Computers and games (CG 2022) conference report

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The 11th *Computers and Games* conference (CG 2022) was held online last year, November 22–24. It was coordinated from Maastricht University (the Netherlands), the University of Alberta (Canada) who provided the Zoom stream on which the conference was conducted, and IBM Research, Tokyo (Japan).

The bi-annual *Computer and Games* conference series is a major international forum for researchers and developers interested in all aspects of artificial intelligence and computer game playing. Earlier conferences took place in Japan (1998 and 2000), Canada (2002), Israel (2004), Italy (2006), China (2008), Japan (2010 and 2013), and Taiwan (2018). The 2020 conference was cancelled due to the pandemic. The 2022 event was held online for the first time.

The themes for this year's CG conference were widened beyond the usual traditional/mathematical games research. This is reflected in the greater number of papers on multi-player and simulation games.

The conference benefited from experience gained from the scheduling difficulties experienced during the *Advances in Computer Games* (ACG 2021) conference held online the previous year. Some attendees were inconvenienced by unfavourable session times throughout, the result of time zone challenges. Hence it was decided to stagger the schedule over the three days of CG 2022 so that session times were reasonable for most attendees and no attendee had to endure unreasonable session times every day. This appears to have worked well.

The CG 2022 programme consisted of four keynote talks and five regular paper sessions, as listed below. All papers and presentation videos can be accessed at the CG 2022 web site.[1] The proceedings will be published by Springer in their *Lecture Notes in Computer Science* series.

1. SESSION 1: CLASSIC GAMES

The opening session, chaired by Jos Uterwijk, included three papers focused on analysis of classic board games. These included "FairKalah: Towards Fair Mancala Play" by Todd Neller and Taylor Neller, "Improving Search in Go Using Bounded Static Safety" by Owen Randall, Ting-Han Wei, Ryan Hayward and Martin Müller, and "Chinese Checkers Bitboards for Move Generation and Ranking Using Bitboards" by Nathan Sturtevant.

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[1]https://icga.org/?page_id=3434

2. KEYNOTE: MATT GINSBERG *What I learned from* DR FILL

The first keynote speaker was Matt Ginsberg (Google X), introduced by Martin Müller. For more than a decade Dr Ginsberg has been developing technology for solving crossword puzzles. The talk showcased his program's superhuman performance in the 2021 American Crossword Puzzle Tournament – the technologies used, the challenges faced, and the areas for improvement.

3. SESSION 2: MULTI-PLAYER AND MULTI-ACTION GAMES

This session, chaired by Todd Neller, presented new results in a variety of multi-player, multi-action and simulation games. The papers presented were "Solving Chainmail Jousting" by Daniel Collins, "An Algorithm for Multiplayer Games Exploiting Opponents' Interactions with the Player" by Kyle Sacks and Brayden Hollis, and "Incentivizing Information Gain in Hidden Information Multi-Action Games" by Nathan Lervold, Gilbert L. Peterson and David W. King.

4. KEYNOTE: MURRAY CAMPBELL *The evolving role of games in AI*

The second keynote speech was by Murray Campbell (IBM T.J. Watson Research Centre), introduced by Jonathan Schaeffer. Dr Campbell talked about the past, present, and future research challenges posed by trying to develop strong game-playing AIs. Contrary to those who think that working on game AI is a thing of the past, a convincing argument was given that there are many interesting and important game AI challenges for our community to work on.

5. SESSION 3: SOLVING GAMES

Michael Hartisch chaired this session on solving, or at least providing more complete complexity analysis, of some classic and modern games. This session included the papers "QBF Solving Using Best First Search" by Yifan He and Abdallah Saffidine, "Oware is Strongly Solved" by Xavier Blanvillain, and "Solving Impartial SET Using Knowledge and Combinatorial Game Theory" by Jos Uiterwijk and Lianne Hufkens.

6. KEYNOTE: TAO QIN *Deep reinforcement learning for game playing and testing*

The third keynote speech by Tao Quin (Microsoft Research AI4Science), introduced by Akihiro Kishimoto. His talk covered two topics on deep reinforcement learning and games. First was a discussion of the world's best Mahjong-playing program, SUPHX, which achieved the level of 10 dan for the first time. This was followed by a presentation on the automated game-testing agent INSPECTOR, which is based on game pixels or screenshots. This tool is applicable to a variety of video games.

7. SESSION 4: MEASURING GAMES

This session, chaired by Reijer Grimbergen, explored ways of computationally measuring games for their potential to interest human players. The papers included "Which Rules for Mu Torere?" by

Cameron Browne and "Measuring Board Game Distance" by Matthew Stephenson, Dennis J.N.J. Soemers, Éric Piette, and Cameron Browne.

8. KEYNOTE: OLIVIER TEYTAUD *AI and games: New directions*

The fourth and final keynote was by Olivier Teytaud (Meta AI Research) and introduced by Cameron Browne. Dr Teytaud gave a high level overview of recent developments in AI for playing and analysing games, and new lines of research that might be pursued. It nicely complemented Dr Campbell's keynote talk.

9. SESSION 5: DECISION MAKING IN GAMES AND PUZZLES

Matthew Stephenson chaired this session which focused on the decision-making process in terms of playing games, cheat detection, and new content generation. The papers included "Improving Computer Play in Skat with Hope Cards" by Stefan Edelkamp, "Batch Monte Carlo Tree Search" by Tristan Cazenave, "Human and Computer Decision-Making in Chess with Applications to Online Cheat Detection" by Thijs Laarhoven and Aditya Ponukumati, and "Procedural Generation of Rush Hour Levels" by Gaspard de Batz de Trenquelleon, Ahmed Choukarah, Milo Roucairol, Maël Addoum, and Tristan Cazenave.

10. CONCLUSION

CG 2022 had 227 registered attendees, down from the 399 that attended ACG 2021. We are not sure why attendance dropped, given the quality of the conference program. Regardless, the move online has greatly extended the reach of the ICGA, as previous face-to-face conferences averaged only 40 attendees. Unfortunately, this has not translated into an increase in ICGA membership.

The staggered schedule received positive feedback from attendees. By having one day scheduled for each of the major geographical regions of attendees – Europe, North America, and Eastern Asia – we were able to make attending talks more convenient.

The *Computers and Games* conference alternates annually with the *Advances in Computer Games* conference. The next ICGA conference will be ACG 2023, online November 28-30. The proceedings will be published by Springer in their *Lecture Notes in Computer Science* series. Start preparing your papers!