

## Development of a Simulation Model for the Physical Examination of All Body Pulse Points

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### Abstract

Simulation-based training methods can enhance students' skills, improve their performance, and help them evaluate and reflect on their activities in a safe environment. Many sources emphasise the importance of well-structured skills laboratories for imparting psychomotor skills to students and bridging the gap between theory and practice. In this study, a simulation model was developed to simulate the physical examination of all body pulse points. This model allows students to experience situations similar to those encountered with real patients in practical laboratories. This model, which mimics real-life patient experiences, will serve as an important educational tool. In the study, a pulse model did developed using computer-aided design to evaluate pulse regions.

A human body model and its dimensions have been determined, into which a vibration motor (solenoid) that produces a pulse corresponding to actual pulse can be installed. Embedded systems have been developed to enable the combined use of the developed vibration motors. It is designed to control solenoid motors via an Arduino-based microcontroller board and to tactilely reproduce the PQRST waveform associated with the heartbeat using these motors. The interface displays pulse points placed on the human body silhouette, and the user can easily activate the relevant motor by selecting these points. In the data management section, the system exports every measurement and application made in excel format.

Consequently, this system combines a hardware layer that simulates the PQRST waveform with Arduino-based motor control, a communication infrastructure that operates via wireless connection over local Wi-Fi, and a user-friendly interface with Excel-based data recording capabilities. Thus, it provides a realistic pulse sensation in practical training while also supporting the scientific reportability of the work carried out.

### Keywords

Simulation, Physical Examination, Nursing, Pulse.

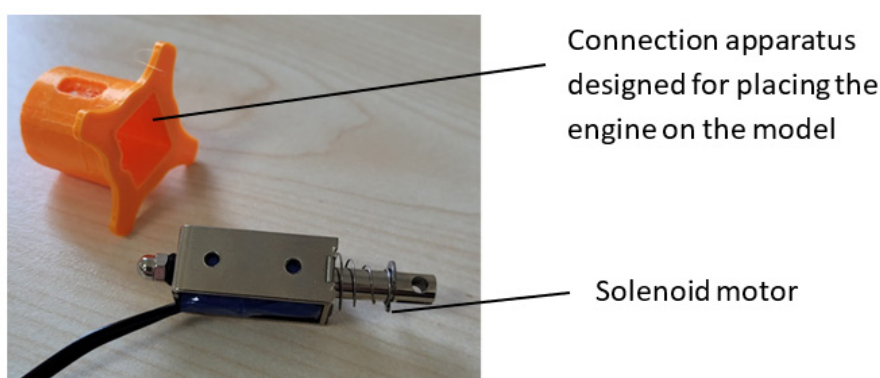


Figure 1. Designed fixtures and connecting elements and their prototypes