model does not exist. How can we learn such forward models for complex environment automatically from interacting with the environment? (2) How can we guide tree search? RTS games feature enormous branching factors. How can we devise techniques to guide the search using either hand-crafted or machine learned domain knowledge? (3) How do we train neural networks to directly generate low-level actions? Recent results using deep neural networks have shown very impressive results in several game-playing tasks. However, for the case of RTS games, these techniques are still limited to low-scale combat scenarios, and more work is needed to scale them up to the complexity of the whole game.

The workshop was organized by Michael Buro and Santiago Ontañón, who also wrote this summary. The workshop papers were published as AAAI Technical Report WS-17-18.

Experimental AI in Games Workshop

The Experimental AI in Games workshop series was founded in 2014 to bridge novel, future-facing ideas about AI in games with useful, practical research demonstrated in playable experiences. We continue to embrace novel AI work that does not fit into existing venues, prototypes that explore AI in new game designs, and insights gained from historical or failed AI systems. Beyond exploring the use of AI in games, we also consider how AI can be used to enable new kinds of games and computational media. Above all, the workshop aims to provide an open, friendly, and

diverse venue for researchers and practitioners who are interested in these ideas.

New to this year's workshop, we focused on increasing communication between the academic community and the game industry. We added a new paper track, Industry Case Studies, featuring submissions from expert industry practitioners on the use of experimental game AI in their own work. Additionally, we added a new role to our program committee, industry expert, tasked with providing advice and expertise about outreach to industry — particularly independent, or “indie” — practitioners.

As was the case with previous workshops, this year's meeting featured paper presentations as well as demonstrations of existing systems in a dedicated showcase. This year, our program included ten long papers, four short papers, four demo presentations (plus four late-breaking demo presentations), and two industry case studies. Several themes emerged during the course of the meeting.

One theme echoed AIIDE's overarching theme — Beyond Games. In our call for papers, we encouraged submissions that, while not directly related to games, would be of interest to the broader community of AI practitioners in computational media, broadly construed. In the spirit of this call, Kate Compton (University of California, Santa Cruz) presented work that frames generativity beyond games, accompanied by physical ideation cards (Generominos) for prototyping generative systems. Allison Parrish (New York University) presented work on vectorial phonetics, treating our attendees to readings of delightful, phonetically expressive computer poetry during her presentation.

Additionally, we received work that pushes the boundaries of games research by extending game AI into new domains. Michael Green (New York University) presented work on automatic generation of video game tutorials. Joe Osborn (University of California, Santa Cruz) proposed tackling role-playing games as a domain for general game-playing. Michael Cook (Falmouth University) presented a new iteration of his ANGELINA system focused on emulating and generating the ideation process for automated game design.

We will also highlight the industry case studies from this year, as they were a new and well-received addition to the traditional Experimental AI in Games workshop series. Tanya Short (Kitfox Games) presented eight mechanisms for building better systems for procedural character personalities based on her experiences developing games such as *Moon Hunters* and *Shrouded Isle*. Tarn Adams (Bay 12 Games) described the systems that allow nonplayer characters (NPCs) to adopt secret identities in his game *Dwarf Fortress*.

Jo Mazeika, Kristin Siu, and James Ryan served as cochairs for the workshop this year and wrote this workshop contribution, while Tanya Short served as

industry expert. The workshop papers were published as AAAI Technical Report WS-17-19.

Intelligent Narrative Technologies Workshop

The Intelligent Narrative Technologies workshop series brings together researchers of diverse backgrounds, including computer scientists, psychologists, narrative theorists, and media theorists, along with artists, writers, and members of the interactive entertainment industry to share their latest work at the intersection of narrative and technology. This year marked the 10th meeting of the workshop series. Of the 30 high-quality submissions, 21 were accepted. Ten of the papers were accepted as long presentations, 6 as short presentations, and 5 were presented as posters. The workshop had 28 registered attendants.

The accepted papers covered quite a large set of topics relevant to the intelligent narrative technology community, ranging from NLP and annotation (sessions 1 and 2), to audience modeling and plot representation (session 3), to planning and character modeling (sessions 4 and 5). Media and languages included video, text, performance, and different storytelling paradigms, from linear and interactive storytelling to narrative role-playing games, mixed-initiative story creation, and embedded narratives. In line with this trend, posters covered topics from natural language to story visualization and generation.

One of the key topics discussed during the workshop was the use of formal approaches such as grammars, planning-based representations, and epistemic logic to model character beliefs, character intentions, and the structural properties of narratives. Work presented in this area included generative mechanisms to automatically create stories, as well as methods to produce representations of existing narratives that facilitate their use in AI research. Other areas of discussion focused on the implementation of collaborative approaches that combine human authorship and narrative generation systems in artistic expression, such as movies and communal storytelling. Work described in this area emphasized the potential advantages of cocreation of content in a setting that enables humans to express their creativity with the help of an intelligent agent. Finally, work was presented on the use of machine learning approaches, such as deep neural networks, to generate narratives. Initial results from work in this area are encouraging and point to a promising area for future intelligent narrative technologies research.

In celebration of the workshop's 10th anniversary, keynote presentations were delivered by the founders of the workshop series, Mark O. Riedl (Georgia Institute of Technology) and Brian Magerko (Georgia Institute of Technology). Riedl's keynote, Computational Narrative Intelligence: Past, Present, and

Future, began with a historical account of intelligent narrative technologies since the 1980s, then focused on the challenges faced by the community in the last decade, and ended by summarizing a complete picture of the most relevant lines of research and their results. Magerko's keynote talk, Improvisation and Embodiment in Interactive Narrative, discussed the tight relations between story construction and improvisation — and embodiment — through a set of experiments and installations aimed at cocreation of meaning and experience between humans and intelligent agents through physical actions.

The workshop also featured a narrative game jam in the afternoon of the first day. During the three-hour game jam, three teams of participants (researchers, practitioners, and students, three to five people per team) engaged in cooperatively developing innovative ways to incorporate narrative technologies into games, with the goal of deepening their understanding of how storytelling works within the medium through practice. The jam ended with a short presentation and discussion of the game design by each team.

Julio Bahamón, Rossana Daniano, Riccardo Fasone, Peter Mawhorter, Steven Poulakos, Justus Robertson, and James Ryan served as organizers of the workshop. Julio César Bahamón, Rossana Damiano, and Justus Robertson wrote this workshop contribution. The papers of the workshop were published as AAAI Technical Report WS-17-20.

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