Symbiotic Interactions between Users and Intelligent Systems

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In 1960 J.C.R. Licklider published the seminal "Man Computer Symbiosis" paper. In this paper he set the vision for computer research for many years to come. He foresaw a future beyond the punch cards of the time when men and computers would cooperate on decision making and would work together in flexible, non-preprogrammed teams. We have yet to achieve this vision. However, the papers presented in this minitrack demonstrate that we are making progress.

The first session in the minitrack focuses on mobile computers, in the form of robots. Nickerson and Reilly look at the effects of autonomy on human behavior. They propose a model to use in investigating instances where people receive advice from both other people and from computers in the process of making a decision. Julie Marble, Dave Bruemmer, Douglas Few, and Donald D. Dudenhoeffer look at supervisory versus peer to peer interactions for human-robot teams. They have developed a dynamic autonomy control architecture that makes it possible for robots to act as team members rather than remote tools. Scholtz, Antonishek, and Young round out the robot theme by looking at an evaluation methodology for supervisory user interfaces for semi-autonomous on-road driving robots. Their goal is to assess user interfaces by measuring the situation awareness that is provided to the supervisor. This information will be used to design the necessary sensor suites and information fusion that robots will need to provide remote users with the necessary knowledge to make decisions about the status of the missions.

Our second session takes a different look at symbiosis by investigating how computers can augment the cognition of humans. Quiroga, Crosby and Iding look at research in information filtering and explain how this can reduce the cognitive load on users. Ikehara, Chin and Crosby model the human-computer interaction as a partnership between two systems to produce quantitative and qualitative requirements for a user interface. They explain their work on using information obtained from passive physiological sensors (i.e., biosensors) monitoring the user to modify the actions produced by the computer's user model to optimize the team interaction. Jodlowski and Doane look at intelligent tutoring systems and discuss their work on developing a tool that can be used for developing individual computational cognitive models for incorporation in these tutors.

A third session looks at collaboration between humans mediated by computers. Furmanski, Payton, and Daily report on an evaluation they conducted on a dynamic, web-based collaboration tool. Their Packhunter tool was developed to allow humans to utilize the information search histories of colleagues to augment their own searches. They overcame the difficulties encountered evaluating this type of software to assess performance and measure what users learned during their interactions with the tool. Waern and Ramberg look at distributed knowledge –based systems with a focus on the human-machine interactions needed to produce explanations. They developed an explanation network and conducted an empirical study to demonstrate it's usefulness for users with different amounts of prior knowledge. The final paper by Massaro presents a tutor for speech and language learning using an accurate three-dimensional animated talking head appropriately aligned with either synthesized or natural speech. Massaro discusses the use of this tutor in many diverse applications.

The papers in this minitrack are proof of the advances we are making in achieving Licklider's vision. We are going beyond the view of the computer as a tool and are developing research applications that look at partnerships between man and machine.

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