Operator Behavior Learning to Optimize HD785 Productivity by Adopting Modified Game Theory Algorithm

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# ABSTRACT

The human brain is the most complex object in the known universe. The visible outcomes of brain processes manifest as behaviors that vary from person to person. In this context, human behavior is significantly influenced by individual capabilities, which develop through interactions with others and the environment. This research conducts an in-depth study of the personal abilities of each employee, specifically focusing on HD785 operators during the production process in open-pit coal mining.

To maintain effectiveness, it is crucial to maximize material transport, minimize obstructions, and, most importantly, keep the HD785 operators motivated. The goal is to optimize productivity by studying operator behavior and focusing on activity parameters within a cycle to form one iteration. This iteration includes the following activity parameters: speed in loaded conditions, load stop time (LST), speed in empty conditions, and empty stop time (EST). These four parameters have been selected to describe historical operator abilities at specific times and locations.

Modified Game Theory offers a robust theoretical framework for analysis, enabling participants (referred to as players) to engage in collective actions that yield mutual benefits without altering the specifications of their abilities. It is used to identify the optimal selection in the optimization process of HD785 operator assignments, depending on the unique abilities of each operator as determined by the four parameters, allowing them to navigate various road mining conditions. This approach addresses the subsequent assignment problem and reveals the players' bargaining power while assessing the stability of cooperation within a project.

Grounded in the principles of maximizing profit (production) and minimizing costs (lost opportunities), the results of this implementation aim for an increase in group productivity of approximately 0.5% in BCM per hour continuously. Using this method, the authors would be able to assist all open-pit companies facing similar challenges.