# Wearable Simulator for Enhanced Realism

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The use of mannequins in simulations has become a prominent tool in the medical industry to train students and staff in a safe environment on infrequent and risky scenarios. Virtually all medical students are exposed to a medical simulation during their education. Some of the most popular mannequins that excel in medical simulation include: “Medical Manekin,” “Simulaids,” and the “SimMan 3G.” The common goal of all medical mannequins and patient simulators is to mimic real patient scenarios to train healthcare professionals. The fidelity of these mannequins depend on different models, but most mid- to high-fidelity mannequins are capable of breathing, producing life-like sounds, heart tones, and palpable pulses. They may also connect to an EKG or oscilloscope monitor, pulse oximeter, arterial waveform, pulmonary artery waveform, or anesthetic gases monitor. However, the current mannequins used for these simulations are ultimately lifeless; they lack crucial interaction capabilities, such as movement and emotion, and overall realism. Many of the high-fidelity simulators also have high cost-barriers, making it difficult to achieve realistic, comprehensive simulations in many hospitals.

The wearable simulation vest is a vest that instructors or actors can wear that will generate its own heart and lung sounds. The final design will consist of a vest that is easily adjustable, durable, and comfortable, and will be equipped with speakers that play audible heart and lung sounds in multiple locations along the front and back of the vest. These sounds will be adjusted by an instructor via a bluetooth module and raspberry pi to simulate different scenarios in real-time. This design allows medical students to communicate with the patient, perform an exam, and more realistically interpret the patient’s symptoms while still receiving accurately simulated heart and lung sounds that correspond to the intended scenario. The design will be validated during different sets of testing including surveys to determine the comfort level of the vest as well as quantitative electronics testing to ensure the speakers play the correct sounds, at proper times, and at adequate noise levels.

The global medical simulation market is valued at 1.9 billion USD and is growing dramatically at a CAGR of about 14.6%. The commercial opportunity for the wearable simulator vest is to offer a low-cost alternative to high-fidelity designs by maintaining the cardiorespiratory cues while increasing the human interaction and social cues. The final wearable simulator will cost less than 500 USD to fabricate. In comparison, the Laerdal SimMan 3G costs over 66,000 USD for a basic high-fidelity model. Simulations are only becoming more prominent in medical education to expose students to a variety of situations in a controlled environment, and the wearable simulation vest allows this to be done in an affordable way while emphasizing the importance of social interaction between doctors and patients.