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GAME THEORY FOR FIRE SAFETY AND EMERGENCY CASES

Unfortunately Fires, Emergencies, and Terrorism Risks are increasing during last years. Modelling and Prevention of these cases is the most important task now. Game Theory for Fire Prevention on High Risk Objects widely used by authors before [1, 2].

This Game Theory Approach is developed for Emergency Cases and Terrorism Prevention and it is based on the Game Theory supposes that targets and techniques of possible terrorist attacks can be modeled by behavioral structures and parameters of terrorist organization.

The Risk Management Solution (RMS) developed an application called U.S. Terrorism Risk. The main goal of the U.S. Terrorism Risk is quantification of catastrophic terrorist attack risk. The model uses information from terrorism experts, estimates the probabilities and costs of property damages, business interruptions, casualties and injuries, taking into account 16 modes of attack.

The models are based on 4 types of terrorist weapons – biological, chemical, nuclear and radiological. The simulation events cover close to 1500 potential terrorist targets in the United States of America – business center of megalopolises, government district of metropolises, facilities, landmarks, etc. The model is focused on the most probable attacks and uses reflection approach to understand the corresponding models of the enemy.

The approach based on the theory of probability, was developed by EQECAT Inc. It strikes by its dimensionality: the model takes into consideration hundreds of thousands terrorist targets and millions of events.

Game Theory and Asymmetric Information are widely used for modeling of economic conflicts, contemporary wars, emergency situations and counterterrorism activity.

A lot of popularizes and advertisers, which inadequately evaluate orientation and availability of these mathematic tools, causing the discredit of all the scientific movement, created by such Titans as Joahn Von Neumann and John Maynard Smith. Using concepts taken from the theory of Games formulated by John von Neumann in the 1940s, Maynard Smith introduced the idea of an Evolutionary Stable Strategy (ESS) in the 1970s. Assuming that two animals are in conflict, then an ESS is one that, if adopted by the majority of the population, prevents the invasion of a mutant strategy. Stable strategies by definition thus tend to be mixed strategies. Many aspects behavioral pathology of human relations from economic fraud tot terrorist activities may be interested and prevented with the Evolutionary Games models developed by Maynard Smith.

Modeling of intra-corporation (collaboration) and inter-corporation (competition) relations demonstrated that infiltration of criminals can be detected and their influence can be restricted using local- or wide –area networks (Internet, Intranet, etc.) and corresponding software [3-6].

Following [7], we try to orange institutionalization of individual and collecting knowledge about terrorism and counterterrorism and transfer the knowledge between individuals, groups and organizations. We do it using the common principles of Trust Engineering and Risk Management and separating functions/aspects in context of bipolar dimensions of Internal/External, Actual/Future, Explicit/Implicit and Experimental/Theoretical Knowledge.

Literature

1. Topolsky N.G, Dombrovsky M. Bases of Theory Game Approach in Computer Aided Fire Safety Systems. Moscow, VIPTSH, MVD of Russia, 1996.

2. Topolsky N. Bases of Objects Computer Aided Fire Safety Systems. Moscow, MIPB, MVD of Russia, 1997.

3. Degitar, V., Safonov. I. Evolutionary Mechanism of Conflict resolution. – New York, NY: Plenum Publishing Corporation, No. 2401-0114, 1988.

4. Degitar, V., Safonov. I. Behavioristic and Ethical aspects for Computerized Collective Decision Support Systems. – Moscow: 1989.

5. Degitar, V., Safonov. I. An Evolution-Stable Conflict-reducing mechanism with side Payments. – New York, NY: Plenum Publishing Corporation, no 2602-0297, 1990.

6. Degitar, V., Safonov. I. Distributed Systems for Decision Ethic Support. – Proceedings of the Fifth all-Union Seminar ”Synthesis Technique and Development Planning foe Large-Scale System Structures” – Moscow: NKAU USSR, 1990.7. Schuppel, J., Muller, G. and Gomes. P. The Knowledge Spiral. – Knowing in Firms. London: SAGE Publications, 1998.