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The use of new technologies for pathologies assessment and education of future health professionals.

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Abstract:

Evolution and efficiency of technological tools always more available in the medical field allow a quick development of engineering systems in healthcare. Two examples of technological developments proposed with physiotherapists are proposed in this communication. The first concerns the development of a reliable evaluation tool of the idiopathic scoliosis and the second used Augmented Reality technology to teach posterior pulmonary auscultation technics.

Idiopathic scoliosis is a tri-dimensional deformation of the spine, impacting 2 to 3% of the population. An early diagnostic of the pathology and associated treatments decrease the uncomfortable consequences on the patient daily life. In France, the actual screening technique is the Adam's test that presents imperfect sensibility (71-84% depending on the literature). The two main research axes developed here are about the guarantee of the data's reproducibility and the choice of a pertinent parameter for the back's surface asymmetry. A depth camera is used to generate a tri-dimensional points cloud of the back's surface of the patient. It is computed with the objective of quantifying an asymmetry of the patient's back, indicator of the spine's deformation in the axial plan, a specificity of the scoliosis. The outcome of this preliminary work is a novelty surface parameter acquired in a patient-related coordinate system. Results on healthy patients and scoliotic patients were encouraging and show the relevance of the proposal.

In the physiotherapy department, during certain applied anatomy lessons, students must develop a skill in manipulating the stethoscope for pulmonary auscultation. Precise procedure exists and students must mobilize their knowledge acquired from different types of resources. The issues that students faced are related to (1) the availability of these resources while seated on an examination table with a patient and (2) their relevance/applicability in a real situation they are faced with. Thanks to the use of Augmented Reality (AR), the student can visualize, superimposed on the patient, a representation of the lungs in 3D as well as the theoretical points on which he has to place the stethoscope. The real environment is also enriched with educational resources allowing him to have access to the characteristics of the respiratory sounds heard. Following the use of inclusion criteria, a cohort of students mobilized AR tools while others served as a control population by following the practical work classically provided. Both groups of students had the same learning objectives. Following these activities, an identical evaluation was proposed to the two groups to validate the pedagogical achievements. The expected result is an application using AR to learn gestures in physiotherapy training. It is currently evaluated and validated with the community of teachers from

the physiotherapy departments. The design approach developed must also be generalized and formalized in order to be reused in other areas of training in higher education.

Keywords: Depth camera, Scoliosis detection, Augmented Reality, pulmonary auscultation.