

Inspection games in arms control

by

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Abstract

An inspection game is a mathematical model of a situation in which an *inspector* verifies the adherence of an *inspectee* to some legal obligation, such as an arms control treaty, where the inspectee may have an interest in violating that obligation. The mathematical analysis seeks to determine an optimal inspection scheme, ideally one which will induce legal behavior, under the assumption that the potential illegal action is carried out strategically; thus a non-cooperative game with two players, inspector and inspectee, is defined. Three phases of development in the application of such models to arms control and disarmament may be identified. In the first of these, roughly from 1961 through 1968, studies that focused on inspecting a nuclear test ban treaty emphasized game theory, with less consideration given to statistical aspects associated with data acquisition and measurement uncertainty. The second phase, from 1968 to about 1985, involves work stimulated by the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Here, the verification principle of material accountancy came to the fore, along with the need to include the formalism of statistical decision theory within the inspection models. The third phase, 1985 to the present, has been dominated by challenges posed by such far-reaching verification agreements as the Intermediate Range Nuclear Forces Agreement (INF), the Treaty on Conventional Forces in Europe (CFE) and the Chemical Weapons Convention (CWC), as well as perceived failures of the NPT system in Iraq and North Korea. In this connection, the interface between the political and technical aspects of verification is being examined from the game-theoretic viewpoint.

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