

Sociology, Information and Language games

Theory of Information and sociology are usually seen as independent sciences. But if one looks closer they are actually dealing with the same – a bit of information– the fundamental building block of the whole. The society and its processes can be formalized using the notion of Information and Information flow since people are dealing with information only when trying to describe anything. The society evolution or its processes can be described by the information theory using theory of complex systems [1]. Information Theory itself can be studied using Theory of Logic and Mathematics. So, we see now that the society and its processes are simply the part of a bigger theory – Theory of Logic and Set Theory that are building blocks of the modern mathematics.

Ludwig Wittgenstein was one of the first researchers who tried to show that everything what people see, think or deal with is only information. In his research he called information a language.

He posed inevitable question what is the limit of the knowledge that is basically the same question as well known mathematical problem P vs NP.

In the Tractatus Wittgenstein's logical construction of a philosophical system has a purpose—to find the limits of world, thought and language; in other words, to distinguish between sense and nonsense.

“The book will ... draw a limit to thinking, or rather—not to thinking, but to the expression of thoughts The limit can ... only be drawn in language and what lies on the other side of the limit will be simply nonsense”. In other words, he had the same vision as we have in this paper: sociology and information is the same because it is only a language and the limit of a society evolution processes lies already inside the society because it already contains everything from information point of view – all information is already known by the society, and what is beyond the limit leads to the nonsense – simply speaking there is no any society outside the limit.

What Wittgenstein did not do – he did not prove this rigorously but instead he was driven by his great intuition.

Let us recall his main propositions:

1 The world is all that is the case.

1.1 The world is the totality of facts, not of things.

1.11 The world is determined by the facts, and by their being all the facts.

1.12 For the totality of facts determines what is the case, and also whatever is not the case.

1.13 The facts in logical space are the world.

1.2 The world divides into facts.

1.21 Each item can be the case or not the case while everything else remains the same.

One of his fundamental proposition is that “what can be logically described can be build”.

Our paper proves such claims rigorously by using the notion of society simulations (models) or what is the same as Wittgenstein said “language games”. We will call them also information flow.

For this, let us follow the notations from Logic and Set Theories. Let a pair $A = (F, L)$ denote one of the possible models of society where F denotes objects (society entities such as people, machines, computers) and L denotes their laws (in the logic it is called axioms) of interactions. One of the examples is a society known as Soviet Union with its communistic party laws, another one is European Union with the corresponding laws.

There is an everlasting question in the society: what is truth and what is false. It can be formulated

also as what is “good will” or “bad will”.

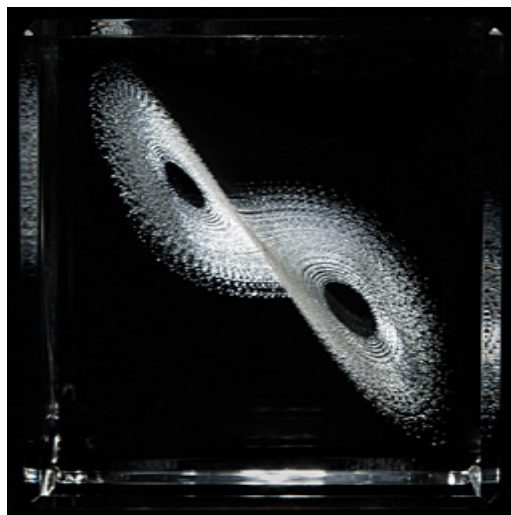
It is easy to see that such a question has no sense in the society model that is inconsistent in the sense of Theory of Logic ie the society has paradoxes. Because such paradox is truth for someone and false for someone else. The same applies for “good will” and “bad will”.

Moreover, we will show that the existence of two view points - good and bad – is a mere sign that the society is inconsistent. The inconsistency simply means that there is a bottleneck, a mental gap that makes the society to be stagnant ie there is no evolution. Because the evolution means a free information flow and the paradox means merely a barrier that prevents such a flow by creating so to say a closed door. As a result the information flow meets a closed door by this creating turbulence. So, the notion (or sense) of good and bad interchange faster and faster and the society is not able to distinguish those anymore. At some point the flow becomes turbulence ie chaos. In other words there is no sense in the society anymore what Ludwig Wittgenstein described in his Tractatus about the language.

This can be formalized and proved very easily if one utilizes Lorenz attractor theory and the known equations

$$\begin{aligned}\frac{dx}{dt} &= \sigma(y - x), \\ \frac{dy}{dt} &= x(\rho - z) - y, \\ \frac{dz}{dt} &= xy - \beta z.\end{aligned}$$

where one uses X as a measure of satisfaction in the society, Y as a measure of “good will” in the society and Z as a freedom measure, t means time. Because society people satisfaction is what actually makes the society members to act, a freedom is what makes them to act differently and independently, and a “good will” is what marks each member act as “good” or “bad”. The parameters σ , ρ , β are positive. Lorenz found out that with parameters values $\sigma = 10$, $\rho = 28$, $\beta = 8/3$ the corresponding system exhibits chaotic behavior. The solutions of Lorenz equations describe the evolutionary process of a society with inconsistency. The picture for it is depicted below



If $\rho < 1$ there is only one equilibrium point, which is at the origin. This point corresponds to no convection. All orbits converge to the origin, which is a global attractor.

A bifurcation occurs at $\rho = 1$ and for $\rho > 1$ two additional critical points appear at

$$\left(\pm\sqrt{\beta(\rho - 1)}, \pm\sqrt{\beta(\rho - 1)}, \rho - 1 \right).$$

One can show that ρ can be interpreted as a number of rules (laws) in the society. It is easily seen that the critical points correspond to ambiguity that arises in the society when the number of rules becomes bigger than 1. When the number of rules (laws) grows over time the society behavior (evolution) becomes a strange attractor. At which state the notion of a society has no sense anymore.

Let us give examples of society models for which Lorenz strange attractor theory is applicable.

Below it is shown that the any society models is inconsistent as soon as they contain the rules of arithmetics and due to this there always arise paradoxes not matter how people resolve the existing ones. This is due to one of Godel Theorems. So, the number of rules of the society grows over time. The same applies to any logical theory that contains arithmetic laws: probability theory, computer science since processors make calculations through arithmetic, notion of energy in physics since it obeys arithmetic laws and etc.

The part of the modern society nowadays consists of computers and robots. Let us consider the interrelations between computers and people.

It would make a sense to ask a question if a society can be simulated by a computer. The answer is of course positive. Moreover, it is possible to simulate the objects (people, machines, computers, we will call them inhabitants) of such computer simulated society ie to simulate their everyday life.

Now let us assume that the inhabitants know some society model $B = (F, L)$ – the model where they currently exist. One can ask a question: will inhabitants ever know if they are computer simulated? As one can see it is in general impossible for inhabitants to find out if their world is computer simulated.

How would one give a sign to inhabitants that their world is computer simulated?

As we discussed above Theory of Logic has a notion of consistency - a consistent theory is one that does not contain a contradiction. For society B this would mean that B contains no paradoxes.

One would assume that the existence of a paradox in society B is a good sign for inhabitants that their world is computer simulated because the computer simulated world is inconsistent due to Godel Theorem. Godel Theorem plays here a role of a red flag. It can be easily understood why Godel Theorem exists – one can not build the world based on arithmetic inside the world that is built by arithmetic rules. It will be nonsense – simply speaking the same thing can not exist inside the thing.

Let us make a question more difficult. Let us assume that the computer simulated world works so that when inhabitants encounter paradox their world is rebuilt by the computer that simulates it and the paradox gets the resolution through adding new objects to F and new society laws to L. So, the society B is extended to society C. But the society C is still inconsistent ie there is another paradox that sooner or later will be discovered by inhabitants.

One can ask a question: will inhabitants of such a world ever find that they are computer simulated?

In this paper we show that they will find it because they will notice how their world changes upon their "good will". What can be called a "good will"? We ask this question because as we showed above there is no single point of truth in the inconsistent society – it is already "messed up". The answer lies in Lorenz theory and from the discussion below: the rules of arithmetic are forgotten as the necessary prerequisite.

One can easily see that the growing laws and objects of a society will eventually occupy the whole computer where it is simulated because the information to hold the laws and objects is growing and the computer has a limited capacity. So, it is up to the inhabitants to understand that the society can not be inconsistent.

One of the examples of such inconsistent societies is Soviet Union. Why? Because it was based on arithmetic laws of economics and human interactions. But due to Gödel's incompleteness theorem it is inconsistent. One can see that one of the paradoxes in such society were trust in God and atheism at the same time.

The society model $A = (F, L)$ can be assigned a notion of Kolmogorov complexity by defining it as a sum of the corresponding Kolmogorov complexities of F and L .

Let us now discuss the relation between Kolmogorov complexity of a society, Matthew effect and Godel Theorem.

Let us define a version of a society to be its modification done to implement new laws.

Let us define Kolmogorov complexity of a society to be Kolmogorov complexity of its subsequent versions.

Theorem A.

Kolmogorov complexity of a society that contains arithmetic rules (laws) grows over time.

Proof.

Due to Godel Theorem such society at some point encounters the paradox. So, this paradox makes the society to halt. This results that the society is "upgraded", ie new version of a society is done where such paradox gets a special handling through new laws. Therefore Kolmogorov complexity of a society grows.

QED

Theorem B.

Kolmogorov complexity of a society that has no rules (laws) of arithmetic does not grow over time.

Proof.

Assume that it grows over time. Hence at some point it will contain rules of arithmetics since the rules are what makes the complexity of a society. Hence at some point of time it is not more the society that contains no rules of arithmetic.

QED

In the science, there is well known Matthew effect that can be formulated as "the rich gets richer and the poor gets poorer."

It is easily seen that the above **Theorems are the proof of Matthew effect in Sociology.**

Let us now ask the question how much Kolmogorov complexity can grow? What is the limit of its growth?

One can think that there is no limit but in fact there is a limit. For this, recall the notion of Reynolds number from fluid mechanics. It is known that this number is used to determine two cases between fluid flow: laminar or turbulent.

Reynolds number (Re) is defined as a ratio between inertial forces I and viscous forces V . Reynolds number interpretation has been extended into the area of arbitrary complex systems as well: financial flows, nonlinear networks [1] etc.

All the above can be easily extended to Information and hence to Society by defining the notion of Information flow.

Matthew effect shows the difference between two societies above: one is dissipative society where inertial forces are the dominant and another one is accumulative society where viscous forces are the dominant.

Hence we get the result

Theorem on Chaos.

Growth of Kolmogorov complexity of a society has the limit - Re . At the limit there happens bifurcation. It separates two different Information flows possibilities: laminar and turbulent. After the limit the Information and hence Society gets no sense anymore since it is chaos.

Proof.

It can be proved by utilizing existing chaos theory.

QED

Let us consider two models of society: P and NP .

P contains the rules of arithmetic ie inconsistent society model.

NP is consistent society model.

Let us discuss the gap between P and NP and if it is possible for P become NP ie if evolution of P is possible.

Theorem on P vs NP .

It is impossible for society P become NP (be extended).

Proof.

Society P is a dissipative information system by nature ie it obeys Theorem A. So, its Kolmogorov complexity grows infinitely, in other words, at some point of time it crosses the limit Re .

After which the notion of Information disappears by previous Theorem on Chaos. Hence the problem to understand anything (including the understanding where is good or bad) will be of no sense anymore.

QED

Let us discuss the method that gives the natural way of how P can become NP .

Due to Godel Theorem there exists a statement that can not be proved or disproved using the rules of society P .

Let us denote this statement as E .

There exists a rule (or rules) that is in NP but not in P . Let us denote those as D . Let us consider a statement "E or D".

This law can not belong to society P due to it contains D .

But at the same time it will be resolved by the society because the statement contains paradox E that the society P used to solve regularly. Hence "E or D" gets joined to the rules of the society P and by this it becomes NP society after one removes laws of arithmetic from P .

One can ask a question what is the statement E. Obviously it is something that lies outside the ordinary work of inhabitants because they should be busy with fulfilling their ordinary duties that the society posed on them through laws (rules). In other words, E is everything that the inhabitants sublimate or half-hide because it is neither accepted nor unaccepted by the society and hence in general should not be done.

Literature.

[1] Kamenshchikov, Sergey (2013). "Extended Prigogine Theorem: Method for Universal Characterization of Complex System Evolution". Chaos and Complexity