

CPS: Medium: Collaborative Research: Enabling and Advancing Human and Probabilistic Context Awareness for Smart Facilities and Elder Care

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Project Details

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Abstract: The objective of this research is to enable cyberphysical systems (CPS) to be context-aware of people in the environment and to use data from real-world probabilistic sensors. The approach is (1) to use radio tomography (RT) and RFID to provide awareness (location and potential identification) of every person in a building or area, and (2) to develop new middleware tools to enable context-aware computing systems to use probabilistic data, thus allowing new applications to exploit sometimes unreliable estimates of the environment. The intellectual merit of the proposal is in the development of new algorithms and models for building-scale RT with low radio densities and across multiple frequencies; the development of efficient multichannel access protocols for rapid and adaptive peer-to-peer measurements; the development of space-time and probabilistic data representations for use in stream-based context awareness systems and for merging ID and non-ID data; (4) and the development of a human context-aware software development toolkit that interfaces between probabilistic data and context-aware applications. The proposal impacts broadly the area of Cyber-physical systems that reason about human presence and rely on noisy and potentially ambiguous (practical) sensors. The research has additional dramatic impact in: (1) smart facilities which automatically enforce safety, privacy, and security procedures, increasing the ability to respond in emergency situations and prevent accidents and sabotage; (2) elder care, to monitor for physical or social decline so that effective intervention can be implemented, extending the period elders can live in their own home, without pervasive video surveillance.

