Theory of mechanical information

Thursday, 4 April 2019

Atomism

In physics we learn how simple the physical world is. We learn the lesson learned from unlearning the supremacy of complexity that was distilled from the experience of the affairs of society. That the metaphysical worlds of our society have virtually no reflection upon the physical world, which is simple.

It can be an exhausting journey to come to some familiarity with physical objectivity because we are most familiar with the metaphysical frames of reference that permit the arbitrary complexity of social relationships and communication. In the physical reference frame we are challenged to discard, first, the metaphysical frame of social reference, and second, the metaphysical frame of person reference. The latter encumbered by the language, experience, frustration, violence, and habit of self preservation, and the former being the source of that learning as the experience of the persons, representations, and projections of others.

There is a magnificent conflux of physical and metaphysical worlds in our computing machinery. The machine, itself, is simple. The computing machine is the manifestation of the confluence of physics and reason. To our seemingly endless realization, physics and reason collided to produce something simple. Of course this occurs in every application of our disciplines of physics, and the computer is sibling to every other product of physical technology. Nonetheless, we must pause and reflect before proposing a conjuction of physical and metaphysical because the worlds of metaphysical frames of reference are diverse beyond common familiarity with metaphysical objectivity.

In either branch of objectivity, we employ a frame of reference which primary tool is objectification. In the process of the acquisition of language, we first must discover objectification before we can employ association to put it to work. We develop the understanding that a name associates to an object of perception and we are born again as atomists. Curiosity in the flux of awareness explores the named object.

Our identities and their descriptions are always finite. This, permanent, character of information produces a dual conscience and conceit of physicality. As a physical representation it is but analog, and therefore it is metaphysical. As physically represented it is finite and must be qualified to represent. The physicality of information is mechanical, when we err in offense of qualification we are found in the conceit of physicality. When we conserve information we are found in the conscience of physicality.

As we apply machinery to information, we confront metaphysical objectivity from the avenue of a physical frame of reference. When we employ mechanical information to the handling of the products of physical scholarship, we are fully prepared to understand our prospects. Otherwise, we are naive. The subjects of our own folly. And we have learned as criminal to project and exploit the results.

We are, therefore, obligated to identify physical and metaphysical objectivity as frames of reference for handling information. That the mechanical information lies in the physical reference frame of the machine, while the subjective information lies in the metaphysical reference frame of the user.

Object

Experience with physical information reveals the following lessons.

- An archival object must be self evident.

- A interactive object must be self sufficient.

A coherent pattern is evident. There exist principal members of mechanical information space, and these share an atomism of mechanical information.

We may conceive of atomism in mechanical information space as utility of facility. A mechanical information object affords utility by design. Design determines utility, but the utility of facility will be measured in the experience of usage, regardless of the mysteries of its origin.

Atomism represents the future to design, and the past to experience. In the design of archive objects, the Atomistic future in experience may be tactile. A study of usability discards familiarity and confronts infamiliarity.

Atomism represents necessity to design. In the design of principal objects, the recognition of necessity discards the comforts of achievement to confront the demands of reason beyond the conveniences of rationale.

When we open the object to inspection or review, do we find what we need to integrate that object with foreign automata? To what degree would a foreign automaton be able to use the design object? Is such a perspective incorporated into the design program?

The object of an Atomic design program is an observable. The substance of observation is information. The object is a composition of information. Atomism requires a reasonable degree of accessibility, usability, readability, and completeness as enables a foreign automaton to use the object as designed, and enables a remote user to comprehend the object as applied.

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Theory of mechanical information

Saturday, 6 April 2019

Radiant objects

The element of theory that first circumscribes a record of data, Atomism would envelop the success of object oriented programming languages, and predict the significance of distributed objects to network topology.

A **radiant object** is an atom in the field of a distributed object topology. It has a globally unique resource identity (GU/RID) which is self identified and version independent. It has typed or structured data, including references to other radiant objects, to form structures in distributed data. And, it has interfaces and semantics to form protocols interacting in distributed processes.

The mechanical space-time field is a possibility space founded on message passing. The data message is spatial, and its processing is temporal. By the application of study and reflection we arrive at theory and practice to develop the mechanical space-time fabric to the study of distributed objects.

This scholarly objective condenses the data message to a topological atom, and the mechanical topology to the space-time field of existence for atomic objects.

Location is defined by topology, like communication. A mechanical space-time fabric defines the existence of distributed objects by realizing location and communication.

Topology

Distributed over communications links, a topology is a graph or network of connections that facilitates an objective (*i.e.* point to point, or point to multipoint communication). The term is employed where traversal is significant to the analytical framework, where the connectivity of a graph is a point of focus.

A topology has a dual substance of significance. Relative to the mechanical space-time fabric of hardware, a network topology exists as a data processing application. Relative to the mechanical space-time fabric of internetworking systems, it is a facility of space and time.

We elect to assign the spatial resources of topological data, and the temporal resources of topological software, to the frame of analysis when we focus on the distributed object as an atom in a topological space-time field. In doing so we have separated the topology and its objective into two distinct frames of analysis. We identify a topology as a “field” that remains abstract because the frame of analysis that focuses on topology is relatively abstract, and therefore it is natural and useful to represent topology as abstract, and to employ terms of abstraction in the description of topology.

A first topological problem is distributed object location and retrieval, as necessary to distributed data structures, or object location and interaction as necessary to distributed information processing. Given a network of communication, which traversal satisfies an objective?

A second topological problem is object distribution in spatio-temporal systems. The location and behavior of objects in spatio-temporal systems can simulate population migration due to climate change, or ideological subscription due to competitive disadvantage.

In other words, “the network is the computer” is condensed by an application of Atomism to focus on the radiant object in the framework of a mechanical topology. In this perspective, the microkernel is a milestone in the collapse of nondeterministic commodities onto deterministic components. And, the tape and choice machines are milestones in the development of formal methods.

Determinism represents stronger knowledge of objective satisfaction, while nondeterminism represents weaker knowledge of objective satisfaction. In terms of distributed socio-economics, determinism represents collective stability, and nondeterminism represents global dynamicism (*i.e.* tolerance of change).

Host

One possible communications topology is the internet protocol [IP], our most prolific communications topology. The info-mechanical hardware is organized into network host and router nodes on network edge links, located by edge node addressing, and connected by edge channels and node routers. The IP routers are statically addressed nodes with periodically updated edge neighbor address maps. A deterministic topology is resource distributed among dedicated routers.

This host topology is intended to provide a transient message passing layer over heterogeneous hardware and under an open world of applications to benefit the communication of digital information. The object of the design is purely topological, which design program has been successful in yielding a global communications network unencumbered by design barriers to access or design thresholds to utility.

In the perspective of avenues for the development of distributed object topologies, the internet host technology is a method of communication capable of solving every problem except the out of band communication problem dictated by some solutions to security problems. However, there are burdens due to exploitation that inhibit access and utility. And, there are cases in which utility is negative due to malice and avarice.

Trust

One possible object topology is a distributed social network. A **distributed trust network** is a social topology defined by the interpersonal sharing of asymmetric keys (*e.g. via* private, *ad hoc* networking). The possession of someone's public key represents the relatively invested association of a social graph edge.

When the association is technically endowed with a practical communications channel, the social graph becomes a communications network. The set of technical associations to each individual, including key, name, and link, is a node in the trust peer social network. The set of social associations to each individual has a radiating (star) connectivity in the topology of the social network graph.

The social graph node object has a communications link. It is a point to point channel intended to communicate objects of data and interaction. Therefore the social network is a mechanical space-time topology. However, unlike a host topology, a social topology is characterized by cyclic connectivity. A message broadcast to every possible link to cover the topological graph exhaustively would cover a host topology redundantly.

Reachability in distributed trust is determined by the graph of social trust relationships. “If I don’t know you, my friends don’t know you, and their friends don’t know you, I cannot find something you have published.”. This property of distributed trust networks contradicts the deterministic retrieval objective of the main volume of research in distributed data systems. Deterministic retrieval on a distributed trust topology is an expensive elective: possible but rare. Which gives distributed trust a nondeterministic topological character.

The distributed social trust network is a topology endowed with an important degree of transparency in resource distribution. Resource consumption has proportion to the social network. Other topologies would be opaque in comparison.

Names

A first distributed database would be applied to name space. Since the domain name system [DNS] was abandoned to the exploitation demonstrated by price collusion, a replacement has been examined in terms of resource distribution. Deterministic retrieval over a distributed universe requires replication. Each data record must be copied in as few as three instances. The cost of deterministic resource distribution is relatively opaque.

The distributed trust network has a natural namespace, and a natural transparency of resource distribution cost awareness. These assets could be developed to a social name space.

Name space represents a topological solution to distributed location and retrieval. It facilitates reference, search, and discovery by the location association that informs retrieval with topological distance or proximity.

A distributed name space on an *ad hoc* topology (*i.e.* social trust peer) yields a topological delay. The retrieval connectivity of the social topology is nondeterministic, a traversal is necessary, while the retrieval connectivity of the host topology (*i.e.* IP+DNS) is deterministic, it has a relatively constant and uniform distance. Retrieval on the social topology has distance, while in comparison retrieval on the host topology has none. The performance of namespace retrieval on the host topology has a pass/fail proximity: a named location (*e.g.* URL) is dereferenced with a request which may fail. However, the deterministic failure is original. It is unrelated to the content object topology.

Generally, the traversal of a social topology is less efficient than the traversal of the technical optimisation. In detail, the performance of local namespace is higher, but the performance of remote namespace is lower and includes failure. Therefore, the character of social namespace is distinct from the character of a host namespace. The experience of utility is application dependent.

Review

The **theory of mechanical information** in simple space-time includes [type theory] and application.

The study of simple mechanical space-time has demonstrated the need to study the complex mechanical space-time that includes the topology of communication.

Therefore, any theory of mechanical information must include this complex space-time. If the extent of the universe of mechanical information is not fully enumerated, the confidence of theory is not satisfied.

Universe

The **mechanical information space-time** universe includes the simple space-time of the theory and application of data types, and the complex space-time derived from communication topology.

Future work

Developing this conception of mechanical information space-time.

Series

[TMI/20190404/1] Atomism [pdf]

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https://docs.google.com/document/d/1q25w_Kp_waZcsAesLsOpYhT-qP_t4-w3SdGDdz-kSvg/edit?usp=drivesdk

Theory of mechanical information

Sunday, 28 April 2019

Spacetime

The information machinery familiar to the twenty-first century may be formalized as an Interaction Machine. The heir to Turing's Choice Machine, differentiated from Turing's Tape Machine by opening the tape cell to a world of communicating Choice Machines. The perspective is physical. The machinery that we are familiar with establishes a unique physical reference frame in spacetime.

$$\pi \{ \kappa \leftarrow \mu \}$$

That is, the topological ranges *(κ)* possible from the mechanical domain *(μ)* is a component of information spacetime *(π)*.

This component is representational. We could define the mechanical spacetime reference frame topologically in analysis.

$$\kappa_\sigma \leftarrow \delta_\sigma$$

The physical distinction in spacetime is due to a linear temporal length scale *(σ)*.

However, comprehension of information spacetime reconsiders the topological object.

The mechanical topology of communications networks is a complex frame of reference. A multiplicity of physical reference frames conglomerated into a mechanical reference frame. The internet on Mauna Kea at two thousand meters above sea level, or the internet in space, is in a distinct physical reference frame from internet near sea level. The physical topology is physically complex.

Mechanical spacetime is increasingly complex, with each layer constructed over physical spacetime. This object of conception recognizes a critical problem-solution domain. There is no simple, convenient, naive physical reference frame on the internet, and this fact is reflected in the use and application of internet technologies. There is no simple, convenient, naive mechanical spacetime reference frame on internet topologies.

A network graph of distance relations is not properly defined in a temporally constant frame of reference. Physical topology is properly conceived *in situ* as a part of spacetime. The temporally constant frame of reference recognizes the distinct concepts of space and time. The observation of physical topology requires a reference frame that is comprehensive of physical spacetime as spatially constant and temporally linear.

Therefore, the world of the Interaction Machine is information spacetime. Properly conceived, we can develop the concept with the structure and production of information. In one approach, information and noise with binary representation coding as familiar to communication. In that case, the relativistic component identifies a degree of complexity in the understanding of topological message flows. In another approach, espoused here, the information facility of structure and production as familiar to programming languages and systems. In this case, the recognition of relativity serves to ensure the integrity of theory.

The recognition of information spacetime establishes the mechanical frame of reference of the Interaction Machine. The conception prefaces the conception of the informational frames of reference employed by information architecture. The mechanical frame is a last physical frame of reference preceding informational frames of reference. In expression of self or record of other, an informational frame of reference adopts a metaphysical component.

The components of the mechanical frame of reference include informational spacetime ($\kappa \leftarrow \mu$), informational association ($\nu \leftarrow \rho$), and informational structure ($o \leftarrow \tau$).

$$
\begin{aligned}
\pi \{ & o \leftarrow \tau, \\
& \nu \leftarrow \rho, \\
& \kappa \leftarrow \mu \\
\}
\end{aligned}
$$

The association of reference (ρ) to object (ν) establishes data space, a facility of organization. The structuring of data (o) to the knowledge of data structure (τ) is the principal facility of organization.

The production and maintenance of structured data is the operational role of the machine in information spacetime (π). The operation of the Interaction Machine occurs in this frame of reference. The Interaction Machine is a member of this frame of reference.

Association

The facility of association of reference to object of data establishes a persistent space of information.

Structure

The facility to structure objects of data according to an assigned structure establishes a coherent, regular space of information.

Review

The mechanical frame envelops the Interaction Machine. The design and implementation of an Interaction Machine occurs in a physical reference frame, defined as topological spacetime, association of reference, and the assignment of structure to data.

The conception of frame as the composition of critical knowledge is elementary to framing, as demonstrated in a progression from physical to metaphysical components. In this case, a valued distinction between physical and metaphysical concepts. Information, association, and structure are physical concepts. The physicality of the frame is substantial to the work that occurs within the frame.

Future work

The development of the space enveloped by the mechanical frame.

The development of metaphysical information framing.

Series

[TMI/20190406/1] Radiant objects [pdf]
[TMI/20190404/1] Atomism [pdf]

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https://docs.google.com/document/d/1oxOaDZeZmzVq7C3xam4USlgXijJS8vjBjDxImRR-_ak/edit?usp=drivesdk

Theory of mechanical information

Saturday, 11 May 2019

Complexity

Mechanical space and time have a single, local reference frame within a "silicon" unit of processing hardware. In the local reference frame, it is normal to separate space and time. In this context, we relate space and time as

$$O_\tau \leftarrow \chi_\sigma \,.$$

That is, an input processor consumes time as a function of input quantity.

The order of magnitude of time consumed in proportion to input quantity has interest. When time consumed per unit input is fairly constant, we happily proclaim the input processor to have linear complexity.

As a tool feature, linear complexity recommends itself as friendly and predictable. A quantity multiplied by a factor yields a practical expectation of performance.

Syntax

In the processing of machine readable text, the complexity of a machine language is syntactic. We may parse objects from text in linear time where syntactic structures are lexically constant.

The class of linear syntactic complexity is large. By illustration, we could analyze the ASCII character set as the specification of lexical structures. The matching quotes and grouping pairs, the characters, numbers, punctuation, and space represent the specification of lexical spans and sequences. The class of syntax that employs the spans and sequences of this lexical feature set has linear complexity. This writer will identify the class as “data code”.

Data code languages are easy to parse and format. A grouping pair -- brace or bracket -- is always matched to form a span. All other characters are accumulated into subsequences by class. And then, spans are branched (recursively).

The production and consumption possibility spaces of data code languages are larger than the possibility spaces of languages having other complexity.

These figures represent a vibrant intercourse, and that character of linear complexity is a degree of technological determinism.

Determinism

When we describe a solution as mapping onto a problem, we refer to a crisp fitness of solution to problem. The problem set has no unmet elements under the solution set. And as a result, the representation of the problem set is completed by the representation of the solution set.

When a problem and solution have been well defined, a contribution has been made to our knowledge. Our epistemological horizon has been expanded. Our future has gained a degree of determinism.

Review

Mechanical complexity relates space to time. Technological determinism relates complexity to economics.

Future work

The development of the space of the mechanical frame.

The development of positivistic metaphysical information framing.

Notes

[McCarthy 1960] Recursive functions of symbolic expressions, John McCarthy, MIT, 1960

> *Surely there are volumes of work in the examination of linear syntactic complexity. This is one. S-expressions have been a landmark, very well developed in this paper.*

Series

[TMI/20190428/1] Spacetime [pdf]
[TMI/20190406/1] Radiant objects [pdf]
[TMI/20190404/1] Atomism [pdf]

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Theory of mechanical information

Sunday, 26 May 2019

Machinery

The first human-computer interface is a sequence of instructions. Assembly language is the system of representation of logical semantics prescribed by hardware. The computation of numerical processes employs an operable specification of process semantics, P_σ.

$$P_\sigma = \Sigma_i$$

The sequential digital computation, Σ_i , is the principle of organization: the specification of mathematical semantics by the enumeration of common, invariant operations (Principia Mathematica).

The operational perspective is definitive of the computational machine. It envelops the mechanical interface to mechanical spacetime. The operator at the intersection of the production and consumption of assembly language objects is a symbol assigned to a mechanical operation defined in hardware. The execution of the operation consumes time and energy to change the state of the machine.

The physical frame of reference includes information, organization, and spacetime:

$$\begin{aligned}\pi\,\{\, & o \leftarrow \tau, \\ & \nu \leftarrow \rho, \\ & \kappa \leftarrow \mu \\ \}\,.\end{aligned}$$

The operational role of the machine in information spacetime, π, is observed in the physical reference frame composed from informational spacetime ($\kappa \leftarrow \mu$), informational association ($\nu \leftarrow \rho$), and informational structure ($o \leftarrow \tau$) [TMI/20190428/1].

This machine, Π, is observed in terms of physics and information in order to observe logic and mathematics in mechanical specification and operation, language and interaction. The reference frame has been conceived as the definition of the intrinsic principles of the aperture of objective. Physics and information relative to interactive computing machinery is complemented by the principles of organization that *describe* the interactive information space. Language and interaction map onto their semantics by definition.

The operative instruction,

symbol target source,

is the human computer interface to the specification of the logical semantics of information and processing with hardware. The mechanical interface in the physical reference frame is the symbolic logic offered by hardware execution. The instruction stream executed by hardware to implement processes is organized as a sequence of instructions. These sequences are organized into the pipelines and state machines that deliver economic utility and productivity to the users of infomechanical tools.

The organization of an interaction machine employs concepts that facilitate the scale of organization necessary to interaction as an economic objective. The organization of digital space is implemented using data types. The organization of digital work is implemented using code types. These mechanical objects are (partial and complete) structural definitions. Associations of identity are assigned to conventions of device with *textual* construction and employment from software languages.

The organization of this machine maps the frame principle of organization to the mechanical implementation of organization.

$$\Pi \leftarrow \pi$$

The software language is a partial system of organization and representation that maps onto processes of interaction.

$$\Pi = \pi + \lambda$$

A system of data types is implicit or explicit in a software language to structure a digital information space.

$$\Pi = \pi + \lambda + \tau$$

A system of code types is implicit in a software system to structure a mechanical instruction stream.

$$\Pi = \pi + \lambda + \tau + \kappa$$

The organized machine maps onto the organization of the interaction machine in code and data.

$$\Pi = \pi + \lambda + \tau + \kappa + \delta + \sigma$$

This association of conception to realization terminates the development of objective from frame to hardware and software.

$$\Pi =_{\lambda\tau\kappa} \Sigma$$
$$\Delta =_{\rho\tau} \Pi$$
$$T =_{\rho\lambda} \Sigma$$

We may consider additional and alternative attributes of conception, but the relationship between type and code is an interesting observable. The frame presented relates type to code by reference and language, which is the illumination afforded by the concepts offered.

Type

$$\forall \Sigma \; \exists T \vdash \forall \sigma \; \exists \tau$$

In assembly language code types, the data type determines operator and subroutine selection. The continuity of type over code is sustained while operations available over types are not missing by fault of the conception and implementation of a type system.

In assembly form,

symbol target source,

the continuity of syntax and semantics of the source and target terms varies with type. The symbol may determine the type of terms, or in another language the type of terms selects a subroutine from symbol. This semantic continuity over data and code type is reflected in syntactic continuity over syntactic types. Where syntactic expression types (σ) relate both data (τ) and code (κ) types, as in the language with inline expression, construction, and call expressions, the same continuity over types is sustained where type representation and relation is sustained.

$$\tau\,\kappa \leftharpoondown_{\lambda} \sigma$$

Syntactic types define data and code types in a human computer interface language. Because type continuity is sustained or sustainable, type expression is endowed with the natural continuity of the mechanical interface.

Future work

Observation of logic in the mechanical frame, including software and interaction.

Series

[TMI/20190511/1] Complexity [pdf]
[TMI/20190428/1] Spacetime [pdf]
[TMI/20190406/1] Radiant objects [pdf]
[TMI/20190404/1] Atomism [pdf]

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