

Modern Scotland Yard: Improving Surveillance Policies Using Adversarial Agent-Based Modelling and Reinforcement Learning

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Abstract : Predictive policing refers to the usage of analytical techniques to identify potential criminal activity. It has been widely implemented by various police departments. Being a relatively new area of research, there are, to the author's knowledge, no absolute tried, and true methods and they still exhibit a variety of potential problems. One of those problems is closely related to the lack of understanding of how acting on these prediction influence crime itself. The goal of law enforcement is ultimately crime reduction. As such, a policy needs to be established that best facilitates this goal. This research aims to find such a policy by using adversarial agent-based modeling in combination with modern reinforcement learning techniques. It is presented here that a baseline model for both law enforcement and criminal agents and compare their performance to their respective reinforcement models. The experiments show that our smart law enforcement model is capable of reducing crime by making more deliberate choices regarding the locations of potential criminal activity. Furthermore, it is shown that the smart criminal model presents behavior consistent with popular crime theories and outperforms the baseline model in terms of crimes committed and time to capture. It does, however, still suffer from the difficulties of capturing long term rewards and learning how to handle multiple opposing goals.

Keywords : adversarial, agent based modelling, predictive policing, reinforcement learning

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