Information Access Technology: Does it Require Getting Involved in Mechanisms of Mind and Intelligence?

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The world produces between 1 and 2 exabytes (10^{18} bytes) of information each year -- about 250 megabytes for every man, women, and child on earth. [Lyman, Peter and Hal R. Varian, "How Much Information," 2000, http://www.sims.berkeley.edu/how-much-info] Therefore better tools and technologies for information access and information management are needed to take full advantage of the ever-increasing amounts of digital information.

The discussion here will focus on technologies for accessing unstructured, digital multimedia and other complex information, including text, web pages, images, video, voice, audio, and graphics (both 2-D and 3-D). Examples of such technologies include search and retrieval techniques; information filtering techniques; methods for transforming speech, text, images, and video to representations that can be searched and filtered; user interaction techniques, including multi-modal approaches, that provide access to information; visualization methods that provide access to information; and sensor data acquisition and management. Note that these areas overlap what are considered to be traditional areas of AI, including speech processing and understanding, image and video processing and understanding, natural language processing and understanding, search techniques, data mining, text mining, speech mining, and video/image mining.

Generally, I agree with the notion that information access technologies can be improved through the use of AI. Although many AI technologies are currently not mature enough to be applied effectively, a program that advances these technologies could lead to better information access technologies. The following paragraphs discuss this further.

Traditional statistics-based information retrieval approaches seem to have reached a performance ceiling. New approaches that combine the linguistic analysis used in natural language processing with the statistics-based approach are showing great promise in improving performance. The AI approach could become particularly important for areas such as question-answering systems and summarization systems. In fact, from a functional point of view, any system that can look up information in databases and on the web and answer questions and generate summaries in a manner similar to humans is, by definition, an intelligent system.

The transformation of speech, text, images, and video to representations that can be searched and filtered requires a certain degree of “intelligence.” In particular, speech-to-text and image/video understanding have traditionally been considered AI tasks. The extraction of sophisticated metadata from video and images is a particularly difficult task,

and many would agree that extracting information such as objects, relationships among them, events, people, and their goals from video is a task that requires intelligence.

There are many different kinds of user interaction techniques. The traditional graphical user interface (GUI) used in much of today's software is not considered "intelligent," but neither are they easy to use by "non-technical" people. One approach to the promise of intuitive user interfaces is through perceptual user interfaces, those in which the machine perceives and understands what the user is doing, and the user can interact with the machine as if she is interacting with another human, through speech, natural language, and gestures. This would require the machine being able to perform tasks such as identifying and perceiving users and their actions and goals, and understanding and anticipating user needs.

In summary, I believe that the field of AI is still quite immature. However, the potential rewards to fields such as information access can be enormous if AI technologies can be significantly advanced. An evaluation-driven, metrics-based program in AI could significantly contribute to such a program.