Sensor Agents : An Anticipatory System For Complex Reasoning In a Widely Dispersed, Asynchronous Information System

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Today's reasoning systems are time consuming, lack adequate temporal and spatial resolution, and are restricted to 'snap-shots' that misrepresent events. This results in a lack of understanding of the relational dynamics that exist between cooperating elements in a system and interferes with its reasoning capabilities by introducing distortions in the asymmetric data and information that is gathered and its evolution, dissipative nature, and response to stressors. Understanding the complexity of such a system will require the development of a new reasoning and information gathering paradigm that is responsive to the entire system and provides a bridge between the temporal and spatial boundaries that occur at changes and the information and data distortions that accompany these transitions.

Many would propose the use of pattern recognition coupled with sensors (elements to extract those data needed for hypothesis testing) to solve this relational problem. This will not suffice. Pattern recognition exploits information that is coherent (time/space), seeking to find similarity in data and extract meaning or patterns. What is needed is a reasoning method that can anticipate, extract motive and intent, suspend beliefs, and restructure its assertions based on unknowns and the composition and structure of contradicting elements.

To effectively deal with this need, one must understand a wide range of actions and consequences resulting from a convoluted and sometimes distorted and imperceptive set of beliefs and views and be prepared to respond to them. Developing a *Sensor Agent Based Anticipatory System* is the most effective method for dealing with this complexity. A *Sensor Agent Based anticipatory system* can be affected through a system of autonomous, interacting entities that can form operational groups based on stated goals and assertions about a problem. Its purpose would be to gather disparate data and extract information and

knowledge for diagnostics, intervention, intelligence gathering, control, and situation/process evaluation. The system can be micro-networked and geo-referenced and communicate and share information and self organize based on events and the context within which they exist.

Important and Critical Aspects of a Sensor Agent Based Anticipatory System:

- Distributed intelligence and communication gathering and information extraction across widely dispersed geographical areas reducing biases and increasing confidence estimates in assertions.
- Unifying principle for a widely dispersed system of sensors (bio, chemical, environmental, etc.).
- Autonomously redefine extraction principles for data/information gathering. This will support extracting asymmetric data at transition boundaries.
- Sentinels that will re-deploy based on events and their context.
- Couple data collection with real-time events (socio-political, economics, environment, etc.). Bridge the boundaries of the temporal and spatial distortions that will be exhibited by terrorist activities.
- Reason from events, seek information, share assertions, generate hypotheses, check plausibility and establish confidence, adjust, and rationalize from present data and generalize disparate elements that provide incremental increases in confidence estimates.