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AI-assisted Serious Games: Dialogue Management with Generative AI

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### Abstract

Cutting-edge technologies such as Virtual Reality (VR) and Artificial Intelligence (AI) have helped elevate the digital storytelling and gaming experience. At the same time, powerful new Large Language Models (LLMs), such as ChatGPT by OpenAI, have taken over the Information Technology (IT) world promising amplification of the user experience in multiple contexts. This paper sets out to explore the utilisation of ChatGPT for managing the dialogue between players and avatars in serious games. Our work is performed in the context of the LAW-GAME project that develops a social AI-powered VR game platform targeting specifically the training needs of Law Enforcement Agencies. Specifically, we focus on one of the platform's gaming modes, namely the Police Interrogation, which aims at a realistic interactive dialogue between a human player (the police officer) and an AI-assisted non-player character (the suspect).

*Keywords:* Generative AI; ChatGPT; Serious games; Dialogue management; Storytelling

## 1 Introduction

Serious games have become increasingly popular in recent years as they offer an engaging and interactive way to learn, and can support cognitive, behavioural, affective, motivational, physiological, and social learning outcomes [1]. Enhanced with cutting-edge technologies such as 3D VR worlds and AI agents, serious games can offer training on realistic scenarios and complex situations that can be conducted collaboratively across geographical and professional boundaries [2]. Hence, serious games have seen a rise especially for Law Enforcement Agencies (LEAs) such as police forces, military and first responders.

At the same time, and especially since ChatGPT's public release in November 2022, generative AI (GAI) and LLMs skyrocketed in prominence and investments. Having the potential to disrupt all aspects of our digital lives [3], GAI sparked a race among big IT companies and smaller start-ups as they seek to exploit this emerging technology for new innovations. As regards the field of serious games, GAI holds significant potential for advancing the modelling of player behaviours [4]. LLMs' capacity to generate coherent and meaningful responses can facilitate realistic, believable Non-Playing Characters (NPCs), which may lead to engaging and authentic learning experiences [5]. However, there is still minimal evidence of GAI applications in serious games.

The objective of this paper is to provide initial insights into how GAI can enhance NPC realistic responses to elevate user experience in a VR game setting. Specifically, we explore the utilisation of OpenAI's GPT-4 model (the most recent update to ChatGPT) for managing the dialogue in LAW-GAME's police

interrogation game.

## 2 The LAW-GAME project

LAW-GAME (<https://lawgame-project.eu/>) aims to train LEAs in theory and real-life practice through gamification technologies in a safe and controlled virtual environment. To achieve this, the project develops a fully configurable, user-centred, social VR game platform embedding four highly immersive and attractive “gaming modes” as follows:

- *The CSI game.* Trainees examine the crime scene, identify and analyse all kinds of evidence (e.g., bullet holes, fingerprints) in order to solve the case.
- *The Police Interview game.* Trainees practise their interrogation and negotiation skills through conversational interaction with an artificial agent (AI-assisted 3D avatar) assuming the role of the suspect / perpetrator.
- *The Terrorist Attack game.* Trainees practise in managing extreme, time-critical situations in a more effective and efficient manner, reducing, or preventing terrorist threats.
- *The Car Accident game.* Trainees virtually collect scene’s data (e.g., tire marks, damage to fixed objects) in order to decipher what happened before, during and after the collision.

## 3 The Interrogation game

Focusing on the Police Interview: Interrogation game, the game’s basic elements are as follows:

- The game takes place inside a police interrogation room.
- There are two main characters: the police officer who interrogates the suspect (i.e., the player); and the suspect (i.e., a NPC controlled by the game’s AI engine).
- The game has a specific storyline, i.e., a description of the incident and the reasons for the interrogation, and a set of evidence, gathered by the police prior to the interrogation.
- The player may freely ask any question to the suspect, i.e., the game provides no guidance as to what or when to ask, leaning more towards a realistic setting for testing the skills of a trainee rather than a learning tool.

## 4 Challenges in dialogue interaction

As discussed in a previous article [6], there are two main challenges in implementing a realistic, interactive dialogue between the LEA officer (player) and the suspect (AI-assisted NPC) in the Interrogation game.

First, the game engine that controls the suspect-NPC responses should be able to understand the officer’s questions and generate a relevant reply, i.e., according to the provided scenario. Furthermore, the game engine should also provide a suitable response to questions that are marginally relevant or even completely irrelevant to the storyline.

Second, the game engine should be able to differentiate suspect’s responses based on the context of the dialogue, i.e., to be able to decide whether it should respond with a lie or the truth, and to be able to decide to which direction the storyline should unfold based on the player’s previous questions. For example, the suspect should be able to respond differently to the same question being asked following

another relevant question; or to the same question being asked after having admitted the truth of an evidence or having confessed the crime.

## 5 Dialogue management utilising GPT-4

GPT-4 is phenomenally capable of addressing the first challenge. When provided with the storyline, the evidence and relevant instructions, it can easily get into the role of the suspect's character. It can generate responses that are relevant, realistic and within the storyline. Moreover, it can creatively respond to relevant questions that were not foreseen in the storyline (e.g., invent an occupation for the suspect when none is provided). Finally, it can address questions that are completely irrelevant to the storyline while staying in character, e.g. pointing out that this is irrelevant to the interrogation case.

However, GPT-4 does not address the second challenge with similar success. Although it is capable of replying according to context, it cannot trustfully follow instructions on what it should reveal or not and when it should or should not lie, and it cannot trustfully follow the provided reasoning for managing the unfolding of alternate storylines. In fact, it tends to admit the truth much easier than it should for the suspect's role, and it tends to be "too talkative", giving away more information than asked.

This result is probably expected due to the generative nature and purpose of the GPT-4 model. Nonetheless, the fact remains that it cannot be trusted to manage a human-NPC dialogue and to control the storyline in the way we need it to. More so, since our application is a serious game for an actual training situation that targets player assessment and consistency / comparability of evaluations.

Thus, it becomes evident that a hybrid approach is needed. The game engine needs to retain control of the dialogue interaction and guide the unfolding of the storyline, while utilising GPT-4 for the aspects that it does well. For this hybrid approach, we differentiate between two types of questions:

- I. questions that should get "one" answer (these answers do not drive the storytelling forward); and
- II. questions that should get alternate answers depending on the context (these act as decision points for the unfolding of the storytelling).

All the information needed to reply to type I questions is provided to GPT-4 to generate relevant answers. However, for the type II questions, GPT-4 is instructed to pass them on to be handled by our conversational engine. In our engine we utilise a more traditional, yet controllable approach inspired by work in automated planning [7]. Specifically, we employ an action-driven framework in which a particular interaction (i.e., a question-and-answer pair) can activate a series of pre-conditions and post-conditions that impact the subsequent interactions. Thus, by monitoring the current state of the dialogue, our engine can decide on how to unfold the storytelling and can provide the most relevant answer to type II questions each time.

Initial tests of the hybrid approach are promising, since it provides a good control of the gameplay (through the handling of the type II questions) and, at the same time, a realistic experience for the user (through the utilisation of generative AI). Our next steps are to test the solution with the end users and refine our approach.

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