Medicine Meets the Second Generation of Immersive Training Simulator

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What is Likely to Bring the Second Generation of Immersive Simulator to the Medical Trainers and the Nursing School

*« Jamais la première fois sur le patient * »*

The objective of **LabForSIMS 2** project is to train more students in more specialties while gaining interpersonal skills. The project will allow the development of innovative tools in terms of **(1) collaborative immersive environments, (2) augmented reality, (3) conversational analysis.**
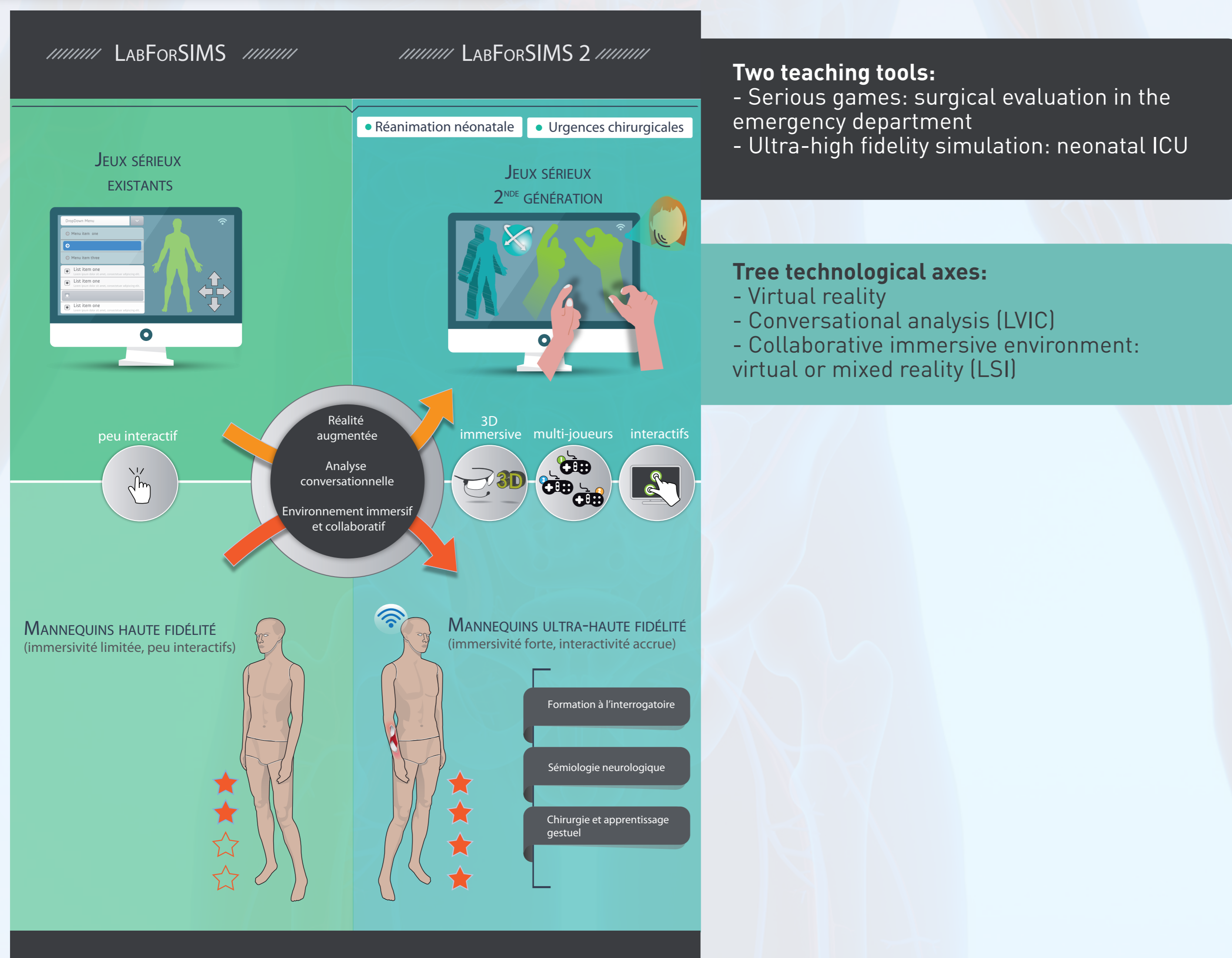
These innovative tools based on the same software platform, will implement ultra-realistic scenarios, initiators satisfaction and acceptance on the part of learners and therefore knowledge retention in the context of:

1) Second generation serious games, in which the learner can interact directly with the environment: immersion in a 3D environment with a helmet and motion detection, natural and ecological handling with the environment (instrument, patient), voice interaction with autonomous avatars using conversational analysis and emotional interactions.

2) In contrast to the present use of tangible high-fidelity mannequin, the learner will be immersed in an ultra-high fidelity platform within an increased (projected images) and virtual environment (voice interaction with both tangible high fidelity mannequin and conversational and emotional self-avatars).

These additional arrangements will cover a number of skills that are already included in existing programs and used by specialties already involved in simulation education: preoperative assessment, surgical procedures, training in clinical examination, patient-caregiver relationship. These new educational methods are also expected to allow for training of a larger number of students with the same number of teachers.

* Never the first time on the patient

Materials and Methods

Two teaching tools:
- Serious games: surgical evaluation in the emergency department
- Ultra-high fidelity simulation: neonatal ICU

Tree technological axes:
- Virtual reality
- Conversational analysis (LVIC)
- Collaborative immersive environment: virtual or mixed reality (LSI)

LabForSims Vs LabForSims 2

To achieve this goal, the partnership involves several experts in teaching by simulation and digital sciences.
Clinicians from LabForSIMS (University of Paris-Sud Medicine), and the School of Cancer Sciences (Gustave Roussy) collaborate with research laboratories specialized in digital and interactive (CEA-LIST) (HRV) technology.
The effectiveness of this new generation of simulator technology will be measured.
To facilitate its deployment, labForSIMS 2 will also rely on additional external support, in particular from the Regional Health Agency (ARS) through its contextual and political expertise.
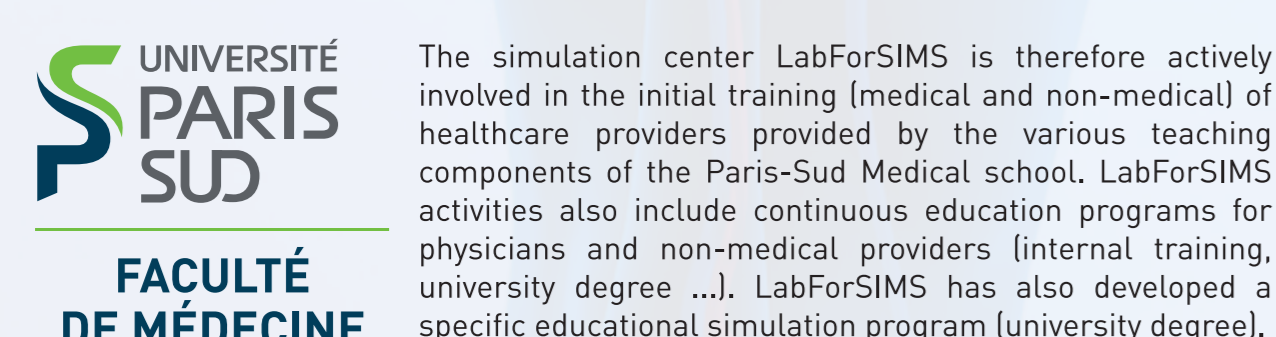
The simulation center LabForSIMS is therefore actively involved in the initial training (medical and non-medical) of healthcare providers provided by the various teaching components of the Paris-Sud Medical school. LabForSIMS activities also include continuous education programs for physicians and non-medical providers (internal training, university degree ...). LabForSIMS has also developed a specific educational simulation program (university degree).
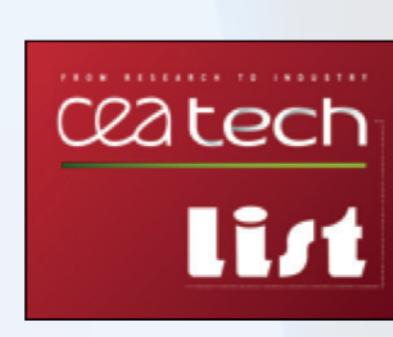
The Vision and Content Engineering Laboratory (LVIC), is structured around 3 topics: scene analysis, analysis and 3D multimedia vision. In the current project, LVIC provides its expertise in real-time 3D vision to develop the axis of Augmented Reality on mannequin. Then, with its experience in Language Processing, the LVIC will offer its technology to Conversational Analysis development.
The Interactive Simulation Laboratory (LSI) develops virtual immersive or mixed (EVMI) and collaborative environments which are dedicated to virtual prototyping product or "process" and training. Associated technologies can be transferred to other fields of health education and especially training of caregivers. As such, the LSI contributes to the development of virtual or mixed environments, collaborative and immersive tools.

The School of Cancer Sciences (ESC) / Gustave Roussy, unique in France, is a key player in academic training in oncology at Paris-Sud University. It brings together a combination of various highest level schools of Paris-Sud (Medicine, Pharmacy, Sciences and Law, Economics and Management) with the most important cancer center in Europe, Gustave Roussy. The ESC / Gustave Roussy trains 500 new healthcare professionals each year (physicians, pharmacists, nurses, researchers, scientists, engineers, companions) through degree courses or vocational training and non-degree in oncology. It has also developed programs to train for new jobs in areas ranging from basic and clinical research, care and support for sick people, in agreement with the National Cancer Plan.

HRV® markets its training platforms with medical schools and Universities (Bordeaux, Nancy, Paris VII, Geneva, Sheffield) to facilitate education. In addition, the company works with partner laboratories such as CEA-LIST, the European Center for Virtual Reality, INRIA or Haption society. Furthermore, the methodology developed by HRV as part of its offerings (Virteasy) is similar to that planned for its collaboration within the LabForSIMS 2 project: analysis of professional needs and activity in the specifications (serious games and high-fidelity mannequins), creation of educational scenarios, use of mixed reality by coupling virtual reality and a physical system (model). HRV participates in LabForSIMS 2 project and brings its complex solutions prototyping skills.
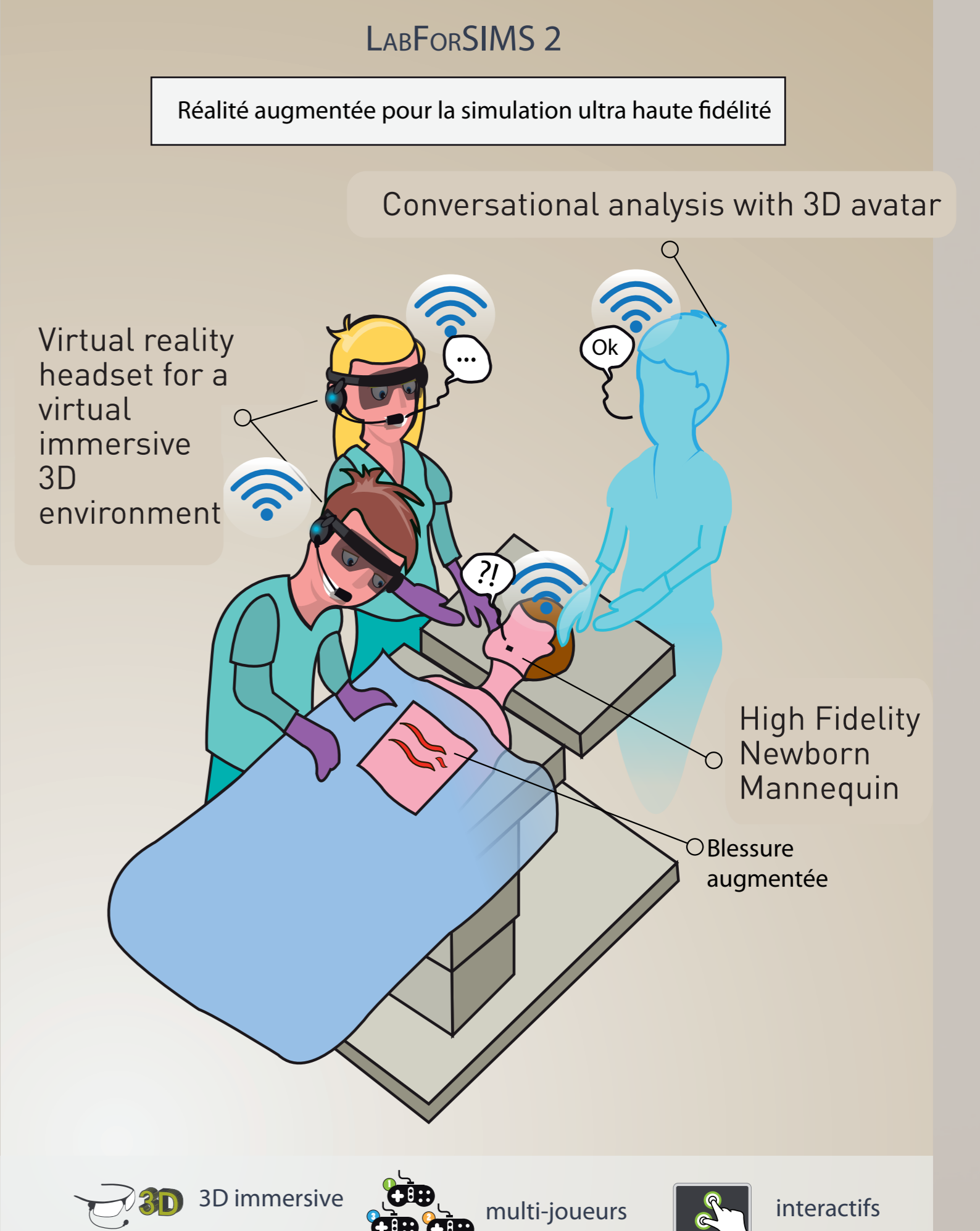
Results

1. Second Generation Serious Game to Improve Medical Students Diagnostic Capabilities in Surgical Emergency Situations

Management of a patient arriving in the emergency room with abdominal pain. Serious game and Virtual Reality: while operating in a virtual environment, the learner will examine the patient, request additional examinations and talk to the patient using a conversational analysis tool.
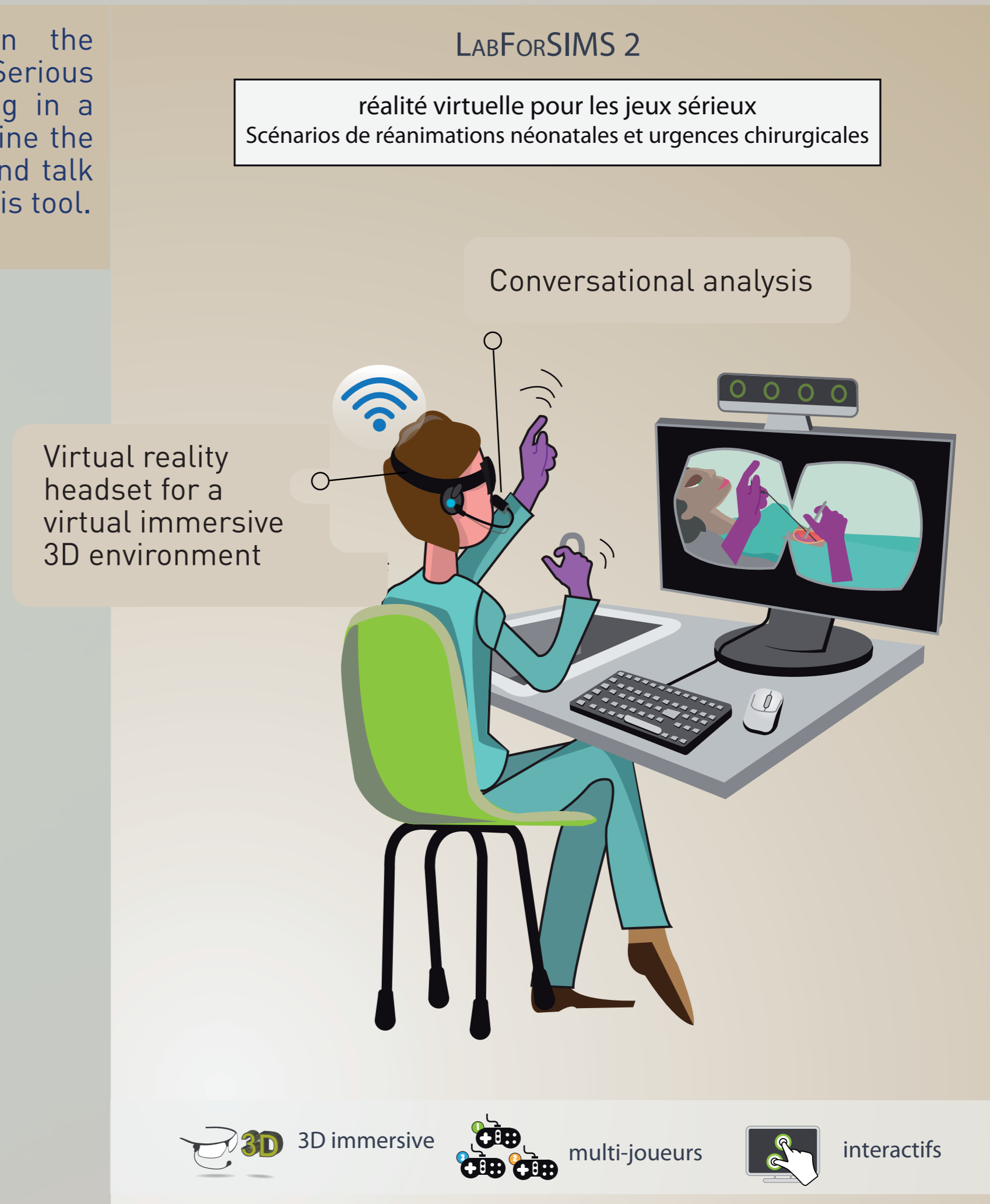
2. Ultra-High Fidelity Simulation: the Model of Neonatal Resuscitation

Support for a newborn as described by international recommendations.
Mixed reality scenario in which learners will be placed in a mixed virtual and real environment, interact with objects both in the real world (mannequin) and the virtual world, dialogue with other learners and different types of avatars by using conversation analysis.

Conclusion

Dissemination of Results

Communication on innovative models and overall research program results will be done through:

Oral communication to the other members of the simulation in healthcare community in: SoFraSimS annual meeting, specialized meetings devoted to educational innovation (SErious GAmes in MEDicine and health (SEGAMED) but also more widely in meetings organized by medical or surgical specialties also involved in the project as well as those specific to CEA researchers.

Communication in specialized journals in simulation (Simulation in HealthCare in particular), journals of various medical, surgical and non-medical specialties as well as journals specialized in educational research (impact of the deployed teaching practices on knowledge acquisition and retention). Moreover, technological innovations will lead to publications in more basic research journals.

Measuring the impact

LabForSIMS defines the most relevant indicators to take into account the impact of the project.
It will consider several levels:

The impact on learners (satisfaction, increased access to training, change in practice), trainers (satisfaction, educational performance). Attempts will also be made to measure the impact on the patients' management and quality of care.

The impact of simulation training on medical teaching methods and results. Simulation tools developed by the LabForSIMS 2 program may revolutionize medical education in the coming years if it proves effective. This impact might also be evaluated through the use by (and opinion from) other simulation centers. To follow the attractiveness of the program, several indicators can be measured : (i) the number of students enrolled in these courses and (ii) the distribution and purchase of the LabForSIMS 2 model by other French or international universities.