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Phantom Arc-Kayles

Combinatorial games are finite, two players games, with perfect information. On the other hand, "economical" game theory is about games that can have many players, simultaneous moves and probabilistic strategies. With phantom games, for which we introduce a general formalization, we try to build a bridge between combinatorial games and economical games by removing the perfect information component of combinatorial games and thus introducing probabilistic strategies. Inspired by the games Phantom Go and Kriegspiel, phantom games have two players and a referee. The two players have no information about the other player moves, and only the referee knows about the exact state of the game. When one of the player tries a move, the referee either confirms that the move is legal considering the state of the game, and the move is then played, or the referee says that the move is not actually legal and ask the player to try another move.

After defining the concepts of strategies and probability of winning for phantom games, we will study the example of Phantom Arc-Kayles. Arc-Kayles is a game played on a graph, where the two players iteratively select an edge of the graph to remove it and all its incident edges. The player that play the last move wins the game. For the phantom version, we give results for paths and cycles with few vertices, union of paths and cycles. To conclude this presentation, we will give a few open problems for this topic.