PREFACE

These joint proceedings contain the papers of the Computer Games Workshop (CGW 2016) and the General Intelligence in Game Playing Agents (GIGA 2016) workshop, which were both held in New York, USA. These workshops took place on July 9 and 10, 2016, respectively, in conjunction with the 25th International Conference on Artificial Intelligence (IJCAI 2016). These two workshops reflect the large interest in AI research for games.

The Computer and Games Workshop series is an international forum for researchers interested in all aspects of artificial intelligence (AI) and computer game playing. Earlier workshops took place in Montpellier, France (2012), Beijing, China (2013), Prague, Czech Republic (2014) and Buenos Aires, Argentina (2015). For the fifth edition of the Computer Games Workshop, 17 submissions were received in 2016. Each paper was sent to three reviewers. In the end, 11 papers were accepted for presentation at the workshop, of which nine made it into these proceedings. The published papers cover a wide range of topics related to computer games. They collectively discuss five abstract games: Breakthrough, Go, Hex, SameGame, and Werewolf. Additionally, one paper deals with optimization problems such as bus regulations and Weak Schur numbers, and two papers are on video games.

The GIGA workshop series has been established to become the major forum for discussing, presenting and promoting research on General Game Playing (GGP). It aims at building intelligent software agents that can, given the rules of any game, automatically learn a strategy to play the game at an expert level without any human intervention. The workshop intends to bring together researchers who have made contributions to the state-of-the-art in general game playing systems and generic artificial intelligence. Following the inaugural GIGA Workshop at IJCAI 2009 in Pasadena (USA), follow-up events took place at IJCAI 2011 in Barcelona (Spain), IJCAI 2013 in Beijing (China) and IJCAI 2015 in Buenos Aires (Argentina). This fifth workshop on General Intelligence in Game Playing Agents received eight submissions. Each paper was sent to three reviewers. All papers were accepted for presentation at the workshop, but in the end, three made it into these proceedings. The accepted papers focus on general techniques for automated reasoning about new games and cover the topics of propositional networks, ground instantiations of game rules, and decomposition of game descriptions.

In all 48% of the submitted papers for both workshops were selected for these proceedings. Here we provide a brief outline of the 12 contributions, in the order in which they appear in the proceedings. They are divided into two parts: the first nine belong to the Computer Games Workshop and the last three to the GIGA Workshop.

Computer Games Workshop

"NeuroHex: A Deep Q-learning Hex Agent" a joint effort by Kenny Young, Gautham Vasan, and Ryan Hayward, considers deep Q-learning for the game of Hex. After supervised initializing, self-play is used to train NeuroHex, a 11-layer convolutional neural network that plays Hex on the 13×13 board. Hex is the classic two-player alternate-turn stone placement game played on a rhombus of hexagonal cells in which the winner is whomever connects their two opposing sides. Despite the large action and state space, their system trains a Q-network capable of strong play with no search. After two weeks of Q-learning, NeuroHex achieves respective win-rates of 20.4% as first player and 2.1% as second player against a 1-second/move version of MoHex, the current ICGA Olympiad Hex champion. This data suggests further improvement might be possible with more training time.

"Deep or Wide? Learning Policy and Value Neural Networks for Combinatorial Games" by Stefan Edelkamp, raises the question on the availability, the limits, and the possibilities of deep neural networks for other combinatorial games than Go. A value network for Tic-Tac-Toe was trained, providing perfect winning information in the open source program MoHex. Next, a policy network was trained for the SameGame, a challenging combinatorial puzzle. The resulting policy adaptation (NRPA) is discussed for optimizing the outcome of single-player games. In both cases the observation is that ordinary feed forward neural networks can perform better than convolutional ones both in accuracy and efficiency.

"Integrating Factorization Ranked Features in MCTS: An Experimental Study" authored by Chenjun Xiao and Martin Müller, investigates the problem of integrating feature knowledge learned by the Factorization Bradley-Terry model in Monte Carlo Tree Search. The open source Go program Fuego is used as the test platform. Experimental results show that the proposed method is very effective in improving the performance of Fuego.
Policy Adaptation for PropNets: Cross-domain puzzles and optimizations for the PropNet structure by Chiara F. Sironi and Mark H. M. Winands, analyzes the performance of a Propositional Network (PropNet) based reasoner for interpreting the game rules, written in the Game Description Language (GDL). The paper focuses on one module of the architecture, the Natural Language Classifier, and demonstrates its use in a multiplayer tabletop social deception game, One Night Ultimate Werewolf. The results indicate that the system can obtain reasonable performance even when the utterances are unstructured, deceptive, or ambiguous.

Learning from the MCTS Based Online Player Modeling paper by Jason M. Bindewald, Gilbert L. Peterson, Justin D. Maxwell, Matthew Floyd, Matthew Molineaux, Swaroop S. Vattam, and David W. Aha, describes a goal reasoning agent for playing AI for a multiplayer tabletop social deception game, One Night Ultimate Werewolf. The paper focuses on one module of the architecture, the Natural Language Classifier, and demonstrates its use in a multiplayer tabletop social deception game, One Night Ultimate Werewolf. The results indicate that the system can obtain reasonable performance even when the utterances are unstructured, deceptive, or ambiguous.

The paper discusses the essential factors in Werewolf with reference to other studies. Next, a platform for an AI game competition is developed and analyzed of the results of the competition. First, the system can handle more games and is typically faster despite the overhead of transforming GDL into a different format and starting and communicating with a separate process.

The paper evaluates four different optimizations for the PropNet structure that can be implemented in the GIGA Workshop — Base framework. The presented system is able to handle more games and is typically faster despite the overhead of transforming GDL into a different format and starting and communicating with a separate process.

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The paper evaluates four different optimizations for the PropNet structure that can be implemented in the GIGA Workshop — Base framework. The presented system is able to handle more games and is typically faster despite the overhead of transforming GDL into a different format and starting and communicating with a separate process.
Furthermore, this grounding of a game description is well-founded theoretically by the transformation into answer set programs. It allows to optimize the descriptions further without changing their semantics.

A General Approach of Game Description Decomposition for General Game Playing" by Aline Hufschmitt, Jean-Noël Vittaut, and Jean Méhat, presents a general approach for game descriptions described in GDL. In the field of General Game Playing, the exploration of games can be significantly sped up by the decomposition of the problem in sub-problems analyzed separately. The discussed program can decompose game descriptions with any number of players while addressing joint moves. This approach is used to identify perfectly separable sub-games but can also be applied to games composed of two subgames and games with compound moves while avoiding to rely on elements that can be eliminated by simply rewriting the GDL rules. The program has been tested on 40 games, compound or not. It decomposes 32 of them successfully in less than 5 seconds.

These proceedings would not have been produced without the help of many persons. In particular, we would like to mention the authors and reviewers for their help. Moreover, the organizers of IJCAI 2016 contributed substantially by bringing the researchers together.

January 2017

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