Virtual Liberty *

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Abstract

In which we explore how artificial societies can enlighten us about freedom and self-responsibility as an individual and societal challenge.

1 The Name of the Game

Humans are social creatures at heart and this is no accident; it is the result of billion of years of evolution of life on Earth. Although human cultures may seem so varied that the possibilities seem endless, this is not actually the case: the fact remains that human societies have a certain structure to them. While communism works perfectly well for the society of ants, decades of experience have taught us that the same does not apply to our species. Why must this be the case and not otherwise? We will soon see that we cannot achieve an understanding of ourselves, our human nature, without first understanding evolutionary biology.

But how does one go about exploring something as complex as entire human societies? Lately, something very complex of our own creation has begun to offer us answers: the universal computer. It turns out that we can build entire artificial societies to try to comprehend whatsoever we wish about the dynamics of society, which is necessarily the interaction of its component individuals.

“The next great awakening of human intellect may well produce a method of understanding the qualitative content of equations. Today we cannot. Today we cannot see that the water flow equations contain such things as the barber pole structure of turbulence that one sees between rotating cylinders. Today we cannot see whether Schrödinger’s equation contains frogs, musical composers, or morality – or whether it does not. We cannot say whether something beyond it like God is needed, or not. And so we can all hold strong opinions either way.”


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2 Let the Games Begin

In this essay, we shall make the reasonable assumption that Nature is computable. This then allows us to be optimistic that virtual reality can indeed explore our complex societies.

It is also impossible to talk about all of computational sociology in such a brief space, therefore we will do the next best thing: take a random sprint among games of life!

2.1 A Random Sprint (and not a Marathon)

One man who has popularized computational sociology is the mathematician John Allen Paulos with his essays on what mathematics can tell us about life in society; for example, on how society cannot always treat individuals equally when it comes to selective processes like employment or how the assumed personal freedom to own guns may only make crime worse. One particularly intriguing model he once discussed is Joshua Epstein’s simulation for how some social norms may automatically spread. Imagine a circle of people with, say, a preference for either of 2 things. One day, a person polls X number of people on either side of him. The next day, he polls X + 1 on either side of him: if the percentage of people favoring the two choices is the same as from the day before, he decides to poll only X − 1 the next day; otherwise he polls more people. Every person in this circle updates his preferences based on these rules for a number of days. Surprisingly, long “arcs” of people who like choice 1, or 2, appear between small “arcs” of mixed people. A shock to the system may change allegiances, but the pattern of arcs reappears, only in different places. Epstein’s model suggests how social norms may spread without much thinking this way. So much for liberty! Paulos even suggests this may be how voters “think”!

On a related note, another simulation by J. Doyne Farmer and his colleagues featuring “zero-intelligence” agents who buy and sell stocks randomly seems to model characteristics, such as the spread variance and variance of the price diffusion rate, of the London Stock Exchange (LSE) quite well. The model also showed that increasing the number of market orders increases price volatility. Interestingly, since volatility may be considered socially undesirable, the LSE has a charging structure in which orders are limited! This means that the individual is encouraged to behave in such a way that the society of stock buyers and sellers does not suffer a particular kind of loss.

Other analyses and simulations of the economy verify a similar case: that the way the individual forms psychological theories of other individuals is a dominating influence on the society (Chapter 8). A good example is the El Farol Problem by the economist W. Brian Arthur (who has simulated stock markets with the computer scientist John Holland and others, which led to interesting observations on how real-world society of traders work with predictors on imperfect information), which is really a problem about trying to decide whether to go to a bar next week by predicting how many people would turn up! Arthur’s simulations present certain conjectures about how individuals working with certain kinds of predictors tend to produce attendance levels which are deterministically random (“chaotic”), but these are unprovable at the moment. Why is this problem of interest? Well, it means
that a society of individuals working with inductive instead of deductive logic on information might produce an economy arbitrarily complex! Human traders seem to use inductive logic instead of being deductively rationalist as classical economics assumes. (A new field called neuroeconomics[6] is trying to prove that this is indeed the case. The brilliant mathematician Benoît Mandelbrot has urged[7] us to spend more money on researching economies instead of making up arbitrary theories.) This brings us to the Tobin Tax[1][155-156], which is a proposal to put a levy on speculative transactions in order to try to reduce the unpredictability of economies; whether this will work remains to be seen. As a side note, a whole range of social phenomena, such as the spread of disease or the crashes of stock markets or the size of wars and even cities, seems to be explainable by power laws; for detailed discussions, please see [1].

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No discussion of society could hope to be complete without game theory, since so many social interactions (such as the Battle of the Bismarck Sea or the Cuban Missile Crisis) can be modeled nicely with it[2][Chapter 1]. The indispensable Minimax theorem for two-player, zero-sum games guarantees an optimal mixed strategy with the same payoff for each player. It doesn’t cover all possible games found in real life, but it’s a good start. What about other kinds of games? The infamous Nash theorem guarantees at least one equilibrium set of strategies for any \(n\)-player, noncooperative games (zero-sum or not) in which each player has a finite number of pure strategies. But there are even more kinds of games: consider the legendary Prisoner’s Dilemma, in which societal cooperation may lead to better payoffs than selfish individuality. The evolution of cooperation in societies is a supremely important topic in biology[2][pp. 36-41].

Then there are the surprises, such as ones in which the individuals follow simple rules but yet create complex, emergent societies. One famous example sometimes seen in computer graphics for blockbuster movies these days (such as Batman Forever) is the flocking behaviour of “boids”. Basically, a “boid” is a creature which follows 3 simple rules: separation (steer to avoid crowding local flockmates); alignment (steer towards the average heading of local flockmates); cohesion (steer to move toward the average position of local flockmates)[10]. The result: “boids” following these simple rules create a very beautiful flocking behaviour, like those seen in schools of fish or groups of birds. As the biologist Stuart Kauffman would put it, it’s like order for free! Another more recent simulation by Iain Couzin and others, again using individuals with simple rules, demonstrates how a group will tend to follow the majority[11]. Is this a form of rudimentary democracy?

There is a large number of other interesting social experiments on the computer, such as Tom Ray’s seminal society of artificial life, Tierra[3][pp. 162-170], and Joshua Epstein and Rob Axtell’s Sugarscape[3][pp. 170-175] (in which it becomes clear why the emergence of economics is so vital for the survival of life). It’s not hard to see that this infant of a field is already extremely rich with insights[3] into age-old mysteries.

3 Game Over

We have only touched artificial societies briefly. Yet, what can we learn?

For one thing, liberty comes at a price. (Anyone who has had the unfortunate
Imagine a society with a certain number of individuals, each of which can interact with everyone else and has a human-like repertoire of behaviour. Now, there is probably a huge number of ways these individuals can interact, but let us suppose the simplest: anarchic, random, independent behaviour. Suppose everyone had a set of possible actions, $A$, and decided what to do next by throwing fair dice. Such a society is not very likely to survive for very long at all, since there usually is no long-term thinking involved to ensure the prosperous survival of everybody. Although this imaginary society provides the ultimate kind of freedom to its individuals (since it’s random, all possible trajectories of the society are eventually explored if the experiment is repeated endlessly), it usually wouldn’t take very long for its disintegration if social structures such as cooperation and planning never evolved. (This is not to say, though, that randomized strategy is a bad idea all the time.) Every human being is born with a certain repertoire of social behaviour, capable of a huge variety of actions, along with the liberty to exercise it. A clever society, however, will possess individuals who calculate what kind of social structures must exist in order to ensure the best survival of all members since evolution, as we know, tends to favour differential survival of those who adapt best to their environment.

Life is as magical as it is fragile: we must be careful where we tread.

The lesson to be learned is that individuals must interact in the right kind of way with each other in order to form a desired society with certain agreeable constraints. This usually means giving up some liberty. Surely a libertarian would agree that having access to freedom doesn’t mean giving the freedom, right or liberty to husbands to kill their wives as they see fit, for example? So, really, in practice — never mind what we believe — most of us are really somewhere between left and right.

Complete liberty is not necessarily bad, depending on how it is used. Consider the freedom of speech, which works extremely well in practice and is a necessity for democracy. But even democracy has its limits: given certain reasonable assumptions, Arrow’s incredible Impossibility Theorem shows that a perfect democratic voting system, in which the majority’s choice is always preferred, cannot exist[3][pp. 96-101]. If we want a certain kind of society, we must know exactly what we’re dealing with.

I am certainly no supporter of tyranny, oppression and evil. I am only trying to say that not all possible societies work with and for human nature and we would not even want it otherwise. The key is to find the right kinds of societies for our species. Following E.O. Wilson’s metaphor, we can use the gift that Prometheus has given us: hope. “The true Promethean spirit of science means to liberate man by giving him knowledge and some measure of dominion over the physical environment.”[12][Chapter 9]

And what is part of that hope? The gift of artificial societies, with which we can test policies on any level of accuracy and detail before trying them out in the rest of our world. This is important because life in the future is likely to be radically different from what we are used to now. (What if immortality or artificial life becomes possible?) Perhaps humankind will be able to liberate itself from a design introduced by its evolutionary history. Will we be able to design societies in which people, say, do not kill other people? This will require massive social engineering projects, with technologies such as genetic engineering and artificial intelligence. Before we try it out on ourselves, we will...
first have to simulate the new societies. All this, in the hope that our own human society may live forever.

References


