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Faculty of Electrical and Computer Engineering	

SUMMARY OF THE DOCTORAL DISSERTATION

PLAYER DATA BASED PATHFINDING IN COMPUTER GAMES

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The dissertation deals with the subject of pathfinding in computer games based on data collected about players. Computer games are a special case of multi-agent and multi-person environments with elements of cooperation and competition. Such a system bears the hallmarks of a complex system. The thesis of the work assumes that it is possible to increase the quality of the agents' path by using data on past and current activities undertaken by other participants. A path is an ordered set of graph vertices, and its quality is understood as a combination of the two features - credibility and travel cost. The cost is considered long-term, and based on the number of points the agent has earned in each matchup, while credibility is understood as such behavior of the agent that could naturally be taken by a person placed in a similar situation.

The main achievement of the work is a proprietary decision support algorithm called Dynamic Edge Reweighting (DGR). This algorithm uses information about events that have occurred during previous and current play sessions, and then adds spatiotemporal context to them. The result of the algorithm's work is a directed graph containing the updated path travel costs. The output of the algorithm can be manipulated through two parameters called the memory factor, and the risk factor.

The work also presents two proprietary test environments. The first environment is multi-agent and was used to verify the operation of the DGR algorithm and how it is perceived by the players. The second environment is an innovative multiplayer game with a built-in data collection and gameplay replay system. This environment was used to test the developed algorithm and other algorithms and to compare their results. Both the environments themselves and the data collected with their help are a significant contribution to the development of the field of artificial intelligence in computer games.

The research results show that the developed algorithm improves the results of agent control algorithms and pathfinding algorithms. Evaluating the agents' behavior, the study participants found the paths it chose to be credible. The results obtained in the work can be generalized to other fields of science, including pathfinding performed by mobile robots traversing the real world.