

BRIEF DESCRIPTION OF RESEARCH ACTIVITIES

Name: Dr.-Ing. Abdulmotaleb El Saddik, *FRSC, FIEEE, FEIC & FCAE*

Affiliation: University of Ottawa, Distinguished Professor

Up to 10 Keywords (expertise): Digital Twins, Multimedia Systems, Multimedia Communication, Connected Health, Quality of Experience, Haptics, Augmented & Virtual Reality, Social Networks, Artificial Intelligence, Biometrics.

Introduction and Research program: Dr El Saddik is working on the convergence of multimedia technologies for the creation of Digital Twins to enhance the quality of life of citizens. He redefined digital twin as a digital replica of a living or non-living physical entity. By bridging the physical and the virtual world, data is transmitted seamlessly allowing the virtual entity to exist simultaneously with the physical entity.

His research program consists of 5 Pillars of research: 1) Artificial Intelligence (ML/DL, Ontologies); 2) Cyber security (Biometrics and water marking); 3) IoT and Social Network (Hard and Soft sensory data); 4) Multimedia Interactions (Haptics, AR/VR, Humanoid Robotics, Audio, video); and 5) Quality of Experience (and services) powered communication networks (5G and Tactile Internet). Information can be found at this URL: www.mcrlab.net

Main undertaken research projects

Nowadays, I am leading a group of 22 researchers conducting the following main projects:

Digital Twins for well-being: The objectives of the research program are to investigate new analytical and computational methods and techniques to bridge the gap between real and virtual Environment and to facilitate the convergence of technologies and scientific knowledge to empower citizens' wellness and enhance their quality of life.

Interconnected Mixed Reality Networks: we model mixed reality media (incl. AR/VR, video, audio, haptics) and map it to the end-to-end network traffic model (perfect mathematical network traffic arrival model or typical traffic arrival data pattern) for better clarifying its requirement in everyday network.

City Digital Pulse: heart pulse is the core of human life. Now imagine an entire city, how would we know that a city is healthy, or if it's not suffering from issues that weaken it and sicken it to its core? we are developing an artificial intelligence-based analysis that collects public social media content in a certain geographical setting, and analyzes peoples' concerns towards certain events, issues, or problems that are of most importance and urgency to them. We analyze the SENTIMENT of that setting towards a certain event or an issue, the HUMAN NEEDS behind that sentiment, and we measure the overall sentimental temperature of the entire city or country towards that event, the temperature rises up or falls according to how positive or negative the sentiment of the city or country is, providing a full picture of how healthy or NOT a specific community is.

Recently Completed research projects

Behavioural Biometrics: El Saddik has pioneered the usage of ECG and Haptics for authentication of human users. In this context, novel systems have been designed and implemented that can be used as biometric technology in applications involving haptics.

Biofeedback and Well-being: El Saddik designed and developed algorithms and systems that make use of state-of-the-art ambulatory sensors to measure various physiological and psychological signals to intelligently monitor users and provide feedback with the help of intelligent, improved interfaces that validate data analytics directly, and produce appropriate persuasive advice to afford them conscious control over their bodies' functions.

Support (Grants and Contracts)

Prof. El Saddik has been the Principal Investigator of sponsored research, primarily with NSERC, OCE, CIHR, MITACS and CFI.