On an Inspection Game with a Fine

Andrey Garnaev

Department of Computer Modelling and Multiprocessor Systems
Faculty of Applied Mathematics and Control Processes
St Petersburg State University
Universitetskii prospekt 35
Peterhof, St Petersburg 198504, Russia
e-mail: agarnaev@rambler.ru
fax: +7 (812) 428-71-59
web-site: http://www.apmath.spbu.ru/ kmms/garnaev/default.htm

Abstract: In this paper we consider an inspection game generalizing a Rothenstein and Zamir game. In this game there are two players: the operator and the inspector and the game is played over the time interval $[0, 1]$. The operator plans to perform an illegal action (say, dispatch from the pollution) and the inspector is allowed to have one inspection to detect the violation.

The profit of the operator depends on the time during which he was undetected after performing the illegal action. The operator will have a choice either to act legally or to act illegally during the game. The inspection system detects a violation which occurred before the inspection with probability $1 - \beta$. With probability α a false alarm is called, i.e., the inspector calls an alarm although no violation took place before the inspection. It is assumed that the inspection is silent, i.e. the event that an inspection took place is not known to the operator unless the inspector calls an alarm. If the inspector detects the violation the operator will be fined. The payoff to the operator is his total profit.

The difference of our plot from the scenario studied by Rothenstein and Zamir (Imperfect Inspection Games Over Time. Annals of Operations Research 109, 2002, p.175-192) is that we allow the operator to act legally as well as illegally (so, it is also allowed for the operator to reject from the illegal action at all) and the operator could be fined. The plot considered in this paper is modelled by a zero-sum timing game as well as by a non-zero-sum timing game. It is shown that the optimal players behavior depends on the fine essentially.