Robotic systems for high-fidelity neonatal simulation: training for medical doctors

Simulation-based training is increasingly emerging in Neonatal Intensive Care Units (NICUs), since high fidelity simulation has been confirmed as an effective instructional strategy to develop clinicians' technical and non-technical skills needed for patient care.By exploiting a strong collaboration with neonatologists, dedicated devices have been designed and realized both for training in neonatal intubation and mechanical ventilation.

1. An active, robust and reliable neonatal skill trainer that is able to provide clinicians with real-time information about the execution of the intubation procedure in terms of both force peak value, force distribution and timing. The system is based on the integration of different sensing elements into a commercial Laerdal® Neonatal Intubation Trainer.
2. An innovative neonatal respiratory simulation system was designed for obtaining a high-fidelity representation of physiological pulmonary features and breathing patterns in infants.

The prototype has 5 compartments arranged to reproduce anatomical distribution. Each compartment is characterized by its own adjustable compliance, and right and left respiratory branches are subjected to an independent and adjustable resistance level. The simulator is designed so as to be compatible with mechanical ventilators commonly used in NICUs, showing active behavior.With the final aim to provide medical doctors with mechatronic and robotic systems able to answer specific and different training needs, custom training kit can be designed and realized as described above, but by following the specific clinical requirements. In this case, an extra time should be devoted to the customization of the training devices.

Key Features

- Custom design for physiological simulation
- Active simulators for neonatal training in intubation and mechanical ventilation
- Possibility to re-design custom systems for high-fidelity clinical training

Possible Applications

- Neonatal resuscitation procedures
- Mechanical ventilation
- Neonatal intubation procedures

Access information

Corresponding infrastructure	School of Advanced Studies Sant'Anna The BioRobotics Institute
Location	Viale Rinaldo Piaggio, 34 56025 Pontedera PI, Italy
Unit of access	Working day

Technical specifications

Software/Hardware	Hardware and custom software
Active/Passive	Active systems, i.e., sensors on board
Simulation	High-fidelity simulation systems