

Developing a Decision Tree Classifier Plug-in for Scenario Automation and Real-Time Feedback Improvement in High-Fidelity Medical Simulation

Simulation-based training is a valuable educational tool that benefits learners at all stages of medical education [1, 2]. Manikin-based simulation is a type of high-fidelity simulator that utilizes lifelike, computerized manikins designed to replicate human functions and realism [3]. **High-fidelity manikins** offer significant advantages, but educational institutions also face different challenges for the successful implementation and utilization of these modalities. Research recommends funding for the maintenance and **upgrading of these systems, continuous research** and evaluation of effectiveness, and identification of areas for improvement.[4].

In this study, we focus on **improving real-time feedback** provided by instructors during simulations. Using high-fidelity simulators while running manual scenarios (which educators currently use most often, as shown in Figure 1), instructors must constantly monitor learners and manually control manikin parameters, which can limit their ability to provide pedagogical feedback. Even for automated scenarios, an **instructor** is still needed during the development phase to design, implement, and validate the scenario properly. To address this, we proposed a **Decision Tree Classifier (DTC) plug-in** that connects sensor data from the manikin to the DTC engine, which determines appropriate actions based on predefined rules and updates the manikin's parameters through an interface emulator (Figure 2).

This automation enables the **scenario to progress automatically** according to student performance and adhere to the defined rules based on medical scenarios from the European Resuscitation Council guidelines [5]. It frees instructors from technical concerns and allows them to focus on **providing effective feedback**. On the other hand, automating this process helps develop automated proactive feedback systems [6].



Figure 1: The instructor is managing a manual simulation scenario while monitoring and guiding students in real time. The photo was taken in the simulation center (SimUL) at the University of Luxembourg.

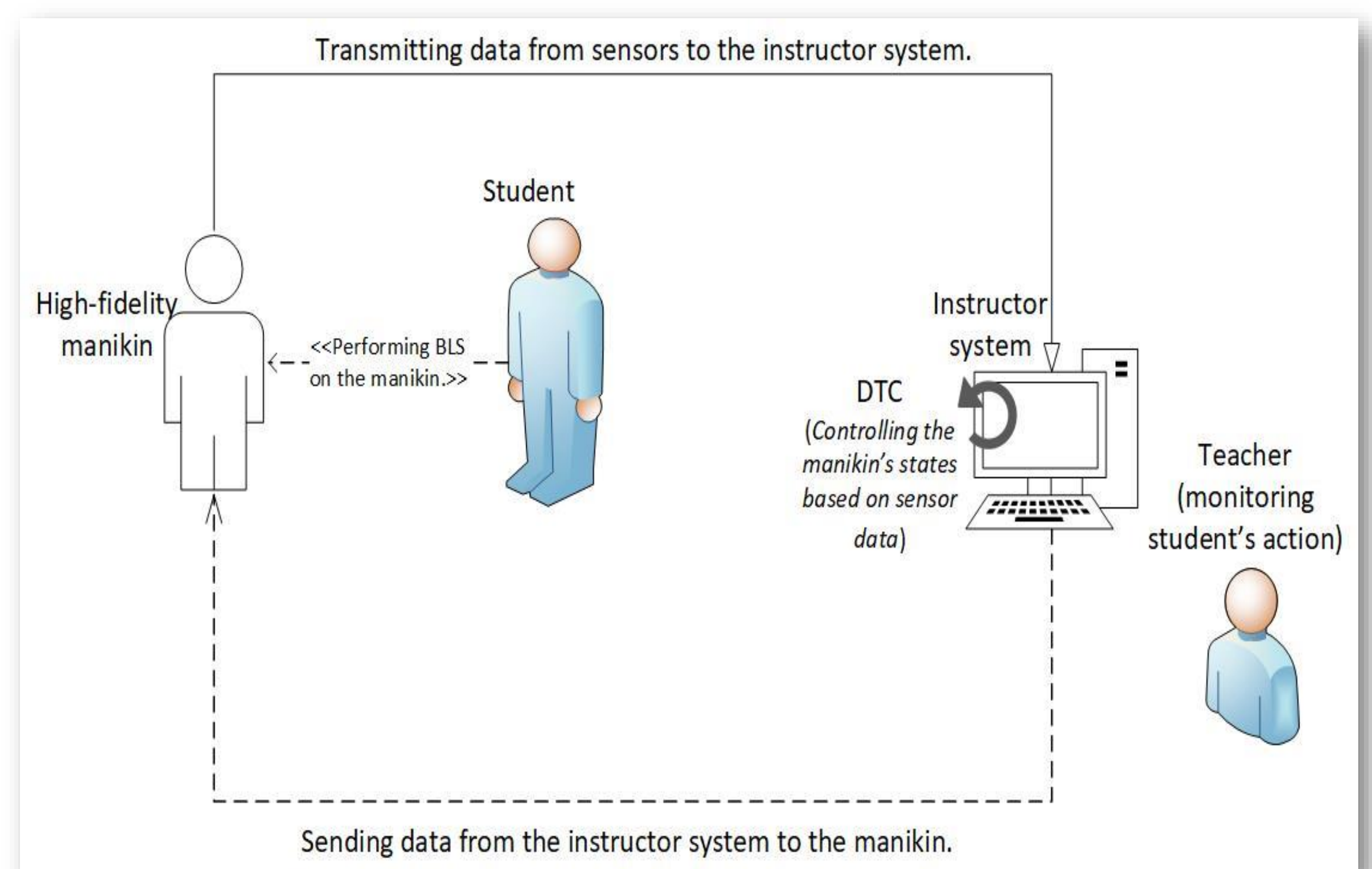


Figure 2: Using DTC to automate control of the manikin scenario.

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