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Simulating In-Home Monitoring of Human Health and Daily Activities (*LiveHealth* Simulator)

D. Hakimi, B. Montreuil

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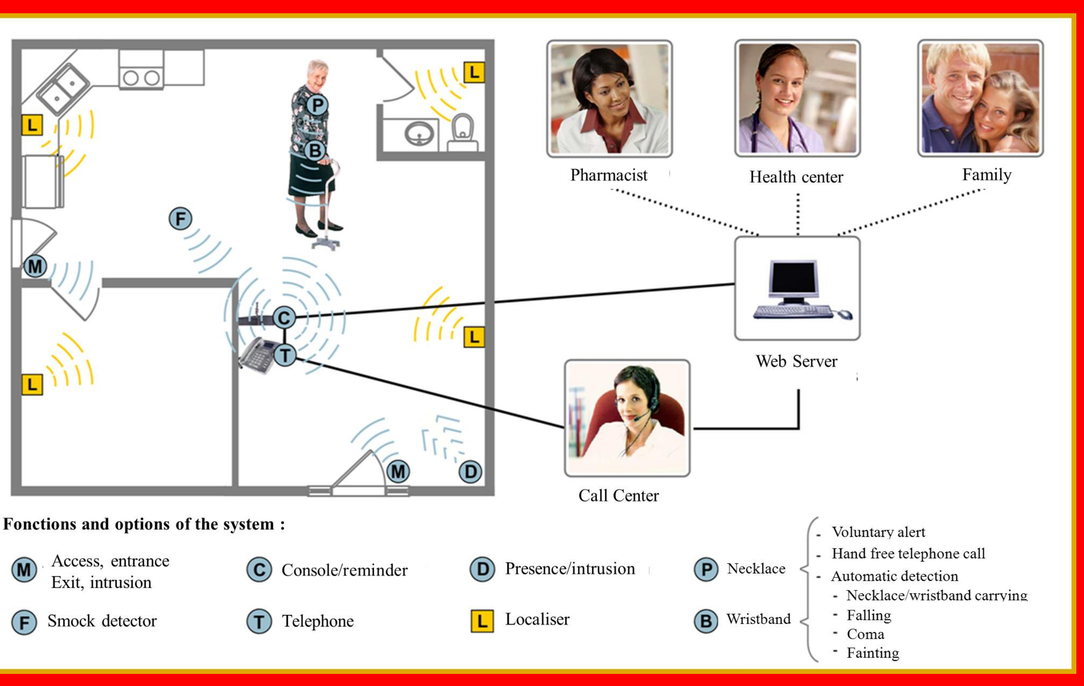
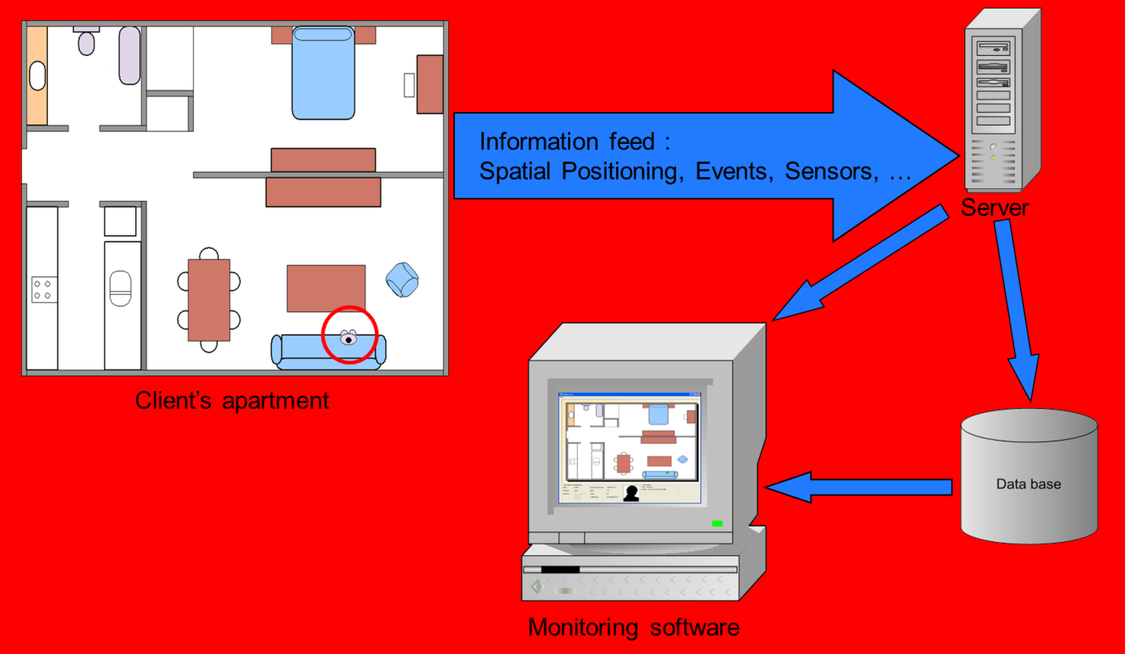
***LiveHealth* Simulator** is an agent- based simulation platform that provides around-the-clock, long-term and second by second simulations of daily in-home activities for different kinds of patients. The objective of this contribution is to introduce the conceptual underpinnings of such platforms and highlight key functionalities, capabilities and challenges for developing and exploiting them.

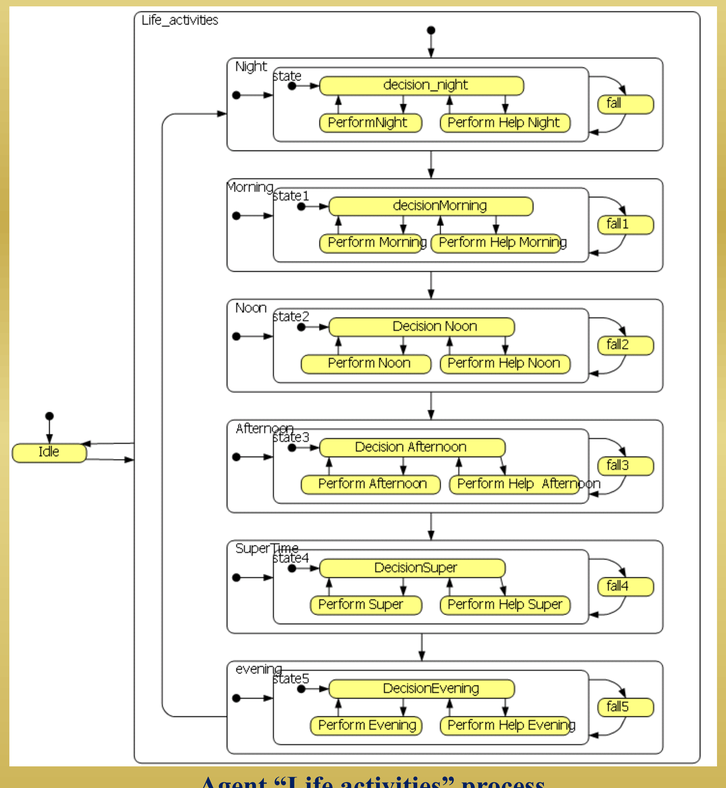
Introduction and Purpose



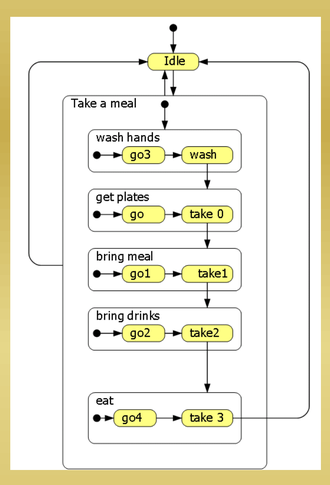


Simulation Modeling Approach

Objective : Imitation of complex, realistic, human behaviours



Agent "Life activities" process



Example of activity (Take a meal)

Agent Modeling Approach

Patient general profile (Database Input)

Name, age, gender, role, life habits…

Patient health profile

Health issues, attitude, and implication in the healing process

(Cardiovascular, Metabolic, Musculoskeletal, Neurological, Normal person)

Basic behaviour

Navigation, obstacle avoiding, memory, object recognition and utilisation

Patient activities

Interaction of dynamically evolving abilities, activities, health states, and the facilitators and/or obstacles of the environment

Patient health evolution

Coding the patient aptitudes using the process of disability production and dynamically modifying these aptitudes based on the evolution patron of diseases, attitude of the patient, and received assistance.

Simulation of daily life of in-home patients

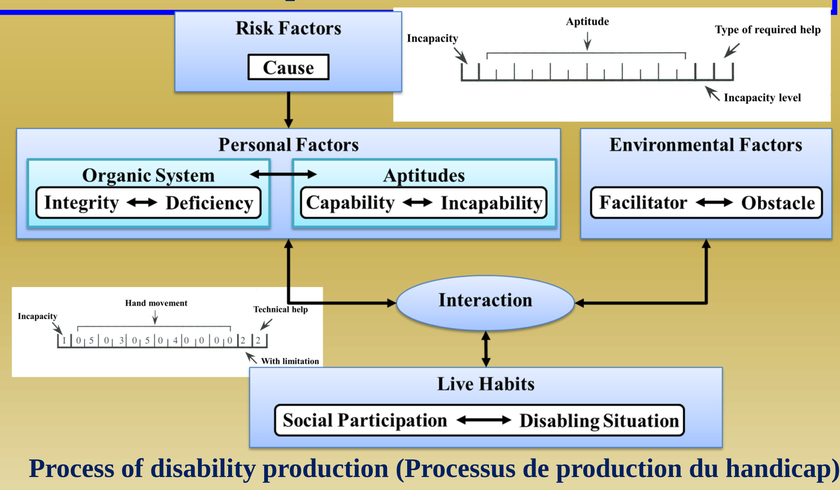
Intelligent choice of activities depending on the person's profile, period of the day, context and previous activities…

Daily activities (Sleep, wash, get dress, use bathroom, prepare food, eat, cleaning, wash dishes, watch TV, use computer and phone …)

Differentiate week and weekend day activities (receive guest, go out…)

Simulate social or medical assistants, visitors and patient companions

Health improvement/decline, and accidents such as falling and going into a coma



Process of disability production (Processus de production du handicap)

LiveHealth Simulator

Database input (patient, assistant & apartment)

Simulating many and different kinds of patients and locations

Around-the-clock vs. long-term

Monitoring actors' activities

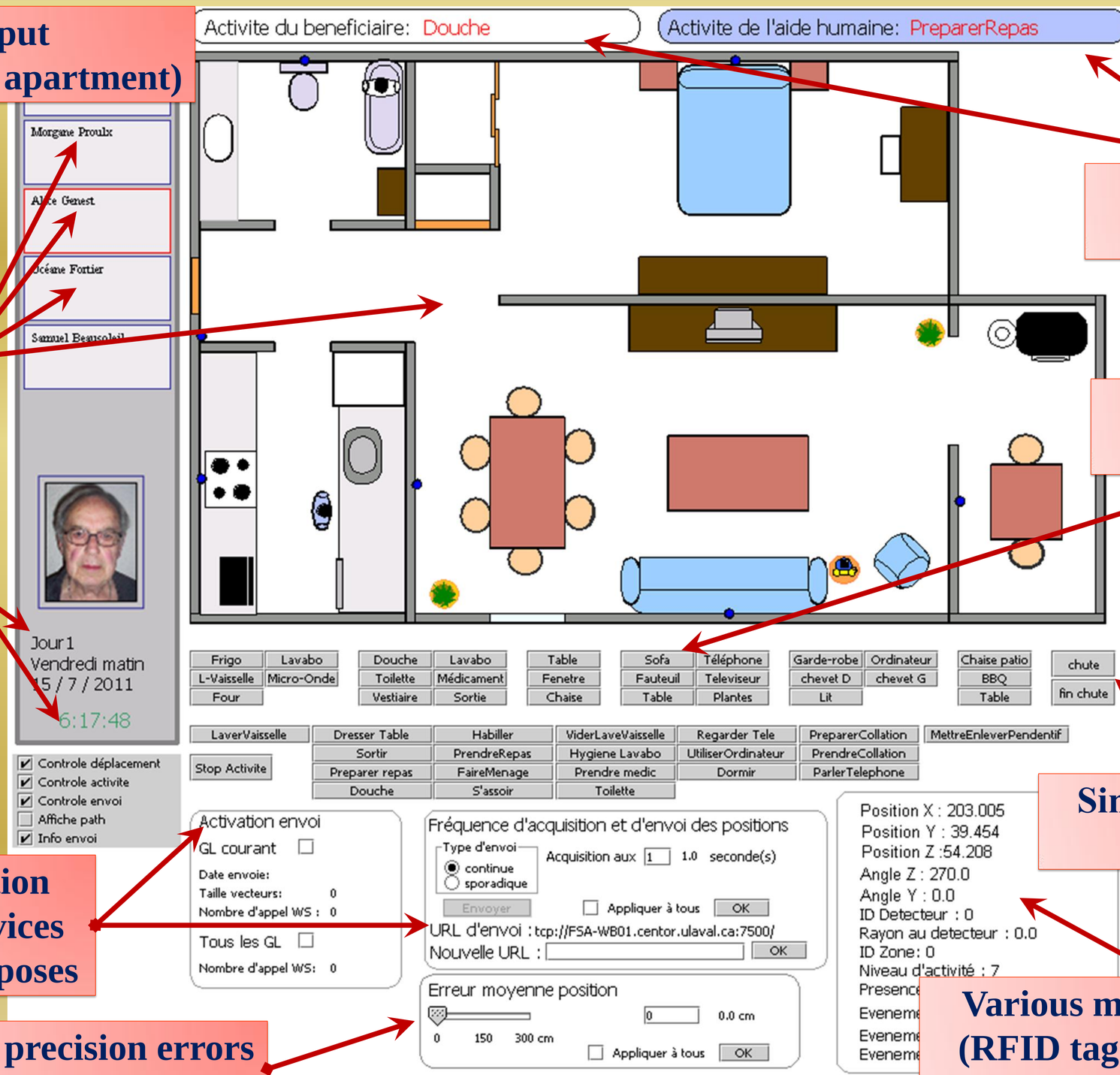
Wide range of daily activities

Simulating patient's fall and coma

Sending information flows via Web-services for monitoring purposes

Simulating precision errors for data capturing

Various monitoring gadgets (RFID tags, geo-acelerators, vital-signs monitors…)



Conclusion

Main Contribution

- **Propose a conceptual framework for developing complex realistic in-home patient simulations**
- **Reproduce realistic virtual environments to substitute the real world experimentation**

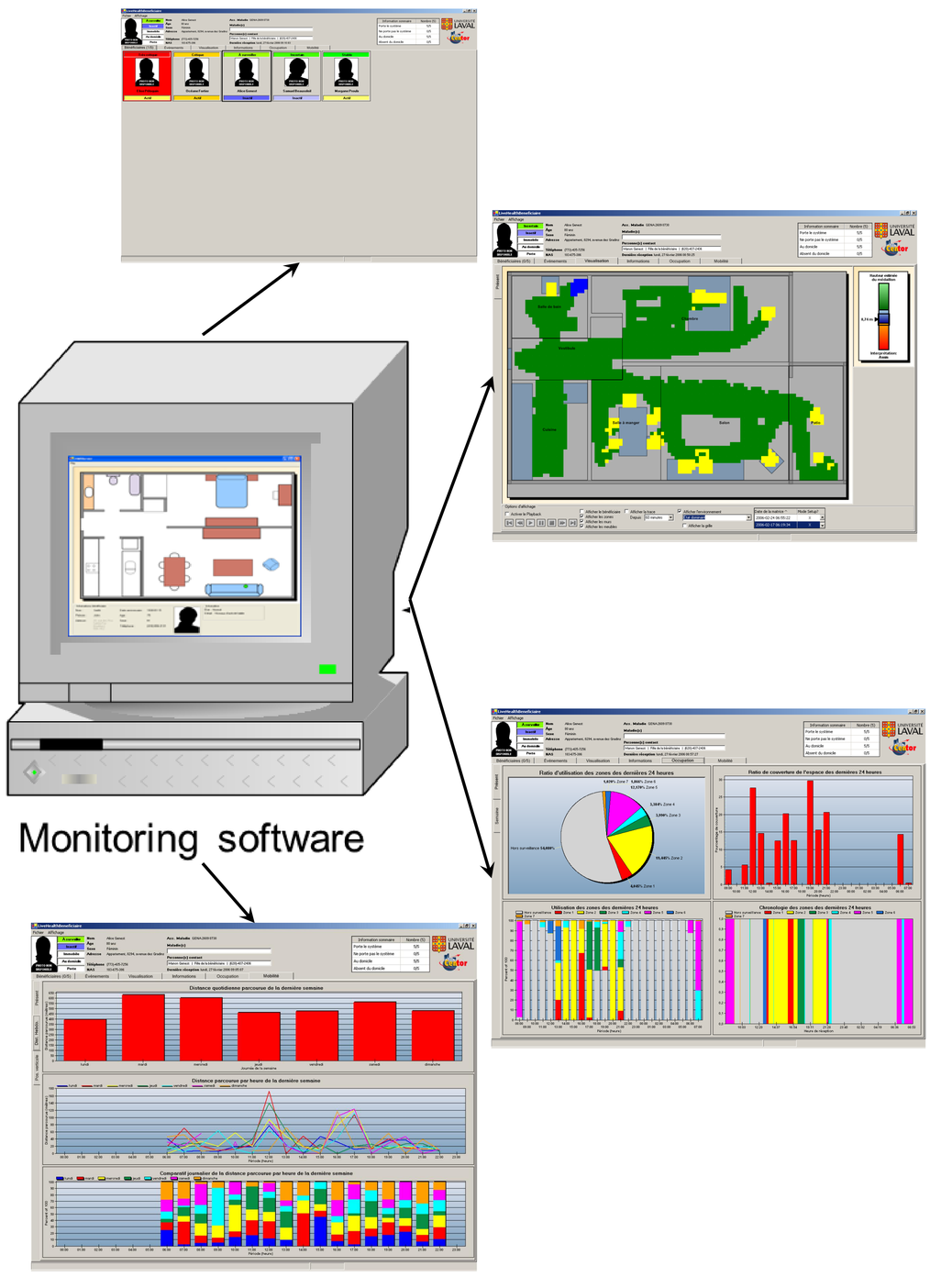
Utility

- **Decrease or remove the necessity to perform tests on human subjects**
- **Use for teaching and training different types of healthcare professionals**
- **Generate a realistic flow of information to use for developing, testing and experimenting on health monitoring systems**

Research Avenues

- **Simulate different health environments (hospitals, clinics, healthcare centers…)**
- **Explore the potentials provided by the new types of data provided by different monitoring gadgets**
- **Develop monitoring and decision support systems exploiting the collected data**

LiveHealth Monitoring System



(Driss.Hakimi, Benoit.Montreuil)@cirrelt.ulaval.ca