Molecular Economics Technology

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Abstract:

This paper is a call for focused, collaborative research, needed to identify and configure global, econometric technology standards that are compatible with existing legacy systems and which also provide a long-term basis for researchers and systems integrators to build future, scaleable econometric systems that are compatible with evolving global conditions. These conditions require the protection of personal privacy, corporate security and national/ military secrets-- even as they also require transparent access to the global data sets.

This paper identifies existing technology components that are already-developed, pre-paid and resident inside U.S. National labs, in universities and in private industry! But today, these potential components (of a potentially wonderful solution capability) have simply not been investigated (as a scaleable system) in terms of investigating their ability to be "connected", thus providing the basis for an econometric system solution that is truly a global standard.

Definition of, "Molecular Economics Technology":

The name describes the three components of this paper's thesis:
First, there is the reality that all real wealth in the world comes from the Earth, unit-by-unit. Secondly, it is therefore obvious that all economic activity is based on the life-cycles of these economic units-- from extraction to disposal. Following extraction from the Earth, economic units of all kinds are, in turn, transformed into units of production. These units of production, in turn, are consumed and ultimately disposed of. The third component of this paper's thesis is that a technology configuration is now possible to be defined that can substitute virtual agents for the behaviors of these real world economic units--from extraction to disposal. Such a technology configuration would also be able to provide past, present and future predictions of behaviors; thus providing individuals, companies and government users of the technology the capability to better-plan and execute the economic activities of which they are a part.

A focused research effort of this technology solution would combine inter-disciplinary studies in private industry, university and government labs. And the research would identify the appropriate final configuration of this paper's identified components (those involving networking, scaleable computational resources, agent definitions and distributed intelligence) to help ensure the long-term, efficient utilization of global natural resources and the more-efficient utilization of human economies, worldwide. This success would enable middle class population increases, worldwide, to occur more rapidly and with stability based on existing economic constraints-- not in excess of them-- thus enhancing global economic, political and regional military stability for future growth.

Outline of the Technology Configuration:
In order for such a technology solution to work in "everyday" applications, such a system must have a Graphic User Interface (GUI) and operational methodology that is useful and predictable in its ability to deliver the answers to desired inquiries. For example, the technology's data set could draw on the data provided by existing worldwide shoe production supply chains. Various users of the technology could ask the system through the GUI to provide data on everything from "Where's my order for 300 pair of children's shoes?" (individual user) to "What's the current output of children's shoes worldwide?" (shoe company) to "How many shoes is the U.S. importing from China?" (U.S. Government policy analyst).

To provide such a robust variety of answers, derived from a common data set that spans a number of existing production and supply chain data is a research job in itself. Putting that together with a GUI that allows for language and cultural differences is what would make this a global standard. And defining the limits of economic "noise" (too random and insignificant to bother measuring) is a third research goal.

To be useful, this technology must be timely and accurate in both its tracking of economic objects (computerized agents) and in interpreting their behaviors. Humans know that a doctor's office "behaves"economically much differently than does a beauty salon. But when it comes to something like cotton balls, humans also know that cotton balls behave the same, economically-- regardless of whether they're found in a doctor's office or a beauty salon. So, the research needed in this system's development must define the edges of chaos theory-- beyond which further agent characteristics are not needed (i.e. cotton balls in doctors office, versus those in a beauty salon). Those useful boundaries of chaos and complexity have traditionally not been studied. And this differentiation needs to be a research objective of this paper's proposed research.

Inherent System Security Capabilities:
This paper's proposed system solution would also require the research and defining of encryption and other methodological security capabilities. Safeguards must obviously be developed for protecting personal privacy--short of court-ordered legal surveillance. Safeguards must also protect company secrets and national security interests. With "ubiquitous computing" and Radio Frequency IDentification (RFID) chips on the horizon, the need to develop secure and reasonable data collection, storage, transport and analysis protocols and features is an imperative research objective--regardless of the econometric applications that this paper calls for.

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Besides offering global econometric modeling and analysis tools, Molecular Economics Technology would also enable non-invasive surveillance of sensitive economic activities (like the purchase of explosives or drugs). And the technology would enable global monitoring of those people who are of interest to international law enforcement. With Molecular Economics, detection of criminal behavior would come from the data itself-- not from an intrusive surveillance. The lone guy in Kansas, whose existing "agent behavior" in the computer data, is associated with the running a small farm, might not trigger any concern when he purchases a certain amount of explosive fertilizer. Yet, when this personal object's behavior is not "attached" to any detected farm "molecule" where purchases of explosive fertilizer makes sense (based on known models for the use of fertilizer) a system surveillance alarm could be triggered to prompt a human review. When that happened, a law enforcement agency, tasked with tracking the use of dangerous materials might query the system, "Why is this guy buying a ton and half of potential explosives?" If no clear answer is obvious, appropriate law enforcement agencies could be notified and further surveillance of economic activity could reveal either an answer or a serious concern.

Specific Research Objectives:
1. Survey a wide variety of computer science, social science and natural science disciplines: To identify the inter-related aspects of "Real world" activity which, in turn, must be software-encoded, network-transported, and GUI shown to the user (in terms that make sense TO the user-- regardless of the user's culture, etc.). Artificial intelligence in the GUI could be the means to achieve displays of what is useful to each user, based on patterns of past use. Robust security features would have to be built into the client-side of the system, protecting the system's users from outside attacks.

2. Identify a practical and cost-effective configuration of hardware and software systems that would enable economic data collection (from all points on the supply chain on up to sale at the cash register, the life cycle behavior of the economic unit under investigation, all the way to disposal. In order to provide this capability, the technology would have to focus on data acquisition, transport, storage and retrieval and archive-duration. When does yesterday's economic activity become such "old news" as to be useless?

3. The big research questions lay in defining the limits of USEFUL data collection-- so that the system isn't wasting its time, tracking individual paper clips or blades of grass. Again, to the author's knowledge, no research has ever defined the useful limits of applied chaos theory-- to the task of modeling complex, econometric behaviors (and not at any level of system scalability--from the desktop to the warehouse, to the industry, the city, the region or global).

Ten, multi-disciplinary areas of research:

COMPUTER SCIENCES
(as applied from the desktop and cash register-- to supercomputer)
Researching the benefits of (and parsing-from) various solutions like Barcode, Auto-ID, Radio-frequency ID, Search engine "templatics", SOAP, DB2, DSTP, CORBA, Java, JINI, XML, UDDI, SIP, WAP, EDI, EDIINT, RosettaNet, Value-Added Networking, Web Services Description language (WSDL), Neural Network Agents/ Neugents, PGP/MIME, MOSS, Instant Messaging, MS Hailstorm/.Net, Liberty Alliance, Advanced Encryption Standard (AES) Very-long-instruction-word, SQL database management, datamining, networking, transport design, object-oriented software development, encryption, middleware, neural networks, parallel processing, fuzzy logic, distributed computing, embedded systems, image/pattern recognition, artificial intelligence and various algorithmic modeling methodologies (now in use in molecular, biological and other sciences). Field-Programmable Gate Arrays and other field-programmable logic.

AUTOMATED LEARNING SYSTEMS:
Including collaborative, collective and probabilistic learning (algorithms and applications) .
Evolution, learning and adaptation; And evolutionary computation.

DATA MINING:
Clustering and classification of objects and behaviors; Knowledge discovery;
Internet protocols; Indexing and Retrieval Methods; Multi-model Data Analysis;
Multivariate Data Visualization; Time series Analysis.

INTELLIGENT AGENTS:
Agent Architectures and protocols; Autonomous and multi-agent systems and applications.

USER INTERFACES:
Speech processing; Pattern Recognition; Image Processing; Feature extraction methods and applications. (emphasis on data display to maximize effective perceptual psychology and human cognition-- understanding-- of results by people of average intelligence; Parallel volume rendering of data)

SUPER COMPUTING/NETWORKING:
Optimized copilers for modern architectures; Debugging Parallel Programs; Intelligent Disaster Recovery; Matrix-matrix multiplies, based on low-cost graphics hardware; On-line parallel Tomography; Nimrod/O automatic optimization tool; SAGE (SAIC Adaptive Grid Eulerian hydrocode); Adaptive Mesh Refinement (AMR); SCALEA overhead analysis of coded regions.

MATHEMATICS:
Algorithm-design; Chaos/complexity theory; Monte Carlo approach; Navier-Stokes equations; Kalman filtering; Markov processes; Lorenz and Strange Attractors in chaos; Space-Phase period relationships in chaos; Behavior of dynamic systems; Estimation theory and probability.

PHYSICS:
Quantum and relativistic studies (to establish thresholds of useless chaos for useful algorithm design).

BIOLOGICAL SYSTEMS:
Complex adaptive systems; Environmental and organism behavior theory; Algorithm design.

CHEMISTRY:
Organic and non-organic, molecular behavior modeling and simulation.

BEHAVIORAL SCIENCES:
Human psychology (cognitive and perceptual), neurosciences.

SOCIAL/ POLITICAL SCIENCES:
Group dynamics, competition theory, law enforcement; Taxation; Logistics and socio-economic databases.

BUSINESS AND ECONOMICS:
Economic theory (computational, empirical, stochastic, equilibrium); Econometrics;
Management information; Finance; Industrial marketing; Mapping, simulation and modeling. Streamlined Sales Tax Project (SSTP)

Survey of existing, "Molecular" technologies:
*Including Non/Uniform Rational B-Spline Polynomial definitions of “molecular” econometric objects;

*Encoding of object/set behavior(s) and the kalman filtering of random unknowns (of data phases, vectors and amplitudes) etc.

*System-on-Chip, CPU logic-core, programmable gate-array and other microprocessor specifications for field-programmable iconization of economic and behavioral data.

*Iconization/ Objectification Strategies (particularly re: attribute-oriented induction/ attribute focusing). -

*Summarization, object-transport protocols (HTTP, NNTP, etc) and middleware standardization for transport and hierarchical storage.

*Digital Signal Processing developments; with the anticipated potential (based on the emerging potential of 64 and 128-bit processing for this paper’s proposed system to perform pattern-recognition of economic objects: Basically recognizing the "surface features" and underlying "hidden content" of the economic object as a hierarchical "multimedia" file.

*Cash register (and other "economic interface") industry developments, relative to the developing market for embedded, System-on-Chip capabilities.

*Smartcard and Radio Frequency ID tag utilization by the U.S. Government; As a baseline for Test and Evaluation field trials.

*System methodologies and timelines to field-deployment of this paper’s proposed capabilities and needed standards to achieve them.

*DataMining methodologies (in particular,relating to Association, Clustering and Trend analysis Fuzzy logic (in particular relating to Rough sets and Clustering of unknowns)

*Real-time Operating Systems Network and data fault-tolerance and recovery

* "Intelligent Agent" strategies for conducting hierarchical searches (particularly in regards to Plangent mobility and reflective metaplanning. Also ontology of expertise, domain model, information source models, query processing, communications language and protocols.

*Artificial-Intelligence-assisted browsing, user's heuristic phrase-extraction and query-free information retrieval by the system, itself).

*Overall Network Design: Relative to satellite, fiber, hybrids; nodes, storage, protocols.

*Security: Citing of mirrored-datamine sites, threats to databases, use of cryptography in data transport and threat countermeasures.

*Social and political dynamics of Molecular Economics: From "selling" it as a research program... to establishing and protecting it as a (defacto?) standard... and to its implementation as a deployed technology.

*Analysis of Governmental/ Agency/Military Involvement, especially in regards to the formation of policies, relating to strategies for the international deployment of Molecular Economics--vs (USA) tendency for "deregulation" and "market-driven natural selection".

Conclusion:

The author of this paper wishes to give its objectives and potentials to American industry, academia and government research labs, to be fulfilled for the benefit of the nation and the world; As his small contribution to securing a more stable and capable global civilization.

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