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Norms and Standards for Safe and Responsible Behaviour in Space (3)

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STRATEGIC DYNAMICS OF SPACE WEAPONIZATION: A GAME THEORETIC ANALYSIS.

Abstract

The issue of space weaponization has become increasingly salient in recent years due to the escalating confrontation between major powers in space. This development has led to concerns about the stability of the space environment and the potential for an arms race in space. To better understand this issue, game theory can be used as a tool to analyze the strategic dynamics of space weaponization.

One approach is to use the stag hunt game to model the situation. In this game, two players must decide whether to cooperate or defect. If both players cooperate, they both receive a payoff, but if one defects and the other cooperates, the defector receives a higher payoff while the cooperator receives a lower one. If both defect, they both receive a lower payoff. Applied to space weaponization, this game suggests that cooperation between major powers is the best outcome, as it can lead to greater stability and less risk of an arms race.

The prisoners' dilemma game, a conflict game, is another way to approach the analysis. Players must choose to cooperate or defect, with the greatest payoff achieved through mutual cooperation. However, if one player defects while the other cooperates, the defector receives a higher payoff while the cooperator receives a lower one. Applied to space weaponization, this game suggests that major powers have an incentive to develop and deploy space-based weapons, even if it may lead to greater instability and an arms race.

A dynamic game approach can also be used to model the situation. In this approach, the game is played over multiple rounds, with each player making decisions based on the outcomes of previous rounds. This approach allows for more complex strategies and can capture the effects of trust and reputation. For example, a player may choose to cooperate in the first round in order to build trust with their opponent, but defect in subsequent rounds if their opponent also defects.

Thus, we introduce game theoretic analysis to provide insights into the strategic dynamics of space weaponization. While the ideal outcome may be cooperation between major powers, the incentives for each power to develop and deploy space-based weapons may make this outcome difficult to achieve. By understanding these dynamics, policymakers can better design strategies to promote stability and reduce the risk of an arms race in space.