

## **A Scalable and Modular Framework for Adaptive, Multimodal, Context-aware Interaction (PI: Dr. Ngai Grace; 2013/14)**

In this project, our objective is to create a framework that will facilitate the development of systems that are adaptive (adjusts to different users and environments), physical (embedded into the environment) and/or mobile (worn on the user). An example of such a system might be a wearable computing system that allows a user to interact with a pervasive computing system in his apartment, or a mobile reader that adjusts its content or display based on the user's contextual activity and attention. In other words, we propose a human-centric framework for affective, context-aware, multimodal interaction. Unlike similar work that focuses on the interaction devices and their incoming or outgoing signals, our framework relates together all aspects of a user interaction process, including human factors such as user needs, task requirements, user affects and emotions, and physical limitations and abilities of the user, together with device details such as functionality, communications and robustness, and environmental factors. The relations between these different aspects are captured in a user-centered ontology that allows our framework to be scalable and easily extensible to incorporate new aspects of interaction as they are discovered or developed. Our project relates to the fields of human-computer interaction, context-aware computing, physical computing and wearable computing. Recent advances have made wearable/mobile and physical devices more pervasive in daily life, and new interaction devices are being introduced regularly. These advances necessitate new ways of interaction, and there has been some work in the design of frameworks to support human-computer interaction, some of it in the mobile computing context. However, most of the work has approached the problem from a technological/infrastructural standpoint, or assumed a single-user, uni-system model of interaction. By incorporating user interactions, environment attributes and the semantics of the task, we believe that our framework has the potential to offer a holistic view of human computer interaction, which will facilitate the development of more intuitive user

interactions and of adaptive user interfaces. We also hope that this framework will allow us to better understand the interactions between environment, task and user affect. We believe that our framework has application potential in a number of areas, including creative design, mobile interaction, social computing, and education. In this project, we will study two application areas for our platform: an adaptive online learning platform and an assistive technology environment to evaluate our framework for completeness and correctness.