Molecular Economics Technology

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Work-in Progress

Abstract:
This paper is a call for focused, collaborative research, needed to identify and configure global, econometric technology standards that are compatible with legacy systems and which provide a long-term basis for software companies and systems integrators to build future, scaleable econometric systems that are compatible with evolving global conditions that require the protection of personal privacy, corporate security and national/ military secrets-- even as the technology provides transparent economic activity data analysis to authorized users (from ordinary consumers, participants in supply chains and law enforcement... all of whom are assigned varying levels of transparent access to the global data set on a “need to know” basis). Besides providing standard econometric solutions, the technology described in this paper can also provide anti-terrorist capability as well as sociological behavioral pattern recognition in general-- apart from individual security concerns. This paper was written by a journalist/ researcher in Wyoming. An earlier version of it was published in n2001 by the University of Amsterdam’s Center for Nonlinear Dynamics in Economics and Finance and the concept has been reviewed by both the U.S. Department of Energy and by the Vice President of the United States and his domestic policy advisor.

This paper identifies existing technology components that are already-developed, pre-paid and resident inside U.S. National labs, 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) as to their ability to be "connected" into an econometric system solution that is the basis of a future global standard.

The name, "Molecular Economics Technology" describes the reality that all real wealth
in the world first comes from the Earth... unit-by-unit. Following extraction from the Earth, economic units of all kinds are then manufactured or otherwise transformed into units of production. These units of production, in turn, are consumed and ultimately disposed of. The agent-based "Technology" component of the “molecular” name describes the fact that the computer-modeling of these units of activity and their economic “lives” is unique and (if modeled in a computer system) appropriate to be assigned agent “behaviors” to describe them and model their past, current and probable future behaviors.

A focused research effort, combining private industry, university and government labs would identify the appropriate final configuration of this paper’s identified components (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, enhancing global economic, political and regional military stability.

Everyday example of the proposed System’s usefulness:

Imagine that you are the owner of a shoe store on "Main Street".
You sit down at your office computer and type in a simple question
(and into the highly sophisticated search engine that resides on your computer.)
Based on your own past use of the system, your Artificial-Intelligence-enhanced computer has pre-defined a custom set of "search rules" that meet your probable needs.

Your question is, "Where are the 300 pairs of school girl shoes that
I ordered from Ajax Shoe Company last June?". The computer system then
finds your past order, searches the globe for current economic date pertaining to the order, focuses in on the Chinese manufacturer, queries its database
and responds that 200 pairs of shoes from your order have (just that day)
arrived in Oakland, CA on this ship; And 100 more are arriving in Oakland in two days on another ship (the proposed research of this concept would seek to define how much access to shipping manifests and transportation details, the shoe store owner-- or any other user of the system-- would be entitled to; And to what degree of specificity, any user's inquiry might enable).

Obviously, it's one thing for a user of "the system" to be a shoe store owner,
who's interested in tracking an order for 300 pairs of shoes--
and it's another thing for a researcher at the Federal Reserve in Washington to ask the same system the question, "How many children's shoes, made in China, were imported last year, based on actual shipments?" Underlying both esquires however, would be system-assigned agents, representing both the behavior of shoes and where those virtual objects are now, in the global, economic environment.

Outline of the Technology Configuration:

Obviously, per the preceding example of "everyday use" such a system must have a graphic user interface and operational methodology that is so simple as to be stupid (i.e. predictable) in its simplicity. It must be useful and timely and accurate in both its tracking of economic objects (agents) and in interpreting their behaviors. Humans know that a doctor's office "behaves" differently than a beauty salon, economically. And humans also know that cotton balls behave the same, whether they're 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 limits of chaos and complexity have traditionally not been studied. And this needs to be a research objective of this paper's proposed research: In defining a useful econometric solution that is global and trans-cultural in basis.

Inherent System Security Capabilities:

This paper's proposed system solution would also require the research and defining of encryption and other methodological security capabilities-- based on global observation of real world data and the computerized (virtual) modeling of that activity. Safeguards must obviously be developed for protecting personal privacy--short of court-ordered legal surveillance; And company secrets; And national security. With "ubiquitous computing" on the horizon, the need to develop secure and reasonable data collection, storage, transport and analysis protocols and features is an imperative research objective.

Besides offering global econometric modeling and analysis tools, Molecular Economics would also enable non-invasive surveillance of sensitive economic activities. And it would enable global monitoring of those people who are of interest to international law enforcement. With Molecular Economics, detection of criminal behavior
comes from the standard system filtering of unusual economic activity-- not from any
invasive surveillance of any individual person! For Molecular Economics, identifying
and tracking a network of terror like Al-Qaeda would be easy!

The lone guy in Kansas, whose known "agent behavior" in the computer network, is associated with the running a small farm, might not trigger any concern when he purchases a certain amount of explosive fertilizer. Yet, when his personal object behavior is not "attached" to any detected farm "molecule", an alarm could be triggered. Some law enforcement agency, tasked with tracking the use of dangerous materials might then 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.

The author of this paper is aware of the potential abuses of such a global econometric modeling capability as he's describing. And he's identified features that would prevent abuse and would ensure global users of the system the rights

and benefits that are associated with the U.S. Constitution. The author, himself, has been put under surveillance a couple of times during his life. And without going into details, it's no big deal because he was doing nothing wrong. Most recently, a homeland security investigator told him, "Yea, we looked at you and decided that you hadn't revealed anything classified. You're just better informed than most people." This is the "real world", for which this paper proposes solutions.

Today, the world's business and law enforcement communities are swamped with incompatible data that resides in a variety of "relational" databases... many of which
are not compatible with each other. This paper's goal is to replace the myriad
relational databases that exist with a cross-platform agent/ object-based capability that would become a de-facto global standard for computerized, economic data, worldwide, for decades to come.

Such a system solution would be much more efficient than today's hodgepodge of largely-incompatible relational databases. Such an effort on our part will also enable billions of people in "emerging nations" to become "middle class", giving them (and their governmental policy planners) the planning tools needed to maintain unprecedented economic expansion for decades to come. With world population increase, there is a clear and obvious need to enable the intelligent analysis of future infrastructure improvements and natural resource utilization (which could be based in part on this paper's proposed technology's anticipated ability to forecast economic behavior from past history to future probabilities).

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 graphically shown to the user (in terms that make sense TO the user-- regardless of the user's culture, etc.).

2. Identify a practical and cost-effective configuration of hardware and software systems that would enable economic data collection (from the cash register... on
up the supply chain for retail and wholesale business) and transport, store and enable the retrieval of this economic data in (near) real time.

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; And the 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. For example, Molecular Economics meets the need (as defined in April, 1999, by U.S. Treasury Secretary Rubin) for "transparency and disclosure" in the global investor knowledge base of economic activity underway in emerging world markets, etc.

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".

Defining governmental benefits (local, state, federal)

Intelligence Agency and Law Enforcement system requirements

Military command utilizations of "molecular" technology

U.S. National Lab involvements and their respective expertise's

Other national governments: As Markets and as possible competitors

Select list of identified Researchers and Institutions
Select list of identified corporate research departments and their strengths.

Select list of identified Venture Capital funds and firms to begin research.

Mission statement for formation of Cooperative Research and Development Agreement with U.S. National Lab.

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.
The author is confident that anyone smart enough to make use of this concept, will be also smart enough to hire the guy who dreamed it up.

END OF PAPER ######