INTRODUCTION TO SOCIAL FUZZIOLOGY

Vladimir Dimitrov

University of Western Sydney
V.Dimitrov@uws.edu.au

Social Fuzziology studies fuzziness inherent in our understanding and dealing with complexity of life.

In 1972 Zadeh - the founder of fuzzy logic, stated a principle known as *principle of incompatibility*: "As the complexity of a system increases, our ability to make precise and significant statements about its behaviour diminishes until a threshold is reached beyond which precision and significance (or relevance) become almost mutually exclusive characteristics". Complexity of human life - individual and social, is far beyond this threshold.

The validity of Zadeh's principle of incompatibility is constantly confirmed through any non-trivial description that we offer about our experience, about our sensations and perceptions, feelings and emotions, thoughts and dreams. *FUZZINESS* is an inevitable companion of these descriptions - a companion, which ought not to be neglected.

1. What is Fuzziness?

About everything we do not know for sure, we usually think, speak or write in a fuzzy way, that is, by using words and expressions, which convey uncertainty, ambiguity and doubt. The truth contained in a fuzzy statement can neither be proved nor disproved, as fuzziness contains both 'truth' and 'non-truth' at the same time.

Fuzziness does not relate to our thinking only - it can permeate our feelings and emotions, our spiritual beliefs and endeavours. We can simultaneously feel happy and sad, attracted and repulsed, strong and weak, determined and hesitant, godly and worldly. This kind of fuzziness does not need words - it 'voices' through innumerable facial expressions, movements of eyes and body, nerve signals and gestures, body position and muscle tone, voice timbre and volume.

Fuzziness can be expressed in our actions - when we act without being sure about what we really do and aim for, or act with information about the goal but ignorant of how to approach it. This is usually the case when we act in a complex or sensitive-to-changes situation. Full of such situations is human life.

Fuzziness manifests in human hypothesis, dreams and even in sound mathematical theories - in 1932, Gödel made it clear that in any axiomatic mathematical system (theory) there are propositions, which we cannot prove or disprove within the axioms of this system.

Fuzziness is not something that exists "over there", as a quality of an external object; it is in *our* understanding of complexity in which we live and constantly create and re-create through *our* actions. But it is also in the way complexity reflects our physical, mental, emotional and spiritual experience and thus constantly creates and re-creates us. So the source of fuzziness is in our own self-referential nature - we are simultaneously creators and products of complexity.

Fuzziness of our understanding of the existential complexity reflects the fuzziness of our understanding of our own nature. Every time when we succeed in revealing some enigma of our own nature, of our 'inward' individual life, we simultaneously reveal a secret of complexity in which we live, a secret of our 'outward' social life.

2. Fuzziness of Human Knowing

Generations after generations of humans have lived, live and will continue to live together with a constantly reproducible fuzziness 'energized' by what we do not know about ourselves, about our lives, about nature and existence. And the deeper the processes of our knowing go into the enigmas we live with, the broader the spectrum of manifested fuzziness. The famous message of Socratis: "

the only thing we know for sure, is how little we know" relates to the never-ending renewal of the fuzziness in human knowledge.

The Ignorance about the Unknown and the Uncertainty about the Known, which ever moves, reshapes and changes, keep the engine of fuzziness going. Powerful accelerators of this engine are the whirling dynamics and spontaneity of ever-growing complexity of the life unfolding - its unpredictable rhythm of constant 'stretching', 'shrinking' and 'bifurcating'.

Fuzziness needs to be studied not in order to eliminate it - this is an impossible task! It needs to be studied in order to reveal how to *live* with it so that instead of being seen as a hindrance on the way to our outward realization, it could act as a catalyser, stimulator and reinforcer of the creative urge for this realization.

Fuzziness inherent in the process of human knowing is in the focus of Social Fuzziology.

3. Fuzziness in Communication and Emergence of Meaning

In the light of Zadeh's principle of incompatibility, the meaningful statements related to the overwhelming complexity of today's life hardly tolerate any imposed precision. By studying the sources and ways of manifestation of their fuzziness, we are simultaneously revealing the secrets of making meaning about the complexity of our lives.

In other words, fuzziness and the emergence of meaning in human brains (and hearts) inseparably relate to each other. And yet, it is obvious that there is always a threshold in the degree of fuzziness expressed through a fuzzy statement (description, story, non-verbal communicative pattern, complex symbol and sign), beyond which it ceases to carry any meaning. Does such a threshold spontaneously emerge in self-organizing complexity of social interactions or it needs to be consciously assigned and cautiously adjusted in any specific process of real-life communication? Social Fuzziology is interested in exploring the answers to this question.

How does it happen that even the slightest changes in the degree of fuzziness of a fuzzy expression can provoke enormous changes in the meaning with which this expression has been initially imbued or lead to misunderstanding and even collapse of communication? Social Fuzziology explores the 'butterfly effects' manifested in the emergent dynamics of meanings out of the fuzziness of communication.

Fuzziness inherent in the processes of communication and emergence of meaning is also in the focus of Social Fuzziology.

4. Fuzziness in Description of the Whole

In the all-pervading wholeness and continuity of manifestation of the existential dynamics, no thing and no being can exist in itself or for itself, but only in relationship to other things or beings.

Each dynamical process is intersected and interwoven by innumerable simultaneously existing dynamical processes. This infinitive interrelationship of all that exists in the dynamic structure of the universe is reflected on a multitude of scale levels, and thus resemble fractals in chaos theory.

One cannot meaningfully describe events occurring at one level of this structure without taking into consideration the relationship of this level with the levels in which it is embedded and with the levels which are embedded in it. This immediately 'injects' a dose of irremovable fuzziness into the description of each level, which is again reflected in the description of the dynamical structure as a whole.

Fuzziness inherent in descriptions of the Whole of the existential dynamics as well as in description of each level of their manifestation are at the focus of Social Fuzziology.

5. Need of 'Fuzzification'

The unfolding of our potential to think and act in harmony with nature is hardly compatible with any rigid mental and emotional pattern persisting in the way we see ourselves and the world around us. Evolution thrives on fluid patterns, that is, patterns with fuzzy, easily permeable boundaries.

Fixed ideas, prejudices, standards in thinking, pre-imposed emotional or spiritual restrictions, various kinds of blindly followed behavioural patterns, attachments and addictions decrease our ability to think and act, to evolve and grow during the journey of life.

While 'fuzzifying' the rigidness of our mental and emotional experience, we empower our capacity for creative action and self-realization.

The art of 'fuzzifying' any established rigidness in human thinking, in emotional experience and in action is at the focus of Social Fuzziology.

6. Natural and Artificial Fuzziness

Misuse or abuse of the fuzziness imbedded in human understanding of social complexity makes humankind susceptible to manipulations. In society these forms of manipulations are usually aimed at clearing the path for the exercise of power of an oligarchy (or a leader). It is common for the select group holding power within an oligarchy to have a clear (non-fuzzy) agenda, but to utilise imbedded fuzziness in a manipulative way as a means of keeping the true agenda secret from the largest part of society.

Most of the charismatic speeches and promises of the politicians today are characterised with a high degree of fuzziness artificially generated to hide motives and actions entirely opposite to what the manipulative speeches and promises indicate.

The phenomenal consumption-oriented brainwash in society also serves manipulative purposes aimed to distract people from possible spontaneous release of their accumulated discontent about today's socio-economic order strongly favouring those with greatest economic power.

By exploring the sources of fuzziness and its semiosis, Social Fuzziology studies possible ways of discriminating between natural fuzziness inherent in social complexity and artificial fuzziness specially generated to be used for social manipulations and suppression of the full expression of each and every human spirit.

FUZZY REASONING: USE OF FUZZY LOGIC

1. Introduction

The term *logic* comes from the Greek word *logos* ("reason"). The idea of the logos in Greek thought harks back to Heraclitus (540-480 BC) defining *logos* as the universal principle through which all things are interrelated and all natural events occur. A significant manifestation of the *logos*, according Heraclitus, is the underlying connection between opposites. For example, health and disease define each other. Good and evil, hot and cold, and other opposites are similarly related. His understanding of the relation of opposites to each other enabled him to overcome the chaotic and divergent nature of the world. He asserted that the world exists as a coherent whole; his persistence of unity despite change is illustrated by Heraclitus' famous analogy of life to a river: "Upon those who step into the same river different and ever different waters flow down." However different the waters, the river they belong to are the same!

Fuzzy reasoning reflects Heraclitus' view of the world as unity of opposites - it is a multi-valued logic that allows intermediate values to be defined between opposite evaluations like *yes*/*no*, *true*/*false*,*black*/*white*,*hot*/*could*, etc. Between *yes* and *no* there are different degrees of doubt ('neither *yes* nor *no*' or 'both *yes* and *no*' at the same time), between *true* and *false* there are different

degrees of ambiguity ('neither *true* nor *false*' or 'both *true* and *false*' at the same time), between *black* and *white* - different degrees of grey ('neither *black* nor*white*' or 'both *black* and *white*' at the same time), etc.

In engineering and mathematics, fuzzy reasoning was introduced in 1965 by Lotfi A. Zadeh, professor at the University of California in Berkeley, with his theory of fuzzy sets.

An element *a* can belong to the fuzzy set (class) F with a membership function f(*a*), whose values are in the interval [0,1]; if f(*a*) = 0, the element *a*definitely does not belong to F, if f(*a*) = 1, the element *a* definitely (we are 100% sure!) belongs to F. For all other values between 0 and 1, we say that the element *a* can both belong AND not belong to F. For example, if f(*a*) = 0.3, we are 30% sure only that *a* belongs to F AND 70% sure that *a* does not belong to F. And on the contrary, if f(*a*) = 0.7, we are 70% sure that *a* belongs to F AND only 30% sure that *a* does not belong to F. So each value of the membership function f(*a*) shows the grade of membership (degree of 'belongingness') of *a*to the fuzzy set F.

Another way to say that *a* belongs to the fuzzy set F with grade of membership f(*a*) would be the following: the *truth-value* of the proposition "*a* belongs to F" is f(*a*), As *truth-value* is a term used in logic, the link between 'fuzzy sets' and 'fuzzy logic' is straightforward: the 'grade of membership' used in fuzzy sets plays the role of 'truth-value' used in fuzzy logic.

For example, let us consider a fuzzy set that includes all people who are *young* and let John be 20 years old. It is obvious that he definitely (with a 'truth-value equal to 1') belongs to the fuzzy set of *young people*, but what about Michael who is 35 years old? He is still considered young but the grade of his membership to the fuzzy set of *young people* is less than 1, and at the same time, he belongs also to the fuzzy set of *middle-aged people*, although the grade of his membership to this set is still not too high. Richard who is 48 certainly belongs to the fuzzy set of *middle-age people*, and at the same time, he might consider himself still belonging to the set of *young people* (however small the truth-value of such a consideration might be) while others may start to assign a non-zero value to his grade of membership to the fuzzy set of *old people*.

Zadeh's theory of fuzzy sets explains how mathematically to manipulate with fuzzy classes and fuzzy numbers, how to solve fuzzy equations, to take fuzzy derivatives and fuzzy integrals, how to recognize and classify fuzzy patterns, generate fuzzy predictions and optimize complicated technological processes.

2. Engineering Applications

In Japan the fuzzy reasoning has been commercially applied to engineering systems, computer-based control and robotics. The currently applications range from large-scale electro-mechanical processes, like subway systems and elevators, to mass market consumer applications like video camera focus control or smooth operation of helicopters and automobile cruise control.

In the world market there are sold Japanese fuzzy logic based devices like fuzzy shavers, washing machines and dryers, blood pressure gauges, vacuum cleaners, air-conditioners, microwaves, etc.

Examples (as described by *F. Lewis* in "Enviros", 1993, vol. 3, No 11):

(1) The fuzzy logic shaver senses the length, thickness and density of the beard and the speed of the blades; for first-of-the-day shaves or dense beards, the shaver increases motor speed and for less dense areas, finishing touches, or slower shavers, it automatically slows itself down.

(2) The fuzzy logic washing machines and dryers have microprocessors that are programmed to store fuzzy logic rules and make decisions as fuzzy-weighted averages. The "smart" washer has just one button to push and automatically adjusts the wash cycle to the type of clothes and dirt status. The agitator feels the load size and guesses at the clothing type as it knocks off dirt. An optical device senses the murkiness of the water and tells the microprocessor the dirt level and thus the detergent level needed. Fuzzy set instructions in the microprocessor turn sensor data into wash commands: load size detected (small, medium, large or very large), water clarity detected (very

dirty, dirty, medium clean, or very clean), and water/detergent level needed (little, medium, or a lot of water/detergent). In the same way, a fuzzy dryer turns the flow of hot air, load size, and fabric type into drying times and drying strategies.

(3) The fuzzy vacuum cleaners sense the amount of dust on a carpet or condition of the floor and set the proper suction level. An infrared sensor detects the amount of dust being sucked up and relays that information to the microprocessor, which selects the proper motor speed; the more dust the higher the power. Because the sensor also tracks the changing levels of dust, a set of lights indicates the cleanliness of the floor - three red lights for plenty, two for some and one for little. When the floor is clean, a green light then comes on.

(4) The fuzzy air-conditioners control the temperature, humidity and carbon dioxide parameters in order to achieve optimum quality indoor air. Thermal sensors are set up to control fan motor speeds and heating/cooling coils, humidistats to control fan motor speeds and steam and carbon dioxide sensors to control the opening/closing of outside air dampers. Each parameter has a fuzzy set: temperature - cold, cool, just right, warm, hot; humidity - very humid, humid, just right, dry, very dry; carbon dioxide - very low, low, medium, high, very high. These parameters are mapped into air velocities, on/off times, outside air damper settings and patterns which combine all of these parameters for optimum occupant comfort and energy usage.

(5) Fuzzy logic enhances the management of projects through its ability to look deeply into the semantics of a project's governing parameters. Fuzzy logic based approaches accommodate complex, rapidly changing project dynamics and also provide managers with evaluation criteria for project readiness or repair based on their own perceptions and requirements. Such seemingly simple concepts as long, late, large, and expensive can be constructed into fuzzy sets, which can be defined in the context of that particular project. (More about this in " The Fuzzy Systems Handbook : A Practioner's Guide to Building Using, and Maintaining Fuzzy Systems", by E. Cox, Morgan Kaufmann Publ., 1998).

3. Fuzzy Logic based Control

The basic fuzzy classes used in the engineering applications, are: *very small, small, moderate, large, very large*. By knowing the spectrum of all possible values taken by a given variable *a* characterising some specific engineering or technological process, an experienced engineers or technologists can define the grade of membership (belongingness) of*a* to each of the basic fuzzy classes. Today, the process of assignment of the grades of membership is computerised by using 'clever' neuro-fuzzy networks (for details, see "What is Neuro-Fuzzy Systems?"). The grades of membership to each basic class are used for generating new fuzzy classes, which help to describe mathematically notions like *rather warm* or *pretty cold* or *more or less equal* or *slightly different*, etc. In this way, fuzzy logic brings computers' understanding closer to the humans' one, and thus facilitates the design of intelligent machines and robots.

What is important to be underlined in the engineering applications is that one and the same quantitative measurement of a given variable *a* can belong to more than one fuzzy class in parallel. For example, if the all quantitative spectrum of values taken by *a* is from 1 to 10, then the precise value *a* = 4 can be classified as *moderate* with a degree of membership of *a* close to 1, say 0.8, that is, the truth-value of the proposition '4 belongs to the fuzzy class of *moderate* numbers' is equal to 0.8. But 4 can be classified also as a *small* number, although it is obvious that the truth-value of such a classification is less than the truth-value of classifying 4 as a *moderate*. Much lesser, almost close to 0, would be the truth-value of the proposition '4 belongs to the class of *large* numbers'.

Such a parallel membership turned to be a great advantage in the engineering applications of fuzzy logic - an advantage, which made possible extremely fine and smooth adjustments of the automatic regulators used in the fuzzy logic-based process control and in robotics.

In non-fuzzy (conventional) regulators, each value of the input variable of the regulator corresponds to one and only one value of the regulator's output variable. In fuzzy regulators, one and the same

value of the input variable corresponds to several possible values of the output variable. How does this happen? Through an operation called *fuzzification*.

As a result of the operation *fuzzification*, any precise value of the input variable is expressed as belonging to several fuzzy classes (in a similar way as this was shown above with the precise value of the variable *a* equal to 4), and therefore it becomes able to 'fire' simultaneously several fuzzy classes defined on the corresponding output variable. The 'firing' means a computer execution of rules of the type IF...THEN....

For example:

IF the input variable *i* belongs to the fuzzy class, say F1(*i*) with a degree of membership m1(*i*) THEN the corresponding output variable *j* belongs to the fuzzy class, say F1(*j*), with a degree of membership m1(*j*)

IF the input variable *i* belongs to the fuzzy class, say F2(*i*) with a degree of membership m2(*i*) THEN the output variable *j* belongs to the fuzzy class, say F2(*j*) with a degree of membership m2(*i*)

IF the input value *i* belongs to the fuzzy class, say F3(*i*), with a degree of membership m3(*i*) THEN the output value *j* belongs to the fuzzy class, say F3(*j*), with a degree of membership m3(*i*), etc.

(The number of this kind of rules can be quite large, if the controlled process involves many input and output variables.)

As far as *i* belongs to several fuzzy classes in parallel: F1(*i*). F2(*i*), F3(*i*),..., it 'fires' several fuzzy classes to which the output variable *j* simultaneously belongs: F1(*j*). F2(*j*) , F3(*j*),...

In the process of control, the operators are interested not so much what are the fuzzy classes 'fired' by the output variable but what exact control action needs to be executed, that is, what is the precise value of the regulator's output. How to find the exact value of the output variable? This can be done through a special operation called *defuzzification* - an operation, which helps not only to integrate all fuzzy classes of the output variable into one common ('weighted') fuzzy class, but also to provide ways for computing the precise value of the output variable. The fact that this value is obtained while taking into consideration several 'candidates' (several fuzzy classes in the example above) and not only one (as it would be the case if using a non-fuzzy regulator), results in a significant increase of the quality achieved in the fuzzy logic-based control.

4. Websites about Fuzzy Logic

At present, fuzzy logic is at the core of *soft computing* - an advanced stage of using computers to understand and work with words of natural language and with human perceptions. The principal constituents of soft computing are *fuzzy logic*, *neural networks* and *probabilistic reasoning*, with the latter subsuming *belief networks*, *genetic algorithms* and *chaos theory* .

For those who are interested to know more about the engineering applications of fuzzy logic, the following websites offer transparent explanations and tutorials:

http://life.csu.edu.au/complex/tutorials/fuzzy.html

http://www.seattlerobotics.org/encoder/mar98/fuz/fl_part1.html
http://members.aol.com/btluke/fuzzy01.htm
http://itri.loyola.edu/kb/c5_s4.htm
http://www.flll.uni-linz.ac.at/pdw/fuzzy/fuzzy.html
http://www.cs.cmu.edu/Groups/AI/html/faqs/ai/fuzzy/part1/faq.html
http://www.tucs.abo.fi/courses/95-96/material/fd1.ps.gz
http://www.mala.bc.ca/~soules/media112/fuzzy.htm
http://www.wspc.com.sg/books/compsci/3312.html
Our paper dealing with application of fuzzy logic to surface irrigation is on
http://www.csu.edu.au/ci/vol4/dimmah/fuzzgen.htm

5. Social Applications

The fuzzy reasoning is applicable when navigating through complexity of life - of course, not in the same way as the engineers do. There is no need to assign numbers between 0 and 1 for the membership functions or the truth-values of concepts (words, stories, phenomena, processes), which appear fuzzy to us. Most of those concepts are *amorphous* - a term used by Zadeh to label fuzzy classes, the membership functions to which cannot be express quantitatively; Zadeh refers to these membership functions as *pseudo-functions*.

Even things, in which we are 'absolutely' sure, trigger the use of fuzzy reasoning. For example, the fact that we know certainly that everything changes, that our physical bodies are going to die, that our lives unfold in unpredictable ways, that we are both creators and products of society, etc. opens widely the door for fuzziness to enter into our thoughts and feelings. Fuzzy is our understanding about the complex interplay of the causes and effects, which ceaselessly gives birth to changes that we observe and experience. Fuzzy are our feelings and comprehension related to the symptoms and signals through which stress and diseases deliver their messages and warnings to us. Fuzzy is our knowing how to bridge the ever-expanding gap in humanity between a handful of riches with great economic (and hence socially decisive) power and masses of people without any decisive voice in society.

Through all our lives we accumulate fuzzy knowledge about ourselves, about society and nature, and pass it to those who are coming after us to continue doing the same. It is clear that we do not only accumulate fuzzy knowledge - we do something with it. *Any act of 'doing something' in society with the fuzzy knowledge that we have about ourselves, about society and nature, represents a social application of fuzzy logic*.

5.1 Fuzzy Management

In the theory of Fuzzy Management (*Dimitrov* 1975,1976), the process of understanding a fuzzy instruction by an individual is described as a generation of a fuzzy set by this individual - the support of the fuzzy set (i.e. its non-zero elements) includes a number of alternative ways of interpretation of the instruction. Each alternative way is presented by a weight (rank, priority) assigned by the individual to express up to what degree this alternative way relates to the meaning of the instruction as understood by him/her. In the case when the fuzzy instruction is presented to a group of individuals, a group choice rule can be applied to map the individual meanings of the instruction (i.e. the individual ways of understanding it) into a virtual (or fuzzy) meaning that is satisfactory for the group as a whole.

According to the **Incoherence Principle** (*Dimitrov* 1983), *the more certain (non-fuzzy, determine) individuals, the more uncertain (fuzzy,indeterminate) the group, and on the contrary: the more fuzzy are individuals in their ways of interpreting (understanding, executing) the meaning of an instruction, the greater is the chance for the group to negotiate a concrete (categorical, non-fuzzy) way(s) for practical execution of this instruction*. Thus, the Incoherence Principle helps overcome the Arrow Impossibility Theorem establishing the impossibility of generating a 'socially satisfactory' choice function from the choice functions of individuals making up a group (society). Under fuzzy management, i.e. in the context of the virtual meanings, there is a socially satisfactory choice function mapping fuzzy individual choices into a non-fuzzy choice of the group (*Dimitrov* 1976).

The above result provides a sound theoretical basis for the use of innovative participatory approaches in the contemporary management practice. It serves also as a theoretical basis for seeking consensus between stakeholders with different positions (this is discussed in the next section).

Unfortunately, in Western democracies, the Incoherence Principle is often misused by the politicians: the fuzzy charisma in their speeches serves as a tool for deceptive ësellingí of policies and decisions based on hidden agenda of ideology and power. By keeping majority of people

ignorant (uncertain, fuzzy) about these agenda, they try to impose (with the help of their most influential supporters) non-fuzzy ëgroupí decisions which work only for a privileged part of the society.

5.2 Virtual Consensus

In the turbidity of human interactions, consensus ceases to be a peaceful long-term commonality of stakeholders' interests. Such commonality grows on determinacy and stability. Unfortunately, neither determinacy nor stability are features of social complexity. The more we reach for commonality in human interactions, the farther away it seems to be. "Consensus is a horizon that is never reached" (*Lyotard* 1984).

An irreducible indeterminacy constantly emerges when we explore more deeply both variety and uncertainty of group decision-making. Paradoxically, instead of consensus being the power house of common social action, it is 'dissensus' which operates in consensus seeking enterprise, permanently implanting chaotic vibrations in the process of communication. However, in this case chaos does not cause the communication network to dissipate. Rather, it eventually gives birth to an emerging order in the form of a new type of dynamic consensus between stakeholders: consensus for seeking a consensus.

This can be defined as a *second order consensus* or *virtual consensus* - people try to seek consensus by exploring different virtual (possible) meanings of the issues of common concern that might lead to mutual understanding and preparedness to move together - to make the next step into the fuzziness of common expectations (*Dimitrov*, 1997; *Dimitrov and Hodge*, 1999).

It does not matter that actually achieved consensus in to-dayís dynamics is 'condemned' to be momentary and transient - what can endure in time is human anticipation and aspiration, the impulse to act together, the natural desire to interact and communicate, to share with and care for others. These are factors that bring forth virtual consensus.

Virtual consensus is a search process entirely open for emergence of new features and unpredictable situations - spontaneity is an important characteristic of this process. Any pre-imposed goals, constraints or requirements inevitably narrow the scope of the stakeholders' search.

The search for consensus by itself is a powerful generator for virtual meaning - the propelling force of this generator is stakeholders' drive to be mutually complementary in their efforts to more fully understand complexity of the issues of their concern and to find out how to act together in order to benefit from the differences in their knowledge. While conducting their inquiry, the stakeholders are aware of the irreducible fuzziness and uncertainty of this knowledge, yet they agree to explore it together and construct it anew.

Virtual consensus is inherently dynamical - not a static overlap of stakeholders' views, but interplay between their interests, motives, values, goals, positions. Virtual consensus assumes a shared acknowledgement that stakeholdersí knowledge abounds in zones of ignorance in which neither the causes nor the effects of what occurs is clear or even can be known. Also, there must be a kind of tacit agreement between the stakeholders to explore social complexity together in order to arrive at a better understanding of it, by using not only your own but each other's experience, expertise and ideas. Virtual consensus assumes a ready-to-manifest *preparedness to act together*; that is, to engage in a joint, collaborative action to work with complexity. Ways of activating stakeholders' preparedness to act together are considered in (*Dimitrov*, 1997) and (*Dimitrov and Kopra*, 1998).

More social applications of Fuzzy Logic one can find in (*Dimitrov and Ruissell*, 1994; *Dimitrov and Dimitrov*, 1994; *Dimitrov*, 1999; *Reznik, Dimitrov and Kacprzyk*1998.

While studying fuzziness of our understanding and knowing, social fuzziology constantly keeps social applications of fuzzy logic in its focus - they demonstrate practical ways of dealing with social complexity.

'BUTTERFLY ATTRACTOR' OF SOCIAL FUZZIOLOGY

Social Fuzziology considers the processes of understanding and dealing with social complexity inseparable. Understanding social complexity helps us working with it, and while working with social complexity we deepen our understanding about it.

1. The "Drowning-man" Paradox

Any act of understanding represents emergence of meaning(s) out of the thoughts and feelings constantly 'swarming' in our brains and hearts. In the moment when meanings emerge, we are able to make sense of what we experience - what we see and hear, touch and smell, read and contemplate, create and discover. Once emerged, meanings immediately reflect the way we think. And as far as thinking is always coloured with feelings, meanings affects our emotional life too.

By influencing the ways we think and feel, meanings self-propel their growth - they act as magnets attracting more and more thoughts and feelings, which support them and make them more definite, more categorical, more stable. For example, once the scholars made sense of what Mandelbrot wrote about fractals, they actively started to generate a huge amount of ideas and accumulate information confirming the meaning of fractals in many branches of the human inquiry, so this meaning became clearer, more definite and more stable. If people discover meaning in some kind of activity, they will do their best to stabilize this activity and make its realization more frequent or more intensive, no matter whether society approves this (say, playing music) or disapprove it (say, smoking drugs).

In the overall fuzziness of our understanding of social complexity, the tendency of any emergent meaning towards stability reflects human 'gravity' to stability, to something that is familiar, secure, habitual and known. This tendency is behind a paradox, which we call the "drowning-man paradox": ***the fuzzier an environment appears, the stronger the attachment to what seems non-fuzzy in it.***

This paradox often manifests in life. It is a well-known fact that any time when the economic and social turbulence increases, bureaucracy activates its role and the rules, restrictions and regulations become much more severe. Although these rules appear as non-fuzzy, they hardly contribute in dealing with social complexity, on the contrary, they make the fuzziness of its understanding almost ungraspable. Before the collapse of the soviet model, Andropov's regime was desperately trying to put into practice non-fuzzy (KGB-like) methods of dealing with social complexity (which resulted in accelerating the collapse). The less a governing body understands complexity of a situation, the higher its willingness to use stringent, that is, non-fuzzy methods of control. The effects of these methods only aggravate the problems.

All the routines (prejudices, stereotypes, customs) in human life are demonstrations of the 'drowning-man' paradox - we cling to rigid patterns of behaviour because of the lack of will and courage to openly explore the sources emitting fuzziness in our own understanding of life. Every time when we cling to what others preach and teach, following blindly their 'precise' recipes and ignoring our own lessons in understanding complexity, we are in captivity of the 'drowning-man' paradox.

The fact that under condition of an increasing dynamism of social life, any stable meaning tends to become dogmatic and thus to impede our understanding, must not be accepted as an argument in favour of the use of unstable meaning. Unstable meaning change so swift that they can hardly trigger any earnest process of thinking.

2. Tuning Fuzziness of Understanding Complexity

In order to 'move' our understanding towards a deeper and broader grasp of complexity, the emergent meanings need to be neither stable nor unstable, that is: stable enough to rely upon them when generating hypotheses, concepts, and emotional attitudes, and unstable enough not to allow these concepts and attitudes to harden and become dogmas and addictions. In other words,

meanings need to be flexible, ready to immediately respond to the changes continuously occurring in each of the countless dimensions of reality.

To be simultaneously stable and unstable implies fuzziness. So, the emergent meanings and the understanding they evoke need a certain degree of fuzziness in order to shape according to changes in the flux of life - with all its 'whirlpools' and attractors and repellers and sudden jumps ('falls' and 'geysers'). The degree of fuzziness of this understanding can be adjusted through its ability bring forth actions - in the case of social complexity, the understanding must result in a concrete social activity. If the understanding is too fuzzy, it does not lead to actions - just words and nothing more. For many politicians this is the way to deal with social issues - to emit cleverly organized sequences of fuzzy words deprived of any potency to change anything in society.

3. Awareness about Fuzziness when Dealing with Complexity

However concrete a social action might appear, when applied to social complexity its effect is 'fuzzified' through a number of consequences - both known and unknown, open or hidden, erupting immediately or after hard-to-predict interval of time. Every consequence of a social action relates with some 'degree of membership' to what was expected to be achieved through this action. In this sense, most of the actions applied to social complexity are fuzzy - one cannot be certain about the consequences they lead to.

The way to cope with the fuzziness of social actions is to be aware of it, not to pretend that it does not exist or to hurry in substituting it with straightforward cause-and-effect explanations. Our haste to offer such kind of explanations when justifying the application of any adopted economical, technological or political decision, is responsible for the most serious maladies of today's society like: severe environmental destruction, disconnection of economy from society, unimaginable inequality in the distribution of wealth, degradation of work, etc. The awareness about the fuzziness when dealing (working, acting) with social complexity goes hand by hand with our drive to understand the nature and dynamics of every incarnation of this complexity as it appears in our lives, both individual and social.

4. Three 'Golden Rules' of Fuzziology

In the sense of the above explanation of inseparability of human understanding and dealing with social complexity - an inseparability which is at the very core of social fuzziology, one can visualised the subject of social fuzziology through the wings of the famous butterfly attractor of Lorenz. From the wing of understanding complexity we move towards the wing of working with it, and from there again to understanding, and then again to working, and so on, in a never-ending attempt to realize the uniqueness and infinity of our potential to think and act.

In order to keep going the dynamics of the attractor so that each flap of its wings might be able to bring forth not only a "hurricane" or "tornado" (metaphors used by Lorenz when describing the butterfly effect in chaos theory) but also real fruits of human creativity, fuzziology offers three 'golden rules' - not blindly to follow but consciously to consider as practical tools for strengthening the individual awareness:

- Not to neglect the unknown or deny it or turn away from it or try to make ourselves and others believe that it is really known and then to organize, dichotomize and impose rules on it. The unknown manifests through spontaneity of any novel expression of human creativity.
- Not to cling to a need for certainty, definiteness and order or to ideas and practices that are familiar, commonsensical or accepted as true by an assumed majority. Remaining attached to what is certain and familiar suppresses idiosyncrasy of the human potential for self-realization.
- Not to fight with complexity of the life dynamics, no matter where they manifest - in our inner nature or in the world around. The way to avoid being a slave or a victim of these dynamics is through understanding how they work and through applying their infinite energy for a continuous growth of the human intelligence and spirit.

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