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An Encore Abstract: Agent-based Social Skills Training Systems: The ARTES Architecture

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1 Motivation and Approach

While social skills training is beneficial, it is often costly, time-consuming, and requires multiple humans to simulate scenarios like patient-doctor communication [19]. Simulated agents can address these challenges by role-playing as humans in social situations with learners, offering a safe, low-cost, and readily available training environment [11, 15, 17].

Instead of building a system from scratch, it is more efficient to build on an existing architecture that clarifies the relationships and flow between different system components. Existing architectures can be modified to serve as a basis for a training systems architecture, such as tutoring systems [18], and virtual human architectures (e.g., [12, 14]). Furthermore, some training systems have architectures that describe how their system components interact, such as for training on aggression de-escalation [6], or job interviews [2]. Both architectures can be seen as domain-general; however, they lack components other training systems might require, such as support for a wider variety of modalities. Therefore, this paper introduces a conceptual architecture for agent-based social skills training systems (ARTES), examines its key components, links them to learning theories and suggests future research directions.

To define ARTES and discuss its components, we examined various literature sources through reviews on training systems (e.g., [4, 3, 9]), keyword searches, and by extracting relevant systems from the IVA conference. The proposed architecture is based on existing virtual humans [12, 16, 13, 20], intelligent tutoring systems [7, 21, 18, 8], and training systems architectures (e.g., [5, 13, 2]).

2 The ARTES Architecture

The Agent-based training architecture for social skills, ARTES, lists elements that should ideally be in a training scenario with an interactive agent. To maximize learning gains, the architecture integrates elements from two perspectives: agent simulations, which simulate a human in a social situation, and tutoring systems, which provide education through guidance and feedback. As such, ARTES represents an integrated view of current models that align with the workings of agent-based training systems.

The ARTES architecture includes two main parts: the interactive agent simulation and the educational model. The interactive agent has a "Mind", which senses the learner's input and determines a suitable action, and a "Body," which performs an action to the learner (e.g., a reply). Meanwhile, the educational model focuses on learning gains and includes domain knowledge, learner knowledge, and a tutor model that manages teaching and feedback to the learner. The educational model influences the simulation and allows trainers to control the agent's behaviour and monitor learner performance.

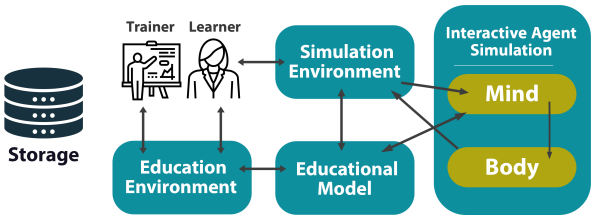

Fig. 1. A simplified view of the ARTES architecture [1].

We further connect ARTES's interactive agent and educational model components to three classical educational theories: behaviourism, cognitivism, and constructivism [10]. This connection helps define the roles of these components in the training process. For instance, *behaviourism* can be applied to teach facts through repetition and memorization, such as determining whether a learner responded correctly. When modelling from a behaviourist perspective, the realism of the agent's actions and consequences is crucial for training, as these form the stimuli to which a response needs to be conditioned. Additionally, the educational model reinforces the stimulus-response relationship by providing feedback.

We mapped ARTES's components to eight training systems architectures, categorised 43 training systems components based on ARTES, and linked ARTES to tools for creating training systems. This showed ARTES's completeness, generalisability, and deployment support across contexts. We also identified nine key future research directions, such as knowledge transfer and ethical implications. We consider ARTES to provide a useful framework for developers and researchers of social skills training systems. We believe this versatile architecture is a step toward enhancing training systems' efficiency and impact.

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