Law and the Mind

Posted on May 12, 2015 by Mahesh Sreekandath

The first computational theory of mind and brain had a significant influence on theoretical computer science, especially through von Neumann. Such a shared lineage between neurophysiology and digital computers should indeed have numerous implications. An interesting one would definitely be the use of automata theory to reconstruct certain critical aspects of the chapter 'Nomos: The Law of Liberty' from Hayek's magnum opus 'Law, Legislation and Liberty'.

Turing Machine Theory

Computer science methodology definitely does not endure the same epistemological problems faced by social sciences. In other words we can access the circuit integrated into a computer but social scientists cannot claim that they comprehend the detailed mechanics of a brain. Also merely observing an individual's action does not reveal the contents of his perception or the involved reasoning. The perceived sensory inputs and the specifics of the processing remain elusive.

Though there are some abstract common aspects involved here. Quite like an automaton, humans also perceive external signals, which then gets processed via some logic and then only a plan of action is formulated. But unlike ordinary computers a human brain exhibits an immense capability to learn, so eventually those perceptions, reasons and actions are constantly undergoing a temporal change. We could claim that humans are highly complex and evolving automatons.

Our process of reasoning will always account for the present state of the mind along with the sensory inputs and our previous memories. One of the reasons why we might express divergent rationales is because of the unique memory structures within our brain, especially those which are formed as a result of our past sensory inputs. Essentially our present perception is always being shaped by our previous experiences.

In the above sense a Turing machine can be an abstract representation of human brain because it integrates state transitions, inputs and also memory. Hence it possesses the actual ability to emulate the process of learning. Such an intelligent machine can be described with a 7-tuple representation — [Q, E, T, S, q_0, B, F]

- Q = finite set of states, of which one state q_0 is the initial state
- T = finite set of allowable tape symbols
- B = a symbol of T, as the *blank*
- E = a subset of T not including B, is the set of *input symbols*
- S = the *next move function* , a mapping function from Q x T to ->> Q x T x {L,R}, where L and R denote the directions left and right respectively
- $_{Q0}$ = in set Q as the *start* state
- F ⊆ Q the set of *final states*

If a human mind can be modeled by a Turing automaton then our sensory inputs and memories will be analogous to the above input symbols provided through the tape. Complex experiences might involve several input impulses and numerous processing steps. So the repeated invoking of the above transition *function* S with different connected and sequential inputs may result in the transformation of tape contents and hence the memory itself. We can specifically draw on the Turing machine state transition mechanism to explain how Hayek's theory of law enables a rational social order.

State Machine

A state transition table is essentially representative of the algorithm employed by a Turing machine to process various patterns of input. Our process of reasoning employed to comprehend reality can also be represented by such a state machine, of course it would be daunting to actually implement something that complex.

The complete set of state transitions possible for a Turing machine can be described by a table which maps specific state and input combination to the corresponding output and the new state. State transitions are basically a logical sequence of steps which takes input parameters from the tape and does step by step processing on them to eventually update the output at some particular memory location on the same tape. Example for a relatively simple machine would be the one which adds or multiplies numbers.

Each of the rows illustrated in the table below represent the specific rules enforced by the transition *function* S, basically it maps a tape symbol plus the present state combination with an output symbol and the new state. For example, if the present state is Q0 and the input is T1 then the output symbol would be T2, also the tape reader head would move left and the new present state would be set to Q1. Next transition would also be similarly determined by the content of the tape and the state Q1. The end state is HALT, so these transitions will go on until it arrives at that final state.

	Q0			Q1			Q2		
Tape Symbol	Write Symbol	Move Tape	Next State	Write Symbol	Move Tape	Next State	Write Symbol	Move Tape	Next State
T1	T2	L	Q1	T2	R	Q2	T2	L	HALT
T2	T1	R	Q1	T1	L	Q2	T1	R	HALT

State Machine

Adaptive Automatons

"The aim of the rules must be to facilitate that matching or tallying of the expectations on which the plans of the individuals depend for their success"

Quite similar to a human brain, subjected to various input patterns a Turing automaton will constantly evolve its state machine because of the modifications done on its tape by the past input sequences. So a coherent top-down organization is implausible for such self-modifying automatons. In that sense we need a legal process which can constantly adapt to an emergent order of automatons and their state machine determined rules of engagement.

Pure logic suggests that the most beneficial order at any instant would be the one where the machines with the most complementing set of rules and plans identify each other and self-organize. Such a productive arrangement will be similar to a modern machinery which is assembled by utilizing a set of perfectly compatible parts. Eventually a dexterous system would be the one which is capable of constantly self-organizing after comprehending various emerging contingencies. Fostering such an order should be indeed our primary goal.

Shared Values

"It is only as a result of individuals observing certain common rules that a group of men can live together in those orderly relations which we call a society"

A sustainable order mandates removal of some uncertainty with regards to the rule of conduct, productive arrangements cannot emerge from destructive rules. So there is a definite need for shared values, but then, only end-independent rules will be compatible with an open-ended structural possibility. In other words, certainty only with regards to the broad qualitative nature of the state machines but not in its exact content which is subjective to each automaton and its plans.

Every process of reasoning can be eventually broken down into a sequence of elementary state machine transitions which essentially detail the exact steps and inputs involved in that plan of action. Across multiple automatons and their contrasting state machines the existence of some shared elementary rules will be crucial, those rules will divert reasoning into those logical paths which will ensure that the overall plan conforms to generally accepted rules of conduct. For example, independent of the machine's larger plan, if its idea involves utilizing someone else's property then at least one of the involved state transition rules will account for paying the fair price.

A Turing machine representative of a complex human brain would be essentially like a black box, we can never know the exact contents of its state machine. But coexistence presupposes shared values, which would mean that at least a subset of the state machine transitions of all the

involved automatons should always represent those prevalent values. Easiest illustration of such a rule in the free world would be indeed the respect for private property. It's the nature of such abstract shared rules which will determine the adaptability of the structural arrangements formed by diverse automatons

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Abstract Rules

"That human intention should concern itself with laying down rules for an unknown number of future instances presupposes a feat of conscious abstraction of which primitive people are hardly capable."

The rules are independent of any purpose because they do not force any inputs or specify particular outputs for the transition *function* S, but they merely dictate that the logic behind state transitions should account for certain abstract principles. In other words, we can claim that the abstract rules do not fix prices or arbitrary percentages but merely state that the use of private property mandates some compensation or that a contractual agreement should be respected etc. Specifics of the equation will depend on the corresponding contextual inputs provided to the *function* S, which is eventually subjective to each plan.

"Whether a new norm fits into an existing system of norms will not be a problem solely of logic, but will usually be a problem of whether, in the existing factual circumstances, the new norm will lead an order of compatible actions."

The abstract quality of the norms would mean that they will be employed in multiple contexts, the exact specifics of such a context would depend on the state transition sequence involved in that plan. So the compatibility of a norm with the existing system of values is an empirical problem because no one can possess all the contextual information to ascertain how and in what manner the norm will be integrated into various emergent sequences of state transitions.

"The 'values' which the rules of just conduct serve will thus not be particulars but abstract features of an existing factual order which men will wish to enhance because they have found them to be conditions of the effective pursuit of a multiplicity of various, divergent, and unpredictable purposes."

While specific top down commands limit the scope of plausible plan of actions, the abstract rules only enable planning within an otherwise dynamic environment.

Mechanism at Work

"We have already seen that in the usual sense of purpose, namely the anticipation of a particular, foreseeable event, the law indeed does not serve any purpose but countless different purposes of different individuals. It provides only the means for a large number of different purposes that as

a whole are not known to anybody. In the ordinary sense of purpose law is therefore not a means to any purpose, but merely a condition for successful pursuit of most purposes. Of all multi-purpose instruments it is probably the one after language which assists the greatest variety of human purposes. It certainly has not been made for any one known purpose but rather has developed because it made people who operated under it more effective in the pursuit of their purposes."

The question is not about what could be the present structural organization which can best satisfy our needs and expectations. But it's more about the process which can enable adaptation to changing circumstances; such a legal order should enable coordination of constantly evolving expectations.

"The contention that the judges by their decisions of particular cases gradually approach a system of rules of conduct which is most conducive to producing an efficient order of actions becomes more plausible when it is realized that this is in fact merely the same kind of process as that by which all intellectual evolution proceeds."

The actual utility of laws will be disrupted if it fails to account for the factual circumstances, such rules tend to get discarded. For example, in most of the developing nations the rules followed while driving are not the ones set by the government but instead are the ones which enable individuals to adapt to the ground reality of poor infrastructure. We can also consider the operation of American prison gangs or black market norms as more illustrations of how emergent laws signify its core function of coordinating expectations.

"Only when it is clearly recognized that the order of actions is a factual state of affairs distinct from the rules which contribute to its formation can it be understood that such an abstract order can be the aim of the rules of conduct."

Legal theory as identified by Hayek enables a framework which provides certainty only with regards to certain aspects of conduct while allowing other expectations to fail. This is a necessary requirement for sustaining a competitive order. Eventually the employment of abstract purposeless rules to innovate and adapt to various challenges depends purely on individual ingenuity.