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Introduction: Serious Games for Law Enforcement Agencies

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Abstract. *This chapter is an introduction to the field of serious games, with emphasis on law enforcement agencies. It outlines their use focusing on four concrete application cases: crime scene investigations, investigative interviews, communication skills and terrorism training. It further outlines the general benefits of serious games compared to traditional training methods.*

Keywords: *serious games, law enforcement, virtual reality, crime scene investigations, terrorism training, professional training*

1 Why Serious Games for Law Enforcement?

The term *serious games* refer to games designed with a specific function in mind such as professional training, education or awareness raising. This purpose sets them apart from games developed primarily for the entertainment of players (Djaouti, Alvarez, Jessel, & Rampnoux 2011). Serious games can be used in a variety of settings that meet law enforcement agencies' particular needs and requirements. Whether it be the practical skills of a traffic accident investigator, training for forensic examination skills, to prepare for terrorism-related incidents, criminal investigations or leadership challenges – there is almost certainly a serious game that can be (or has been) created to complement the current training or educational curriculum. The main benefit of serious games is their extreme flexibility: They can be utilised within a classroom setting, in which the participants undertake the scenario individually, or trainees can share the same virtual world to learn together. Serious games can also be used outside of a classroom environment and in distributed settings. Especially the latter can be beneficial, as it allows users to cooperate and train without having to be in the same location.

Perhaps the most important value of serious games for law enforcement agencies (LEAs), however, is to create a realistic scenario and situational awareness to understand, learn, comprehend and gain new insights on how to manage a problem solving process in the context of police operations. Knowledge is an abstraction of a learning process (Akhgar, 2007). With their focus on realism and experiential learning, serious games are powerful tools for knowledge management (KM) processes within LEAs, whereby knowledge gained during the game can be applied in an actual operational environment. In this way, they can facilitate the transition between classroom learning and on-the-job training: By simulating a real-world situation, serious games train knowledge and skill sets that police officers require before they have to experience real-life situations first-hand, hopefully minimising the number of mistakes that occur in the field. Serious games also profit more experienced personnel (Binsubaih, Maddock, & Romano, 2009). As most experienced officers are used to working in the field under time constraints, there is a chance that they develop 'bad habits' or shortcuts that may lead to mistakes. A serious game gives officers the chance to reassess their current knowledge and methodologies and to develop alternative ways to cope with the constraints of their job and, most importantly, learn from their mistake in a safe and secure environment.

As these examples illustrate, serious games have a broad application and usefulness for the area of law enforcement. This book provides practitioners and designers alike with an overview of the possibilities of serious games as well as practical guidance on the process of serious games development – following the process from user requirements elicitation to evaluation. The

knowledge and case studies presented can be used by law enforcement agencies intending to commission their own serious games and by game developers interested in collaborative pedagogy.

To make the application of serious games more concrete, in the following we present four areas with relevance for law enforcement in which serious games can and already have been successfully employed.

2 Serious Game Examples for Crime Scene Investigations

A challenge for new crime scene investigators is the knowledge transfer between skills acquired in the classroom and their practical application in the field. Typically, this challenge is solved by on-the-job training in which a new investigator is paired with a more experienced officer. The expectation is that, as the new investigator works on life cases, any mistakes will be identified by the more experienced colleague who will either prevent or rectify the mistakes. While on-the-job training is effective, it is also time-consuming and limited by the availability of sufficiently experienced officers.

Serious games offer an addition or even an alternative to the traditional approach of on-the-job training to prepare new recruits. They have further been explored for the re-training of experienced investigators to ensure continuation of best crime scene practices.

An example in this area addresses traffic investigations using a virtual reality (VR) environment (Binsubaih, Maddock, & Romano, 2006). The scene presented to the trainees involves a two-vehicle collision. The investigator is given 30 minutes to complete the investigation, including the drawing of the scene. The scenario and task are independent of the experience level of the trainee in the field. Engaging with the scenario, the participant should be able to park their patrol vehicle in an appropriate location at the scene, search for and identify clues, mark the position of the clues in order to secure them, use traffic cones to secure the scene, photograph the incident, take measurements that could be used to provide a reconstruction of the accident and draw the accident scene. After completing the session, the trainee fills in a self-assessment form on which they are asked to check which of the expected actions they think they have taken. This self-assessment can be compared with the actions logged by the serious game system. In the game, records are kept of the user's navigation choices, interactions and questions along with a few additional metrics. The analysis of the game metrics is based on a marking scheme approved by two traffic investigation trainers. If a participant does not score at least 70%, they are asked to replay the scenario.

An evaluation of the training (Binsubaih et al., 2009) showed that the first time the scenario was played the experienced investigators scored generally higher than the novice investigators. However, neither group achieved the 70% requirement; the average score of experienced investigators reached only 36% of correct actions. After a second play through, the novices scored an average of 76% correct actions, while the experienced users scored 67%. This difference may be an indication that experienced officers used shortcuts developed during their work, which resulted in lower scores compared to the optimal solution. Another interesting observation was the initial low score for both groups after the first run through the game. A possible reason for low starting scores can be the lacking familiarity with the game system. To ensure that lacking VR experience was not the main factor, trainees had to fill in a written test before and after the experiment. Both groups improved their scores by over 20% in the second written test, i.e. after engaging with the serious game. Overall, both groups showed a significant increase in their scores after their second session with the serious game. This suggests that serious games can profit both novice and experienced

investigators, although in different ways (i.e. first time learning of new skills versus unlearning of potentially faulty behaviours).

Another serious game for crime scene investigators – entitled *Unravel the Mysterious Murder* – focuses on preparing a police cadet for forensic examinations (Drakou & Lanitis, 2016). In this particular scenario, an elderly lady is found murdered in her home with eight potential suspects. Eight potential murder weapons are hidden around the house (see **Figure 1**), and each possible suspect had equal opportunity and access to the weapons. Once the trainee has found the potential weapons, they are expected to take them to the in-game forensic laboratory where they must follow the correct procedures to analyse them. This game trains four forensic investigation steps: 1) registering the evidence, 2) the collection of fingerprints from the suspects and murder weapons, 3) matching the fingerprints and 4) analysing and matching the blood. The process users have to go through in order to perform these forensic investigations replicates the processes used by forensic departments in police authorities.



Figure 1: Scenes showing the eight murder weapons in Unravel the Mysterious Murder (Drakou & Lanitis, 2016)

As in the traffic investigation study, the effectiveness of the game was evaluated using a questionnaire before and after trainees experienced the software (Drakou & Lanitis, 2016). The results of the forensic examination game closely matched that of the traffic setting, in that participants showed improvements after the game. The positive results across such different contents and scenarios suggest that serious games can be a valuable approach for crime scene investigation trainings.

3 Serious Game Examples for Training Investigative Interviews

An important element in the education of police cadets is the training in interview techniques. Investigative interviews are held for the purpose of collecting additional information about a case, questioning potential witnesses or victims as well as trying to obtain potentially incriminating information from a suspect. If the physical evidence within a case is weak, interrogations can provide vital additional information.

Trainings for investigative interviews are usually based on the PEACE framework (College of Policing, 2016), which consists of five phases: 1) plan and prepare, 2) engage and explain, 3) account clarification and challenge, 4) closure and 5) evaluation. The ability to manage these five phases well can ‘make or break’ an investigation. It is thus important that police officers receive effective training to ensure they perform these interview techniques to the highest standards.

Traditionally, training sessions for interviewing are performed with actors that take on the role of suspects, witnesses or victims. Depending on the scenario at hand, these actors can portray different

personalities, so that trainees can experience the range of emotions and reactions they may have to contend with in a real interview. A downside of this approach is that it depends heavily on the quality of the actors, i.e. the availability of highly skilled actors who understand the nuances of the interviewing process and situation. An inexperienced actor may not be aware all of the nuances that cadets need to learn. The costs and time investments for actor-based trainings can thus spiral dramatically; not least because officers can only train one at a time.

Serious games can offer cost and time efficient alternatives, allowing multiple students to train simultaneously while an instructor oversees the training. Automated reports created from trainee's in-game behaviour can provide additional input for reflection and add a further possibility for feedback. *Virtual-Suspect* is an example for a serious game for investigative interviewing developed with the help of criminology researchers, psychologists and police departments to provide multiple scenarios based on real cases, which also offers a range of personalities as interview partners (Dias, Aylett, Paiva, & Reis, 2013).

A criticism sometimes voiced against using serious games to train investigative interviewing is that the simulation of responses may not always be realistic for the personality in question. In order to assess the effectiveness of serious games against human responses, Bitan et al. (2016) compared the behaviour of three people in an interrogation situation. One worked with a human actor, another experienced the *Virtual-Suspect* simulation with a specialised response selection model and the third used the same serious game but with random responses. In each situation the participant had 30 minutes to attempt the suspect to confess. The three interviews were recorded, and their transcripts provided to a further 24 participants. The participants in the second phase of the experiment received all three transcripts and were asked to read through them carefully. While the simulation with random responses was picked out easily as being from a computer, the participants were unable to differentiate between the interview based on the specialised game-based selection and the interview conducted with the human actor. This suggests that serious games using appropriate response models can be similarly effective as a hiring a trained actor.

4 Serious Games for Communication and Collaboration Skills

Law enforcement personnel often operate under high pressure in stressful situations, which can impact negatively on their communication, teamworking and decision making. These 'soft skills' are another area of focus for serious games. An example for 'soft skill' training is a serious game from the *DREAD-ED* project developed to teach communication and team building skills using a collaborative board game (Linehan, Lawson, & Doughty, 2009). The game has three timed rounds during which the players must assemble a team with the task to control an emergency situation. In this game, each player has a unique role that allows to alter the game in subtle ways. Also, each player has six cards, each of which represents personnel they can use or exchange with other players. The key lies in communicating and collaborating during the allotted time to ensure the right people receive the correct cards (i.e. personnel), while still adhering to the game mechanics.

Throughout the game, new pieces of information can be given to the players to simulate a developing situation and add an element of uncertainty. The *DREAD-ED game* was also transferred into a computer game to allow for multi-location training (Haferkamp, Kraemer, Linehan, & Schembri, 2011). The basic mechanics in the computer-based version remained the same, although the use of an instructor became optional. Haferkamp et al. (2011) tested the computer version students and managers under controlled conditions and found that both groups experienced improvements in social skills.

5 Training for Terrorism Response

Increasingly, law enforcement agencies have to consider the likelihood of a terrorist incident. In consequence, also the need to prepare officers for this eventuality has grown. One way to provide such training is the use of terrorism-based scenarios in which one team plays the role of the insurgents and the second plays the law enforcement side aiming to stop the first group.

Running realistic scenarios is, however, often associated with considerable efforts and costs. Not only do they require access to an adequate location (e.g. a hotel, train station or soccer stadium); another limiting factor is that only one specific scenario can be trained and tested at any one time. Further, in order to conduct a comprehensive debrief at the end of the training, multiple trainers must be present to follow the chain of events and take note of any areas for improvement.

Serious games can offer a realistic training experience, while again reducing some of the costs and resource requirements associated with scenario trainings in real-world locations. The largest investment is the specialised technology (e.g. VR or AR/MR headsets and computers) and the efforts involved in developing the scenarios. Yet, once both are available the costs to re-train and re-do exercises remain comparatively low. Also, multiple teams can train either separately or together at the same time, and often one instructor (instead of an instructor group) will be sufficient to oversee the training. This is possible as a computerised system can store data about participants' behaviours throughout the training, which can serve as foundation for detailed reports about actions officers took either individually or as a team. While not necessary for most learning goals, the possibility for continuous data collection thus presents instructors with the chance to accumulate records with highly detailed information for the assessment of individuals as well as group interactions. Depending on the training requirements, a serious game can also use artificial intelligence (AI) to simulate the insurgents and different tactical locations.

Different designs are available: Some games expect officers to train in the role that they will have in a real-life incident; other games allow for two teams to play against each other, which gives officers the chance to experience terrorist incidents and their logic 'from the other side'. Both versions have merits, depending on the training purpose.

A serious game that allows for two teams to play against each other is the game *PROACTIVE* (Sormani et al., 2016), a turn-based game between law enforcement agencies and insurgents. The aim of the game is for the insurgents to successfully complete an attack against a specific location, while the law enforcement agency team tries to prevent the attack. To accomplish the attack the insurgent team has to completing a number of preparatory phases before they can carry out the assault. First, the specific location must be observed four times either by vehicle or on foot to acquire sufficient information. After the information is gathered, the security of the location must be tested; only then can the attack be carried out. If the insurgent team manages to complete the attack, they reached their goal, and the game ends. While the insurgent team performs these steps, the law enforcement team has to identify information or events generated by the activities of the insurgent team in order to correctly identify which location will be struck.

Although this sort of serious game can prepare officers for well-planned terrorism attacks, it does not necessarily help with unpredictable and seemingly random terrorist incidents. In this regard games such as *PROACTIVE* are limited, especially as it assumes a turn-based logic (i.e. one side always has to wait until the other finishes their turn before being able to make the next decision). Transferring the game into a (virtual) environment, in which decisions of both teams can be put into motion simultaneously would allow for more realistic encounters.

PROACTIVE focuses on the surveillance side of counter terrorism. Another serious game, *Sibilla*, addresses the sheer amount of data received and the decision making challenges that come with it. *Sibilla* was developed with the goal of training individuals involved in preventing terrorist attacks (Bruzzone, Tremori, & Massei, 2009). The game encouraged the sharing of information with a focus on improving the analysis skills to assess the gathered information and thus the quality of available information overall. By taking the role of a higher-level operator in a counter terrorism organisation, the player attempts to understand what the insurgents are planning to do with the information they are collecting. *Sibilla* can be played either by individuals or groups with differing learning aims for both. For an individual, the game is primarily focused on training the individual's analysis capacity, while for a group the main focus is on team building, relationships and negotiation skills. The latter can be beneficial especially for players who do not know each other before to the game and will have to learn to trust each other quickly.

The players both gather and connect various fragments of data, while also contending with limited resources in order to achieve their goal. In the multi-player version, each player controls a different agency with disparate budgets and resources ensuring the cooperation of all players. The players do not have all necessary information; hence, a lack of cooperation could spell failure for the entire team. As the game progresses, more and more information is released and spread out amongst the agencies including dummy information. The players must decide, which information to share and which to invest money and resources into to find additional useful information. A time limitation for the game means that players must act faster than the insurgents to stop the attack.

In the real world, terrorist attacks are usually not broadcast in advance, as is the case in *PROACTIVE*. Hence, *Sibilla* is probably a better example of how to use serious games to train for the specific skills that counter terrorism efforts require. *Sibilla* has the further benefit that it can be used by multiple people at the same time, even when the aim is to train people individually. The multi-player option allows collaboration between officers that are not stationed at the same location. Not only can this improve teamwork within the station, it can also support building connections across the police forces as a whole. Both games, however, have equal merit as a learning tool and work to highlight the importance of knowing what the learning aims are in order to effectively develop a serious game for training.

6 Conclusions

As the above examples illustrate, serious games have a wide range of application areas and features law enforcement agencies can benefit from. At the same time, serious games do not have to replace real-life scenarios or on-the-job training. Instead, they should be seen as enriching and complimenting other training approaches, especially in the sense that they provide a link between the classroom, scenario-based trainings and real-life operations.

Serious games can expose trainees to more variety in terms of situations and scenarios and provide additional opportunities for training. If the same training is provided on regular basis, they are further comparatively frugal in terms of costs and resource requirements. As long as the technologies are available, trainings can be conducted at any time independent from the availability of actors and potentially even instructors. Reports generated from in-game responses can serve for individualised feedback from instructors or for self-evaluations. Most attractively, serious games can both be used for training teams locally as well as collaborative, i.e. in conjunction with other police forces or first responders world-wide.

At the organisational level, serious games can provide police forces with a baseline tool for their knowledge management strategy (KMS) capabilities. Akhgar (2007) defines KM as

“a term that reflects an evaluable framework for a complex matrix of thoughts, visions, ideas, insights, learning processes, experiences, goals, expertise, values, perceptions, and expectations or collective mental constructs of individuals that provides specific guidance for specific actions in pursuit of particular ends by utilising knowledge within organisational extended value systems.”

Thus in an LEA context a serious game KM-strategy can also be defined as a pragmatic, action-oriented and goal driven process of transforming organisational knowledge from a current status ('AS IS') to the desired status ('TO BE') based on KM lifecycle processes which include knowledge collection at particular stages of the game, creation (new insights gained from the game), transformation (e.g. improving tactical decision making) and collaboration (through collaborative gaming environments), visualisation using game-based scenarios, evaluation and operational and tactical model refinement and assessment. Lessons learned from training and decision making processes during serious game based scenario exercises can be analysed and evaluated in order to improve police forces' knowledge and insights about particular areas of interest and capabilities.

References

- Akhgar, B (2007); Knowledge management architecture from concept to code (2nd ed.). NEGAH Publication.
- Binsubaih, A., Maddock, S., & Romano, D. (2006). A serious game for traffic accident investigators. *Interactive Technology and Smart Education*, 329-346. doi:10.1108/17415650680000071
- Binsubaih, A., Maddock, S., & Romano, D. (2009). *Serious Games for the Police: Opportunities and Challenges*. Dubai: Dubai Police Academy Research & Studies Center.
- Bitan, M., Nahari, G., Nisin, Z., Roth, A., & Kraus, S. (2016). *Psychologically Based Virtual-Suspect for Interrogative Interview Training*. Los Angeles, CA, USA: Springer, Cham.
- Bruzzone, A., Tremori, A., & Massei, M. (2009). *Serious Games for Training and Education on Defense against Terrorism*. Italy: Defense Technical Information Center.
- College of Policing. (2016). *Investigative Interviewing*. Retrieved April 4, 2018, from www.app.college.police.uk
- Dias, J., Aylett, R., Paiva, A., & Reis, H. (2013). *The Great Deceivers: Virtual Agents and Believable Lies*. CogSci 2013 Proceedings, 2189-2194.
- Djaouti, D., Alvarez, J., Jessel, J. P., & Rampoux, O. (2011). Origins of serious games. In *Serious games and edutainment applications* (pp. 25-43). Springer, London.
- Drakou, M., & Lanitis, A. (2016). On the development and evaluation of a serious game for forensic examination training. Lemesos, Cyprus: 2016 18th Mediterranean Electrotechnical Conference (MELECON). doi:10.1109/MELCON.2016.7495415
- Haferkamp, N., Kraemer, N. C., Linehan, C., & Schembri, M. (2011). Training disaster communication by means of serious games in virtual environments. *Entertainment Computing*, 2(2), 81-88.

Linehan, C., Lawson, S., & Doughty, M. (2009). Tabletop Prototyping of Serious Games for 'Soft Skills' Training. Coventry, UK: 2009 Conference in Games and Virtual Worlds for Serious Applications. doi:10.1109/VS-GAMES.2009.9

Sormani, R., Soldatos, J., Vassilaras, S., Kioumourtzis, G., Leventakis, G., Giordani, I., & Tisato, F. (2016). A serious game empowering the prediction of potential terrorist actions. *Journal of Policing, Intelligence and Counter Terrorism*, 11(1), 30.