

## Integration of a tangible deformable object for the training of cardiopulmonary massage with Virtual Reality (*in collaboration with the company Be!Rescuer*)



Example of a tangible object currently used for the training of cardiopulmonary massage  
(Mannequin Brayden)

### **Background:**

Recent VR systems offer an opportunity to increase the sensitivity of the general population to the importance of a quick and effective response whenever someone is witnessing a person suffering a cardiac arrest. Beyond raising the general awareness to the first aid protocol (procedural knowledge), a VR system could also increase the effectiveness of performing correctly cardiopulmonary massages (movement coordination knowledge = skill).

### **Project Idea:**

The present project proposition aims to assess the effectiveness of integrating a real mannequin into the VR interaction scenario to focus on the training and evaluation of the movement coordination skill. The core idea is to exploit the haptic interaction with the mannequin to effectively train the coordinated movement. This project is proposed in collaboration with a professional active in the field of cardiopulmonary resuscitation who will be involved in the assessment of the project outcome (Company Be!Rescuer).

At least one currently used training mannequin (similar to the one in the picture above) will be available during the project and will be used as a tracked tangible object integrated within the virtual environment. The mannequin will correspond to the virtual human who is suffering a cardiac arrest and on which the cardiopulmonary massage has to be performed with a predefined intensity, amplitude, frequency and duration. The virtual mannequin has to deform in the same way as the real one and to display the same type of visual feedback about the quality of the performed massage.

The user will be immersed in the virtual environment with a HTC headset ; various solutions will be tested for the tracking of the mannequin and of the user posture/hands. When a suitable solution in terms of comfort is chosen the project will focus on the online

assessment/feedback of the performed movement in collaboration with the industrial partner.

For a final Master project, the student will address the assessment of the three different classes of mannequin (from baby to adult) and conduct a comparative study of the training effectiveness with and without the Virtual Reality component for a range of potential users (to be refined with the industrial partner).

**Goal:**

- Assessment of the tracking solutions for selecting the most appropriate one.
- Design a deformable virtual human corresponding to the tangible mannequin.
- Assess the motion capture solution and motion analysis
- Conduct a comparative study with multiple users (for final master project)
- Produce a Unity plugin

**Requirements :**

- Unity (scripting in C#/DLL in C++)
- 3D geometry and quaternions (Vectors, cross products, rotations)
- Matlab/R (statistical tool).

**Information, materials and resource:**

*<http://www.resuscitation.ch>*

*An approach without haptic interaction with the mannequin:* <https://www.wanadev.fr/yourescue>  
*Untiy3D game engine:* <http://unity3d.com/learn>

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