"Who am I?" Identity, Evaluation, and Differential Equations

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Abstract[1]

In this paper we study the connection between the use of evaluative language and the building of both personal and social identities, from the perspective of *Dynamical System Theory*. We primarily discuss two issues:

1) The use of evaluation (in the sense given to the term by Alba-Juez and Thompson (forthcoming)) as a means to the construction of both individual and group identities, thus exploring how the connection between linguistic choices and social identities is shaped by interactional needs for stancetaking. In order to illustrate this connection, we examine examples of the use of evaluative language in a web social network, and we analyze some of the discourse elements showing ways of positioning that act as catalysts for the emergence of a multifactorial dynamic system of identities.

2) The consideration of *Dynamical System Theory* (DST) as a theoretical framework for the modeling of language and identity. Although originally a mathematical theory, DST has been adopted by cognitive science as a valid framework for the study of cognitive phenomena, on the grounds that natural cognition is a dynamical phenomenon. Within the realm of (socio) linguistics and pragmatics, this study is to a certain degree in line with some recent studies such as Gibbs (2010), Geeraerts, Kristiansen and Peirsman (2010), or Moreno Fernández (2012).

Thus, we herein focus on how linguistic evaluation intervenes in the intricate dynamical system of identity, and even though we do not engage in complex mathematical disquisition, we argue that the idea and philosophical foundation underlying DST can lead us towards the 'integration' of the complex equation of identity construction, and that consequently the field has great potential for further research.

Keywords: cognitive phenomena, differential equations, Dynamical System Theory, feedback control systems, evaluation, identity, linguistics, pragmatics, stancetaking.

1. Introduction

The main aim of this paper is to elucidate some facts about the relationship between stancetaking, the language of evaluation and identity construction, as well as about the possibility of placing the study of identity within the framework of *Dynamic System Theory* (hereinafter DST), which was originally a mathematical theory but which has been and is being used in other disciplines such as Biology (e.g.VA Shiva, 2013) and Cognitive Science.

Within Cognitive Science, scholars like Tim van Gelder (e.g. 1998) have resorted to DST on the grounds that natural cognition is an inherently dynamical

phenomenon resembling more the features of a feedback control system than those of rule-based symbol manipulation (and therefore it is best understood in dynamical terms). A simple example of a feedback control system is the temperature controller of a house, which turns the heater ON or OFF based on the difference between measured (controlled) and desired (set point) temperatures. By analogy, cognitive phenomena and – for the particular objectives of this paper – identity construction could be regarded as a feedback control system which is adaptive and whose structure changes as a function of its interaction with the exterior.

Identity construction is, undoubtedly, a very complex, intricate, and multifarious phenomenon. Identities respond to apparently very simple, though equally very profound and philosophical questions, such as *Who am/are I/we? What do I/we want? What do I/we like? Who do I/we associate/feel comfortable with?* The particular stances taken with respect to these questions may be linked to specific uses of language which in turn reflect specific personal and/or social identities. And because identities are complex and evolutive processes, we believe we can speak of them as dynamic systems containing many and various embedded sub-systems which are intertwined, and which at the same time partially instantiate the superordinate system.

Taking these ideas as a basis for reflection, we herein intend to discuss two main issues:

1) The use of evaluation (mainly in the sense given to the term by Hunston and Thompson (2000), and later by Alba-Juez and Thompson (forthcoming)) as a means to the construction of both individual and group identities, thus exploring how the connection between linguistic choices and social identities is shaped by interactional needs for stancetaking (Englebretson 2007: 69). Alba-Juez and Thompson define *evaluation* as

> …a dynamical sub-system of language, permeating all linguistic levels and involving the expression of the speaker's or writer's attitude or stance towards, viewpoint on, or feelings about the entities or propositions that s/he is talking about, which entails relational work including the (possible and prototypically expected and subsequent) response of the hearer or (potential) audience. This relational work is

generally related to the speaker's and/or the hearer's personal, group, or cultural set of values.

Human desires and goals are important reference points in evaluation, which makes its relation with human identity an inevitable fact. In order to illustrate this relation and connection, we shall examine examples of the use of evaluative language by a young male member of a web social network (*Facebook*®). The analysis of such examples will show the use of different strategies showing ways of positioning that act as catalysts for the emergence of a multifactorial dynamic system of identities.

2) The consideration of *Dynamical System Theory* (DST) as a theoretical framework for the modeling of identity. In mathematical terms, a dynamical system is a set of quantitative variables changing continually, concurrently and interdependently over time in accordance with certain laws described by some set of differential equations. A differential equation is basically a numerical relation between at least one variable and its rate of temporal change. Knowing the rate of change of something allows us to predict the value of that something in an infinitely small neighborhood of its current value. By 'integrating' (solving) such an equation (i.e., compounding the infinitesimal predictions inherent in the equation) one could predict the system trajectory over a finite amount of time. The set of all possible values for those variables is called the system *state-space* (or, for historical reasons, *phase-space*).[2] Dynamicism, as a relatively new approach in cognitive science, contends that differential equations are more suited to modeling cognition than more traditional computer models[3] (van Gelder, 1998: 615). By way of example, in Figure 1 we use the simple physical instance of a pendulum: If – as in the case of a pendulum – the force applied to a body depends on its position (angle θ of the bob with respect to the vertical), Newton's well-known Second Law of Mechanics ($\vec{F} = m\vec{a}$) becomes a differential equation. Given that the acceleration ($\vec{a}$) is the temporal rate of change of the velocity, and the latter is the temporal rate of change of the position (noted as $\dot{\theta}$) the acceleration is the temporal rate of change of the temporal rate of change (second derivative) of the position and is noted as $\ddot{\theta}$. The differential equation so obtained governs the evolution of the pendulum in its bi-dimensional state-space, i.e., in the set of all possible values of the pair $(\theta, \dot{\theta})$. In

Figure 1, we see that the bob was manually taken to a negative angle (to the left of the vertical) and let go from repose, i.e., its initial state is defined by the angle $-\theta_{Max}$ and zero velocity. Once the bob is released, the differential equation fully determines how the system will evolve in state-space (Alba-Juez, 2013).

We use the pendulum here as an analogy to intuitively understand the language of DST and thus interpret the analysis of identity within the DST framework. However, in this paper we shall not focus on the equations, but on how linguistic evaluation intervenes in the intricate dynamical system of identity construction.

Figure 1: Newton's Second Law leads to a differential equation
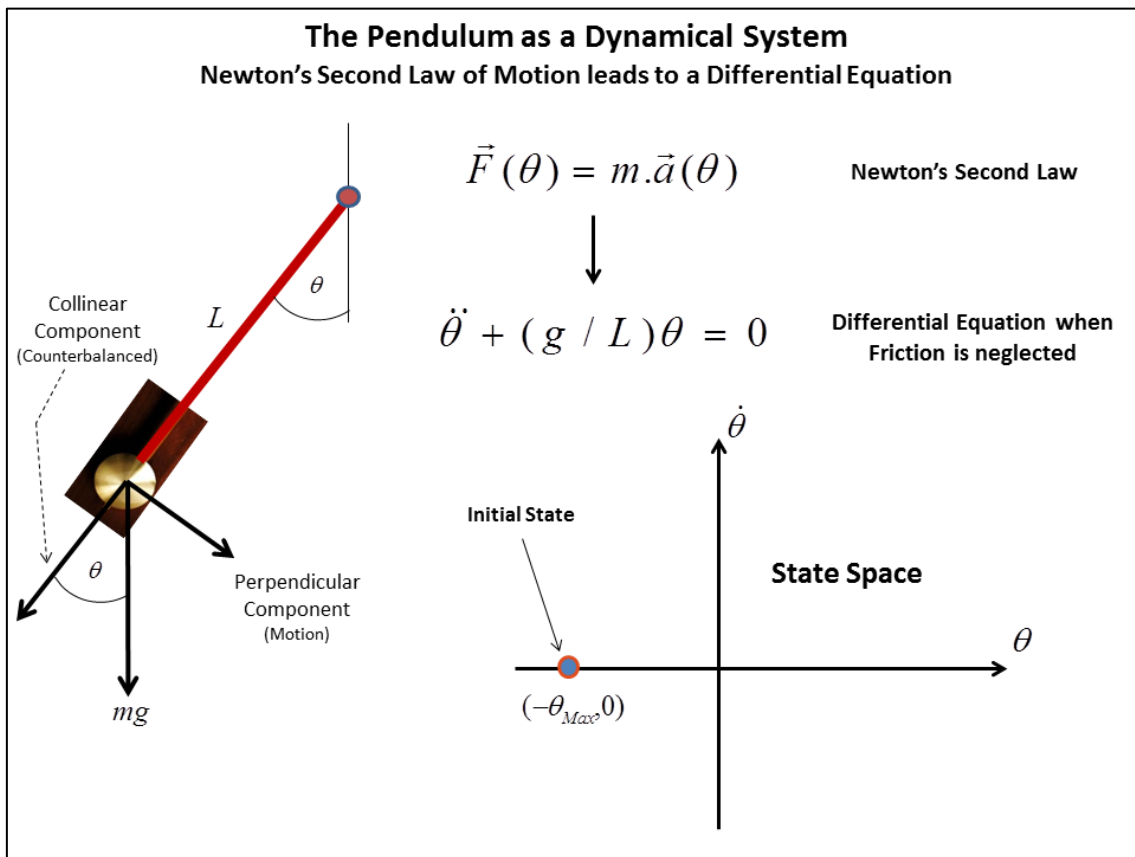
DST originated in the field of Applied Mathematics, but has later been adopted by cognitive science as a valid framework for the study of cognitive phenomena. The point of departure for this consideration is rooted in the idea –which can be traced back to David Hume (1978 [1739-40]) and permeates through the works of psychologists such as Lewin (e.g., 1935) and Tolman (e.g., 1959), or philosophers such as van Gelder

(e.g., 1998)– that natural cognition is a complex dynamical system and therefore DST is better suited to describe and understand the phenomenon than the more orthodox representational (symbol manipulation) approach or the connectionist (neural network) approach (i.e., it can be better understood in dynamical, rather than static or stationary terms). When using rule-based symbol manipulation, concepts, ideas, notions, etc. are represented with symbols and then the rules (e.g., the rules of logic) are established and manipulated. This model is static in the sense that the variable 'time' is not explicitly used, but the set of symbols (concepts) and the rules to manipulate them could be expanded as the identity under study (in this particular case) evolves in time. By doing so, this identity would be enriched by enlarging our 'dictionary' and adding a 'dynamics' to the rules, i.e., by becoming more intelligent.

In connectionist (neural network) approaches, the mathematical model is trying to mimic the way physiology indicates the brain seems to work. Time is not explicit either but again the topology (connections) of the neural network can be made to change with time (that is the way things are 'learnt'). Therefore, while symbol manipulation and connectionism can be also used to represent to a certain extent systems that are dynamic, feedback control systems (DST) could represent the evolution of a given set of identities in a more accurate and powerful way because they explicitly and straightforwardly take into account the dynamic character of the variables. In essence, the difference between one approach and the others would be more a matter of degree in their ability to model different aspects of the phenomenon under study, than a mere opposition of terms and concepts (e.g., static vs. dynamic, or symbol manipulation vs. differential equations).

Thus we shall argue that the idea and philosophical foundation underlying DST account for both broad regularities and specific variations, and can lead us towards the 'integration' of the complex equation of identity construction (as a pragmatic behavior), and that consequently the field has great potential for further research. Following the same line of thought, we share Ray Gibbs's (2010) view that pragmatic phenomena are emergent products of self-organizing systems which show an interaction of brains, bodies and the world, and therefore we argue that the construction of identity constitutes an instance of such kind of system.

2. Identity and its relationship to basic philosophical questions

In order to better understand the phenomenon, we thought it would be useful for us to do some introspection and delve into our own particular identities. So when we asked ourselves "Who am/are I/we?" we came to the conclusion that we were many things, depending on what plane or dimension of life and discourse we were placed. We found we could speak of (respectively in the order in which we appear as authors) a gender identity as a woman/man, or an identity as a mother/father, a daughter/son, a sister/brother, a linguist/scientist-mathematician, as members of the human race, etc. All these identities are shown and reflected in our language depending on the discourse situation, but we can neither see them as totally separate nor as totally working together on all occasions. Also, we cannot identify ourselves completely with each one of them, because our intuition tells us that we are none of them in isolation and all of them at the same time; and therefore that they are all interrelated and continuously evolving.

As with everything in life, it is very difficult to assign labels to a phenomenon, and this – together with the fact that identity is obviously multi-dimensional – was one of the main reasons that led us to believe that the integration of all these identity variables or sub-systems as part of a superordinate dynamical system could become a suitable model for the study of such a complex phenomenon. This view is partially in consonance with the *social constructionist approach,* which, as de Finna, Schiffrin, and Bamberg (2006: 2) explain, assumes that identity is neither a given nor a product, but rather a process that a) takes place in concrete and specific interactional occasions; b) yields constellations of identities instead of individual monolithic constructs; c) does not simply emanate from the individual, but results from processes of negotiation and entextualization that are eminently social, and d) entails discursive work.

If we agree with the view that the analysis of any aspect of language is inseparable from the analysis of its use in contexts, then we shall conclude – in agreement with de Finna et al. (2006: 22) – that identity is not something that people "have", but something that emerges through interactional practices and, moreover, is *embedded* in social practices as Foucault (1984: 119) explains, within which discourse practices have a central role (Fairclough 1989: 22). Both social and discourse practices frame, and in many ways define, the way individuals and groups present themselves to others, negotiate roles, and conceptualize themselves (ibid. de Finna et al.).

3. Corpus and analysis

Computer-mediated communication, and in particular the use of social networks like *Facebook*®, constitutes one of the most common and frequent types of social practice of the 21st century, where individual and group identities are constructed and co-constructed by the 'friends' in the cyber-community.

Facebook® is an ideal place for people to take stances and position themselves with respect to anything that might be of interest to the individual and/or the social group. So, who are we when we are interacting in these social networks?[4] By writing "what's on their minds" on the *Facebook*® wall, people normally use a great deal of evaluative and/or emotion talk that helps define their identities, which are in turn and at the same time shaped by the interaction which is brought about after this original thought or expression of personal feelings or emotions. The use of affective language is part of what many scholars study under the name of *appraisal, evaluation,* or *stance*. The affective features of language are in close connection with cognitive processes, and "are members of a set of signs that regulate human behavior. They are crucial to the process of social referencing in which affective information is sought out and used to assess how one might construct a next interactional move" (Ochs and Shieffelin 1989: 10).

In DST parlance, the system's state (the group identity) is more than the mere aggregate of its members' states (individual identities). The system's state emerges and evolves as a result of the members' states, their internal interaction, and the system interaction with the external world. In turn, the continuous perception and evaluation of the emerging system's state by its own members will reshape their individual identities.

When analyzing the different instances of evaluative language in the corpus, it became apparent that identities are linguistically indexed through stances, and that therefore there is an intimate connection between the stance taken, the implicit or explicit evaluative comment, and the construction of a specific identity, as shown in Figure 2:

Figure 2: Evaluative language, stance, and identity
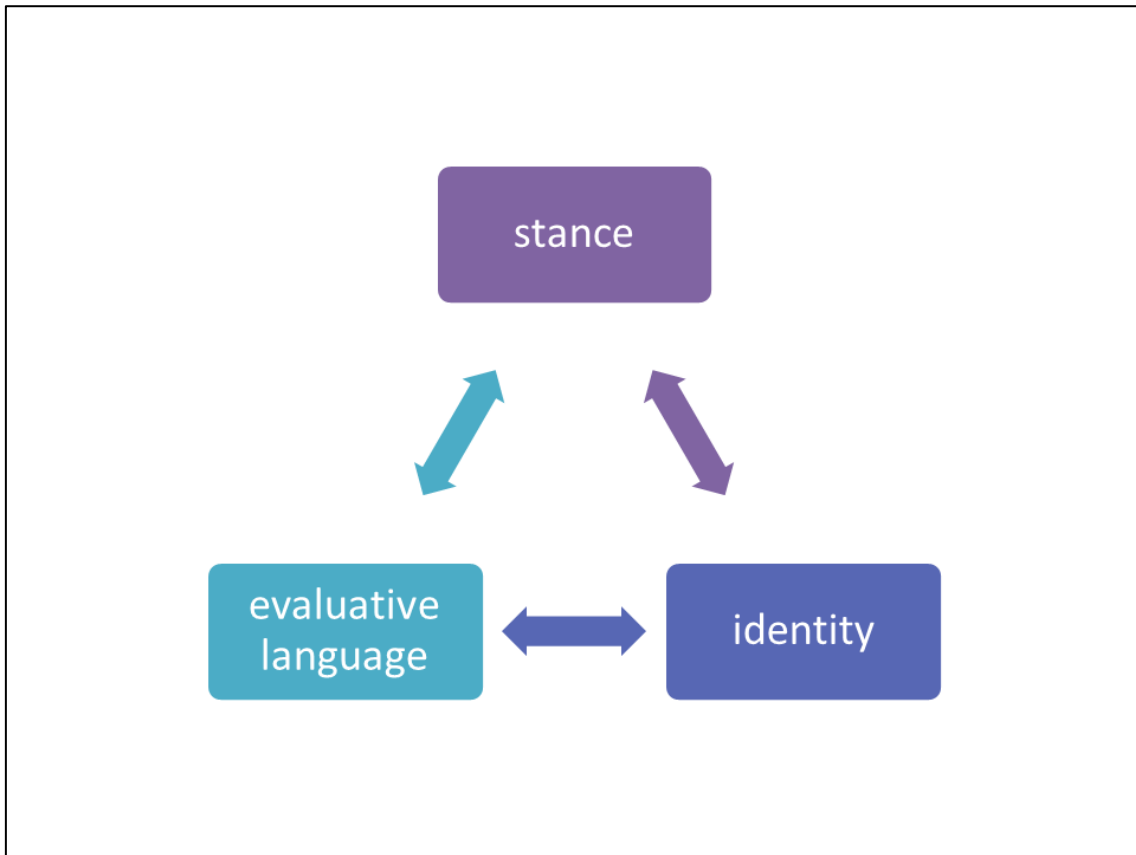
3.1. *Analysis: Nick's wall*

In this study in particular, we shall focus on the linguistic mechanisms and discourse strategies used by a young American male and his *Facebook*® friends on his *Facebook*® wall in order to take certain personal and social stances. By using discourse strategies such as verbal irony, narration, reported speech or impersonation, Nick assumes stances not only towards ideologies (e.g., religion, ethnicity, ethical values), but also in connection with other people, or with more superficial aspects of life or things such as an alcoholic drink or a soccer team.

In the analysis of evaluative language we shall distinguish between *inscribed* (or explicit) and *invoked* (or implicit) evaluation (White 2001). We shall also work with the concept of *provoked* evaluation, but we shall use it in a different sense from that given to it by White (1998) or Bednarek (2009). We refer to *provoked* evaluation when an evaluation given by a *Facebook*® member provokes a chain of similarly evaluative responses on the part of his/her network friends.

It is also interesting to point out that intertextuality also plays an important role in the shaping of identities within social networks. As we know, intertextuality is basically the property texts have of being full of snatches of other texts, which may be explicitly demarcated or merged in, and which the text may assimilate, contradict, ironically echo, and so forth. In terms of production, an intertextual perspective stresses the historicity of texts: how they always constitute additions to existing "chains of speech communication" (Bakhtin 1986: 94) consisting of prior texts to which they respond (Fairclough 1992: 84). In Example 1, for instance, we shall see how Nick and his friends use sarcasm as a strategy to ridicule (= negatively evaluate) people who believe in horoscopes, by means of the superposition of stereotyped, commonplace texts onto their own text.

3.1.1. *Methodology*

For every instance of evaluation analyzed, we have designed and worked within a framework that considers the following aspects as crucial for the interpretation of the phenomenon under study:

a) The parameter of evaluation used by the speaker, loosely following Bednarek's (2006, 2008) framework, but also including parameters of our own.[5]

b) The polarity of the evaluation (negative, positive or neutral within the evaluation continuum). Although Bednarek considers the positive/negative parameter (Emotivity) at the same level as the other parameters, we believe this would not faithfully describe the phenomenon, for the positive/negative parameter permeates the whole system of evaluation and always co-occurs with the others, so we consider it deserves a special treatment.

c) The type of evaluation in terms of its explicitness and the effect caused: inscribed/overt, invoked/covert, or provoked.

d) The discourse strategy used to generate the evaluation. We assume there is a superstrategy ("use evaluative language") that is made manifest through different sub-strategies.

e) The resulting or reflected stance taken by the speaker (through the use of evaluative language).

f) The facet of the speaker's identity (or sub-system of identity) reflected through such evaluation and stance.

g) The placement and analysis of each discursive unit (the comment with its resulting reactions from the *Facebook*® friends) within the framework of DST.

It is relevant to note here that, as Bednarek (2006: 194) observes, evaluative language as such may or may not have an exact correspondence with a cognitive frame. In some cases it can merely reflect an act of politeness that has no true connection with the speaker's internal system of values or, in the case of the building of identities, it may obey to a fabricated identity, to some fake image the speaker wants to project through the *Facebook*® medium in this particular case. It is very difficult for an analyst to find the boundaries between these two frames, but in any case, we believe that even the fabricated identity will have some kind of background cognitive work and will form part of the myriad of intertwined variables (or 'sub-identities') that the speaker has chosen to build up his image and identity as a whole. Thus, to separate the cognitive frame from the linguistic frame is not an easy task, but even when emotions may not always have an identical linguistic correlate, we believe there is always a relationship between the two systems. As Bednarek (2008: 148) points out,

> In cognitive linguistic terms, our folk model of emotion is structured in terms of schema knowledge -involving categories, interrelations, default assignments (prototypes) and expectations, and words can 'trigger' the 'activation' of such a schema.

These assumptions are confirmed by a large body of research from cognitive linguistics as well as cognitive and cognitive-social psychology, and by other researchers on emotion (e.g., Shaver et al 1987, Russell 1991, White 1990, Mees 2006).

Let us now turn to the analysis of examples 1 and 2,[6] following the steps specified in the methodology (a-g):

1)

Nick's wall

Nick:

Your daily horoscope: family is the most important thing to you. You are looking for love but a little hesitant. You have many friends but only a few true friends. You are kind, yet assertive; reserved, yet ambitious. You have two eyes and possibly a nose. You like to breathe air and you have either a penis or a vagina. Or maybe both. ---- am I close?

20 people like this 👍

M: You are way off nic..

S: That is soooo me. The stars don't lie.

H: I agree with you 100% of the time.

R: OMG this was written just for me!!!!

B: HOLY SHIT!!! i gotta start getting my daily horoscope! It's so right on!!!!

N: Loan I have both....

J: haha I live by my horoscope!

a) **Parameter**: In this example, both Nick and his friends show a mental framework that despises horoscopes (*Mental State* parameter) and consider them – and, indirectly, the people who believe in them – idiotic. Also, the parameter of *Reliability* enters into play here (Nick is saying in an indirect manner that horoscopes are not reliable).

b) **Polarity**: There is an implicit negative evaluation of horoscopes and of the people who believe in them, both on Nick's and his friends' parts. On the other hand, we find that Nick's friends make a positive evaluation of Nick's ideas, for they endorse him with their comments and the "like" symbol (thumbs up).

c) Nick expresses an indirect, **invoked** negative **evaluation** of horoscopes, which at the same time provokes similar negatively invoked evaluations on the part of his friends (*That's sooo me. The stars don't lie; OMG that was written just for me!!!; Holy shit!! I gotta start getting my daily horoscope!; It's so right on!!!! ; I live by my horoscope!!*). In contrast, there is both inscribed (by means of the "like" symbol) and invoked positive evaluation of Nick's ideas on the part of his friends.

d) **Discourse strategies**: Use of negative verbal irony (sarcasm) both by the emoter (Nick) and his interlocutors; prosodic prominence marked by the lengthening of the vowel and the exclamation mark (That's sooo me!).

e) **Resulting stance**: Nick takes an incredulity stance with respect to horoscopes, as well as a critical stance towards people who believe in them. He marks the preferred stance in his wall, and his friends follow him by aligning their stance to his.

f) **Identities**: We learn through this interaction that Nick does not identify with horoscope believers and neither do his friends. We therefore see Nick's identity as a non-believer in this kind of esoteric knowledge, which in turn evokes a further identity as an intellectual young man who considers himself more serious a person than those who 'live by their horoscopes'.

Looking at the above example from the DST perspective, it could be said that Nick's identity towards horoscopes defines an 'attractor' state for the system (group identity). Under 'normal' perturbations, the system will recurrently evolve towards Nick's stance, and any isolated member with a different unchangeable stance may decide to leave the group or fight to redefine the system structure so as to generate the opposite attractor state.

Consider now this other posting on Nick's wall:

2)

Nick:
So what we must do is come to a subjective conclusion for our own purpose and meaning in life. Knowledge, pleasure, discovery, peace, love, success, equality, truth, teaching, exploring, understanding people, the world, and the cosmos. And, ... on the other end, we must keep in mind the intrinsic morals and ethics that we have evolved as a species and as societies and treat others like we would like to be treated, such as not causing pain to others. Tell that to a religious fanatic and he will not understand. He only sees servitude to an almighty god and a path to heaven as the only purposeful voyage in life. But here is where my cynical and pessimistic side, heavily influenced by George Carlin, Bill Hicks, and other comedians/writers, kicks in. We are not all rational. We are not all moral. And I do not see equality in the foreseeable future. There will always be a struggle for power, which undeniably introduces war and violence. There will always be groups and stratification, which inevitably introduces prejudice and ethnocentrism. Hopefully I'm wrong and the human race surprises me and we slowly all evolve towards rationalism and humanism..... Ok, rant over. May have derailed a little there.

38 people like this 👍

T: I couldn't agree more…

S: OMG, Nick, you ARE good when you become philosophical ☺

H: What a sensible rant… Way off Nick!

As may have become apparent, example 2 is greatly loaded with evaluative content, both in Nick's state of mind and his friends' reactions to it. For the analysis, we shall divide this exchange in three parts:

Part 1: *So what we must do is come to a subjective conclusion for our own purpose and meaning in life. Knowledge, pleasure, discovery, peace, love, success, equality, truth, teaching, exploring, understanding people, the world, and the cosmos. And, ... on the other end, we must keep in mind the intrinsic morals and ethics that we have evolved as a species and as societies and treat others like we would like to be treated, such as not causing pain to others.*

a) **Parameter**: We find several elements that show a mixture of the *Mental State* parameter (and within mental state, some value that has to do with subjectivity/objectivity, as well as the value of Knowledge (*keep in mind*)), and the *Evidentiality* and *Possibility/Necessity* parameters.

b) **Polarity**: There is a positive evaluation of the necessity of finding meaning and our own purpose in life and of all the items on the list (knowledge, pleasure, etc.), as well as of the intrinsic morals and ethics of our species, and the fact that we should treat others like we would like to be treated.

c) **Invoked** evaluation of ethical values and justice. Provoked evaluation of Nick's stance, seen in his friends' reactions to the posting.

d) **Discourse strategy**: Use of deontic modality (e.g. *what we must do…*); use of discourse markers (*So* – as a presupposed conclusion of some internal reflection of the speaker – *and, on the other end*); incorporation of the preferred stance in his statement.

e) **Resulting stance**: Philosophical, humanistic stance towards the important things in life, a stance that supports justice. Nick sets the basic stance for everything that comes next.

f) **Identities:** Here Nick shows another of his identities, this time that of a humanistic and profound thinker and a fair human being.

Once again, and using DST jargon, Nick is subconsciously trying to establish a stable state attractor for the system (group identity). As shown in Figure 3, the desideratum state defined by Nick is represented by the point (0, 0) (pendulum in vertical position and static) and supposed to be stable, i.e., upon any disturbance that takes the system to the arbitrary initial state, the system will spontaneously evolve towards the attractor (0, 0). The spiraling (convergence) is produced in the pendulum by the friction inside the mechanism and between the bob and the air. This friction transforms the bob kinetic energy (motion) into heat so that the amplitude of the oscillation gradually decreases until repose[7]. But Nick's morality and rationality will soon emerge though – to suggest compromises, so that the system's equilibrium will then resemble more a cycle state (as shown later in Figure 5) than a single stable state.

Figure 3: Nick's ideal positioning with respect to moral issues: A stable state
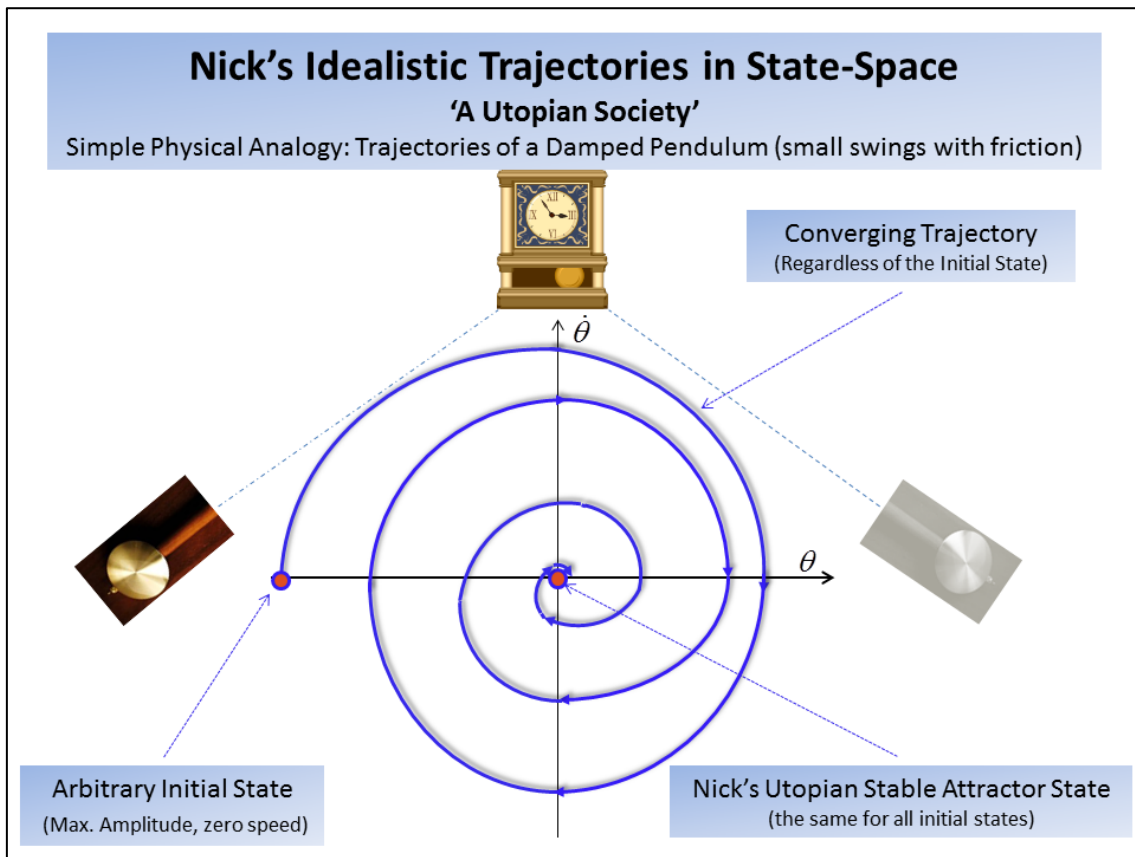
Let us now look at the second part of Nick's posting:

Part 2: *Tell that to a religious fanatic and he will not understand. He only sees servitude to an almighty god and a path to heaven as the only purposeful voyage in life. But here is where my cynical and pessimistic side, heavily influenced by George Carlin, Bill Hicks, and other comedians/writers, kicks in. We are not all rational. We are not all moral. And I do not see equality in the foreseeable future. There will always be a struggle for power, which undeniably introduces war and violence. There will always be groups and stratification, which inevitably introduces prejudice and ethnocentrism. Hopefully I'm wrong and the human race surprises me and we slowly all evolve towards rationalism and humanism..... Ok, rant over. May have derailed a little there*

a) **Parameter**: Again, in this chunk of Nick's discourse there is a mixture of the *Mental State* (value of belief/disbelief), *Reliability* (cynical pessimistic side; moral, rational), *Expectedness* (e.g., *hopefully, surprises, I do not see equality in the foreseeable future*) and *Possibility* (*may have derailed…*) parameters.

b) **Polarity**: There is a negative polarity towards religious fanatics (and religion in general, which can also be seen in the evolution of his posts in *Facebook®*), the morality and rationality of some human beings, the struggle for power, war and violence, prejudice and ethnocentrism as well as towards his own "derailing".

c) **Invoked evaluation** of religious fanatics. Both **inscribed** and invoked negative evaluation of human beings' morality and rationality. Overt negative evaluation of his long intervention on the wall (*May have derailed a little…*).

d) **Discourse strategies**: Use of argumentative prose; incorporation of the preferred stance in his statement; use of contrast (*But…*); repetition (*We are not…*); use of discourse markers (topic closure with *O.K.)*; metaevaluation of his previous evaluative comments.

e) **Resulting stance**: Agnostic person, against established religion (all along the postings). Pessimistic, cynical stance.

g) **Identities:** Nick presents himself as a philosophically liberal, non-religious, free-thinker and as a somewhat cynical and pessimistic person. Another of his identities has to do with his rationality and the fact that he has been influenced by George Carlin and Bill Hicks. We also see Nick's identity as a self-critical and humble person (because he can see his own (possible) mistakes).

Part 3: Nick's friends' reactions

38 people like this 👍
T: I couldn't agree more…
S: OMG, Nick, you ARE good when you become philosophical ☺
H: What a sensible rant… Way off Nick!

a) **Parameter**: Nick's friends' comments are metaevaluative of Nick's initial evaluation of humanity. The prevailing parameter is *Mental State* (value of Emotion and State of Mind: *I couldn't agree more*). We also find the basic parameter *Good* both in S's and H's evaluation of Nick's 'rant'.

b) **Polarity**: All the friends' comments show a positive polarity towards Nick's initial comment.

c) All the positive evaluative comments have been **provoked** by Nick's initial state of mind in his "rant".

d) **Discourse strategies**: Metaevaluation of Nick's expressed stance. Use of emoticons (☺); use of semantic contrast ('*sensible rant*'); use of capitals to show surprise (OMG) and to emphasize positive appraisal *(…you ARE good…).*

e) **Resulting stance**: Once more, Nick's friends adopt Nick's stance.

h) **Identities:** By adopting Nick's stance, his friends also present themselves as free thinkers who are philosophically liberal, non-religious and somewhat cynical and pessimistic.

Again, through Nick's evaluative language we see his identity as a cynical, realistic and down-to-earth person who provokes similar reactions in his friends, thus contributing to the joint construction of their identity as a group. The dynamic approach turns crucial here, for dynamicists do not see interaction only as a setting state, but recognize that it can be a matter of *coupling*, i.e., two systems (or more) simultaneously shaping each other's change (Figure 4). All along Nick's posts in *Facebook®*, it can be seen how his identity (system) interacts with, shapes and is shaped by his friends' identities. Using the DST jargon, we can say that the individual state-spaces and dynamics affect and are affected by the group (system) state-space and dynamics.

Figure 4: Interaction and Coupling
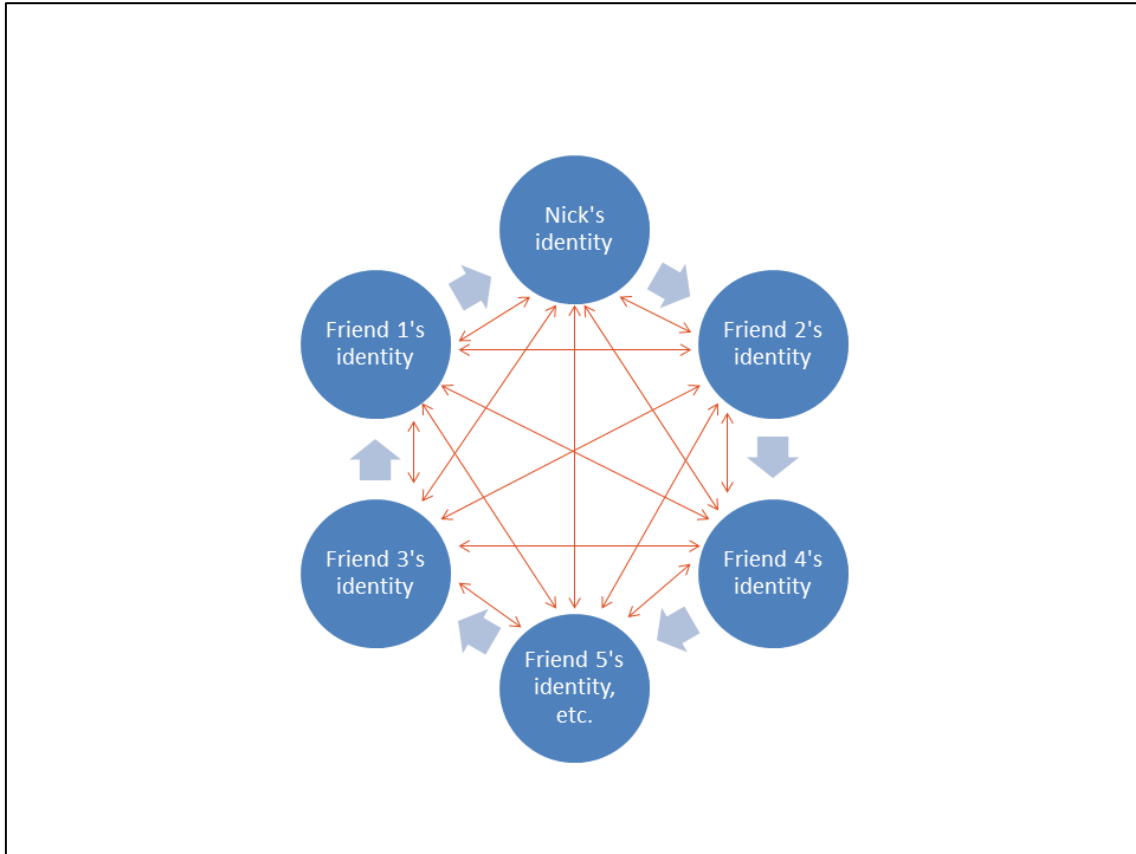
Example 2 also shows that, ironically, Nick's rationality forces him to re-evaluate his thoughts and accept that "we are not all rational, we are not all moral", so that his own morality is not enough to "see equality in the foreseeable future". His originally conceived attractor state for the system (in this case, humanity) is clearly utopian; he is now settling for a 'cycle attractor', not a unique stable state to which all trajectories converge, but a stable dynamic trajectory (set of dynamic states) to which all system evolutions converge; a trajectory which he still hopes is close enough to his desideratum state, which cannot be stable because of the diversity of the group. Nick steers the group so that any minor disturbance from that utopian state takes the group to a cycle attractor which represents the compromise accepted by the group under Nick's leadership (his new desideratum – now a trajectory instead of a single state). Once in the dynamic stable attractor, upon any disturbance driving the system outside or inside the cycle attractor, it will return to the attractor. For the pendulum (Figure 5), it corresponds to the real case in which the clock is periodically given (from a spring or a battery) the

mechanical energy necessary to compensate for the damping due to friction, so as to keep the amplitude of the oscillation from constantly decreasing.

Figure 5: Nick's realistic stance: A cycle state
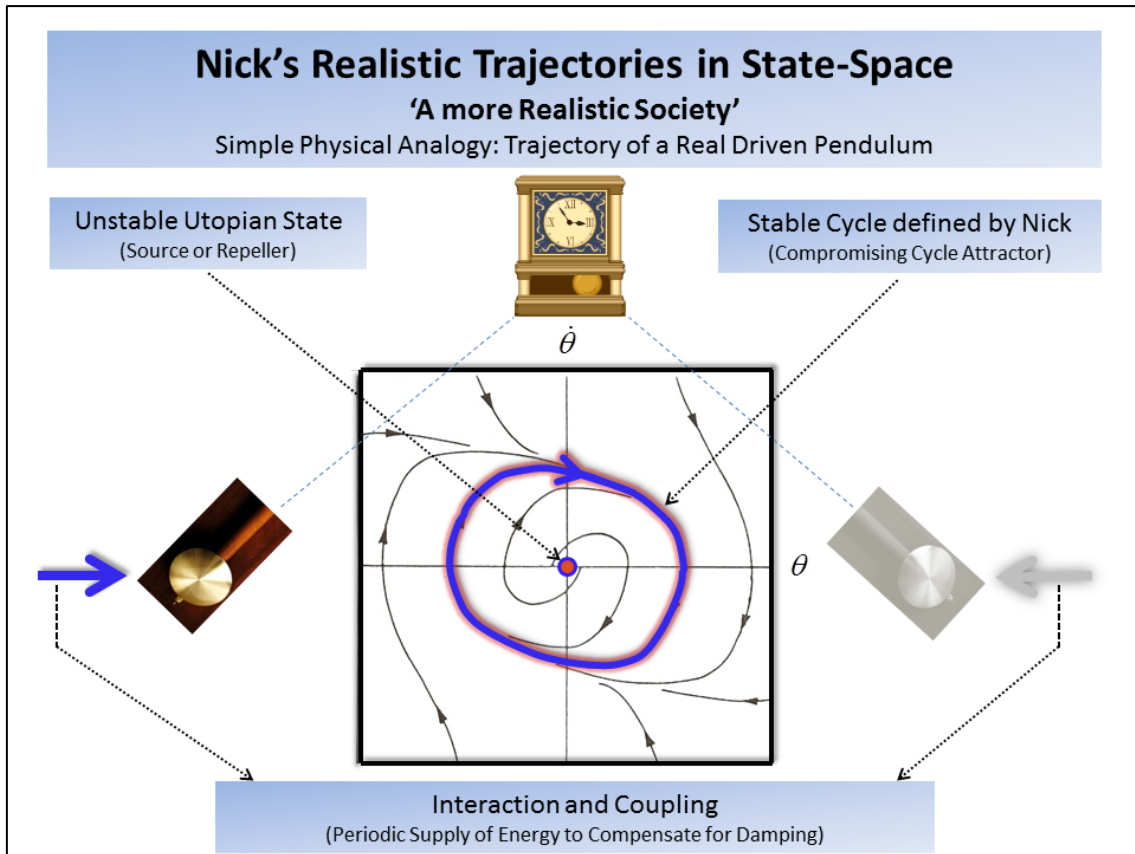
But what Nick adamantly abhors is the existence of 'indifferent cycles' for the system (humanity), i.e. the occurrence of a different stable trajectory for each different initial state. No state or cycle attractors; just indifferent trajectories. That would sadly indicate to him the lack of all those precious human values he listed at the beginning of his 'rant' – in sum, a hopeless society. In this case (Figure 6, ideal even for a pendulum), there is friction neither in the mechanism nor in the air, so that the amplitude of the oscillation remains constant forever (that's why all trajectories are circumferences instead of spirals). There are an infinite number of stable indifferent cycles (including the degenerate case of the single state (0, 0)), but none of them are attractors: a slight disturbance takes the system to a slightly different cycle (never returns). This would be a hopeless society without any values or, better: "all values have

the same value" without an optimum or, more optimistically, a society with values but without the feedback control (see below: sense-think-act) necessary to keep itself recovering from inevitable upsets.

Figure 6: Nick's unwanted state: Indifferent cycles
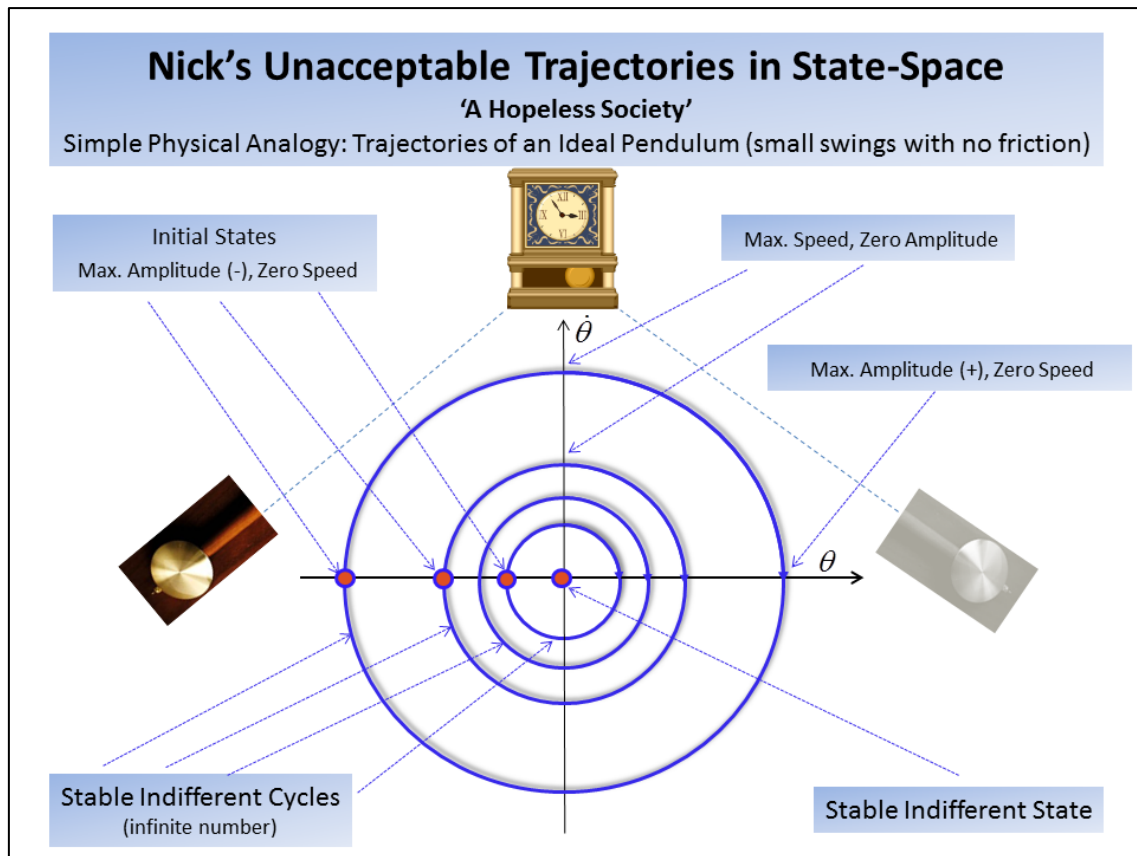
In turn, all of Nick's identities interact with one another and can be considered as sub-identities which instantiate a superordinate identity portraying Nick as a philosophical being who is concerned about the big moral and rational questions of the human race, which in turn instantiates the all-embracing identity that includes all the other aspects of Nick's personality. These other aspects are also reflected in the evaluative language used in his *Facebook®* interactions (which we cannot continue analyzing here due to space restrictions), which reflects his other identities as a lover of soccer, an admirer of Messi and the Barça, an American of Hispanic origin (social identity), a lover of Argentina and Spain, his parents' home countries (e.g., by code-shifting and using Spanish words intertwined with his English discourse – when changing his language variety, he also changes his stance and his ethnic identity), a

heterosexual male (his wall is full of pictures showing him in the company of pretty women, displaying his gender identity), a caring but liberal brother, etc. The discourse identities (Englebretson, 2007: 52) adopted (for instance, as writer of the *Facebook®* wall or as reader of his friends reactions) form part of the interaction as well, for they also constitute sub-systems within the great system.

All these identities, therefore, can be considered as sub-systems which not only co-create Nick's main general identity, but also partially instantiate the identity of his group of cyber-friends. The different identities show the variability and complexity of the phenomenon, but, as Gibbs has pointed out, variability and stability are different sides of the same coin (as we have seen in the graphs, variability can be represented by stable trajectories). The conflation of them all also contributes to delineate certain stability in the identity of this young man and his group.

The system is complex like all cognitive and all pragmatic systems and, besides language (syntactic and lexical choices, etc.), there are other variables that could mark stance and evaluation of some sort (and therefore contribute to the building of the identity), such as eye movements, body postures, gestures, laughter or prosody[8] (Figure 7).

As illustrated in Figure 7, pragmatic phenomena (and within them identity construction), as seen through the prism of DST, are emergent products of self-organizing systems. They show an interaction of brain, language, bodies and the world (environment). Any account of the phenomenon, then, must eventually explain how it is that it relates to that which grounds and surrounds it.

Figure 7: Aspects or variables that mark stance and evaluation, and which therefore affect the construction of identity
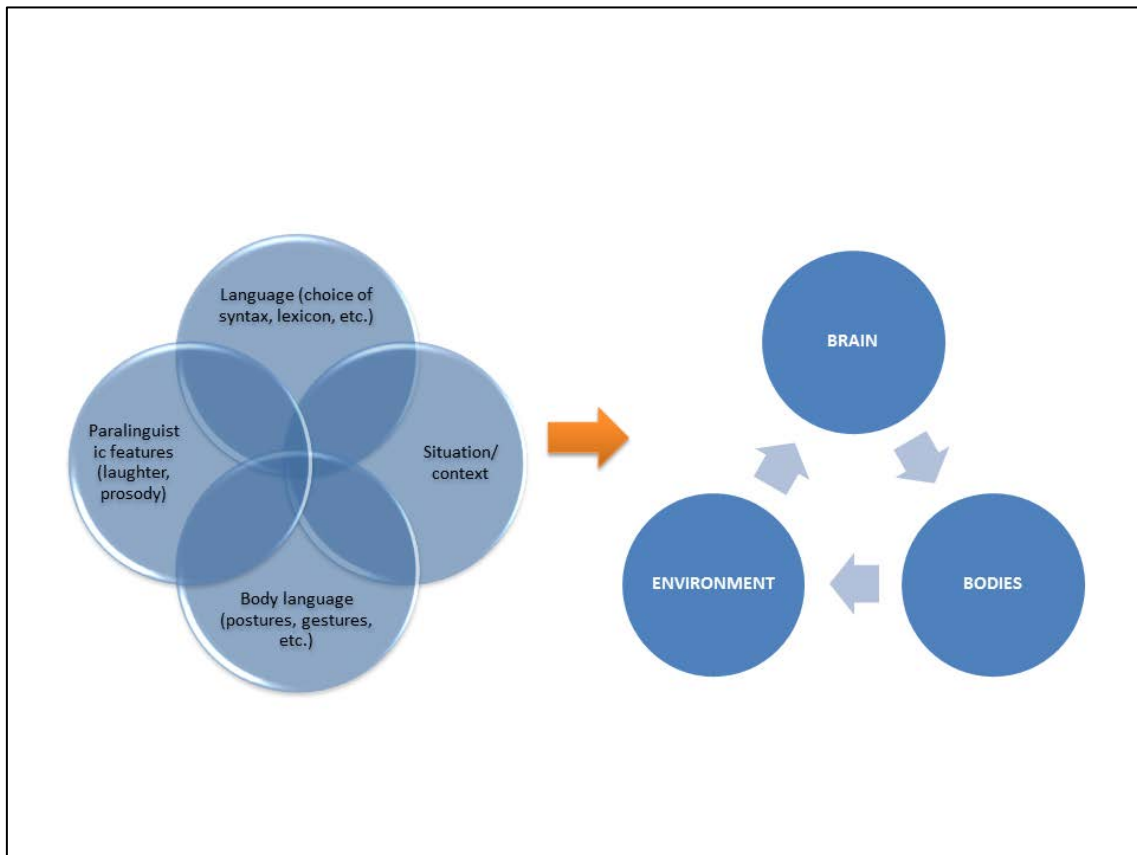
Thus, by analyzing phenomena from the DST perspective, a given behavior can be described in terms of *attractors, transients, stability, coupling, bifurcations, chaos*, and so forth, features that are largely invisible from a classical (symbol-manipulation) perspective. Within DST, the time variable is an essential element. From this perspective, cognition (and in this case, the building of identity) is seen as having a sequential cycle (sense - think - act) structure (Figure 8), as a matter of continuous and continual evolution (like a feedback control system). Identities change and evolve with time, and thus DST seems worth of consideration for their description and study.
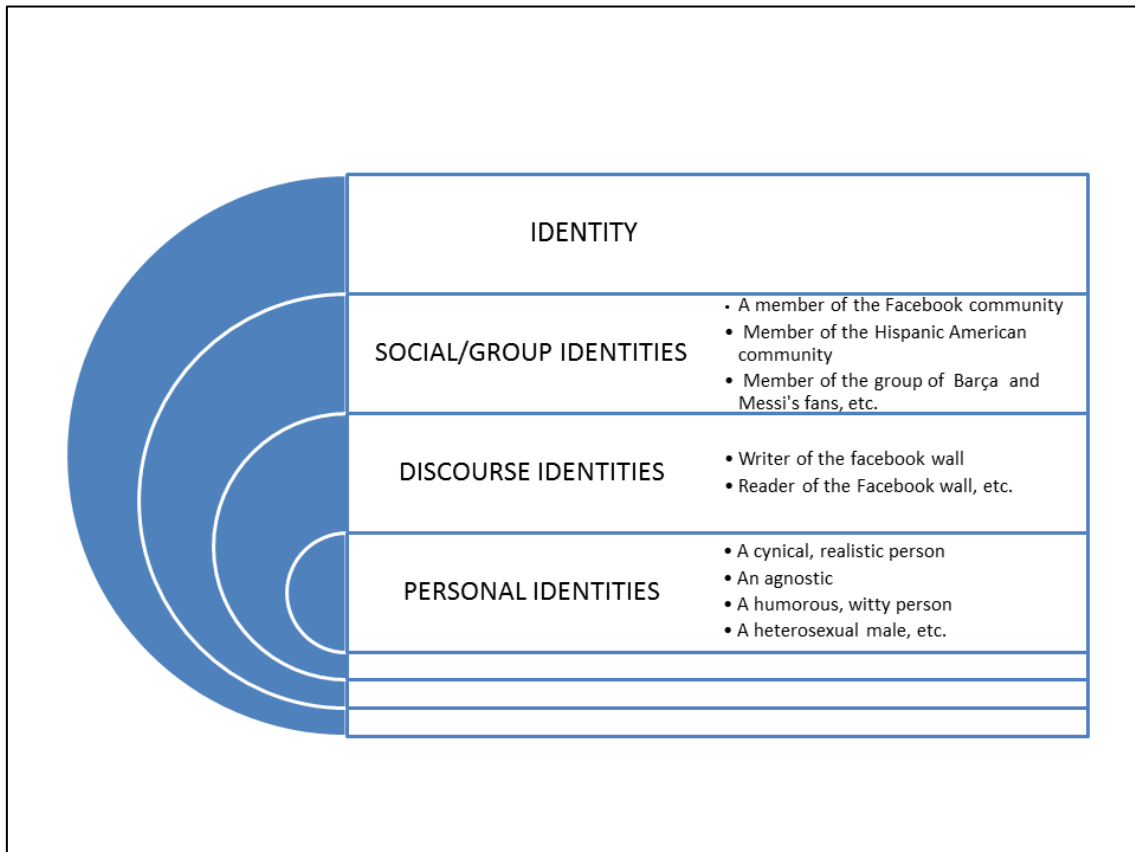
Figure 8: Sequential cycle structure in DST
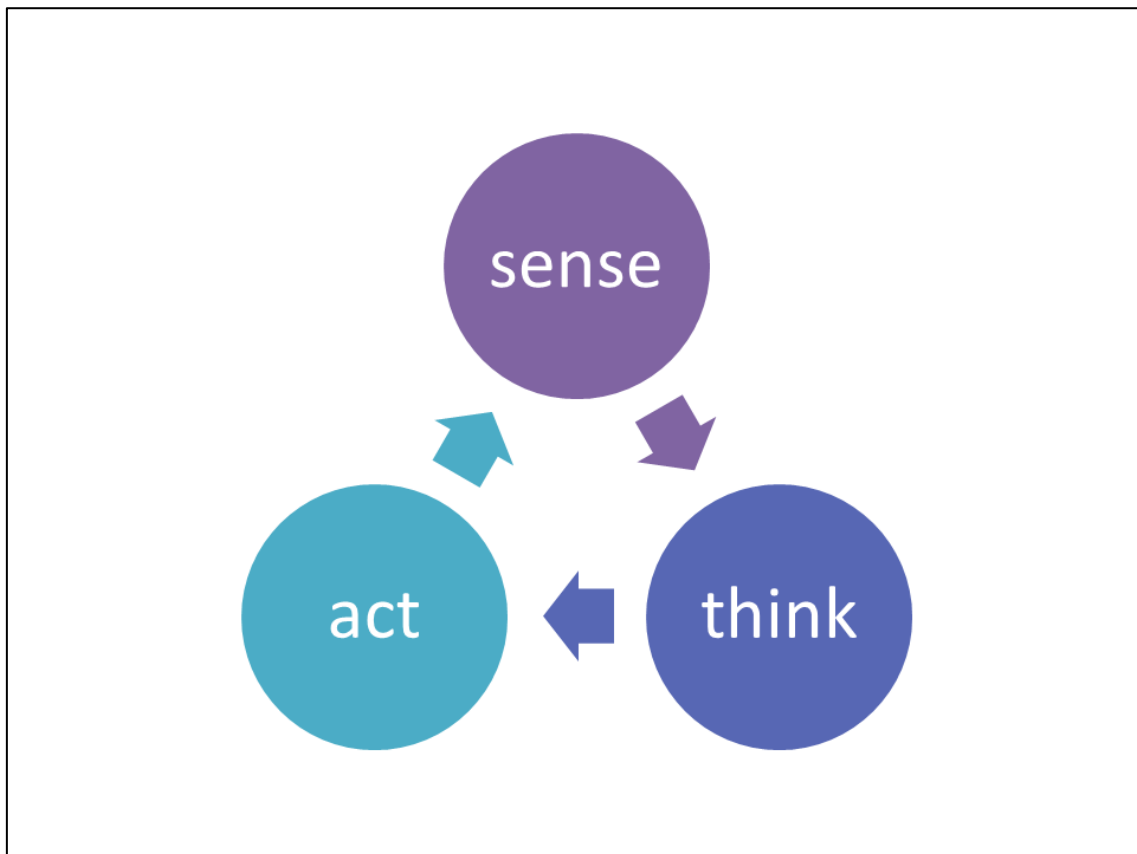
Another reason why we think DST is a good framework for analyzing identity is the fact that dynamicists also emphasize *situatedness*. As anticipated earlier in this paper, natural cognition is always environmentally embedded, corporally embodied, and neurally 'embrained'. Dynamicists tend to see cognitive processes and collective achievements of brains (e.g., group identities) in bodies and in contexts, and therefore their language can be used to describe change in the environment, bodily movements, and neurobiological processes (Bingham 1995, Wright and Liley 1996, etc.).

4. Conclusions

To summarize, and in conclusion, we argue that DST can be a very fertile framework for the analysis of identity construction, given the fact that the representation in dynamical models tends to be seen in terms of transient, context-dependent stabilities in the midst of change, rather than as static, context-free permanent units.

Figure 9 shows our attempt to represent the identity sub-systems (in this case, Nick's sub-systems of identities) within the total dynamic system in a graphical form. This is, needless to say, a simplification, for the complete network of identities and their relationships would result in a much more complex graphical representation.

Figure 9: Identity system and sub-systems

IDENTITY

SOCIAL/GROUP IDENTITIES
- A member of the Facebook community
- Member of the Hispanic American community
- Member of the group of Barça and Messi's fans, etc.

DISCOURSE IDENTITIES
- Writer of the facebook wall
- Reader of the Facebook wall, etc.

PERSONAL IDENTITIES
- A cynical, realistic person
- An agnostic
- A humorous, witty person
- A heterosexual male, etc.

Each sub-system instantiates the general identity system, and at the same time interacts and relates with the other sub-systems. Van Gelder (1998: 616) explains that systems in DST

> …are taken to be sets of interdependent variables. As we know, a variable is simply some entity that can change, i.e., be in different states at different times. Variables are interdependent when the way any one of them changes depends on the others, and change in the others depends on it. The state of the system is simply the state or value of all its variables

at a time; the behavior of the system consists of transitions between states.

The connection with pragmatic phenomena such as the construction of identities here is obvious, but in spite of all that we have said in this work in favor of DST as a clarifying framework for the study of identity as a cognitive phenomenon, in practice this is a very challenging enterprise. As van Gelder (1998: 623) notes, "Some of the greatest achievements in science have amounted to describing some natural phenomenon (e.g., celestial motion) in dynamical terms. This activity is no more trivial in cognitive science than anywhere else".

Finally, we would like to reiterate that it seems apparent that the study of evaluative language within a dynamical system of identities can throw important clarifying light upon the comprehension of this complex topic of research, and at the same time make us reflect upon the thought, as Ochs and Schieffelin (1989: 22) so wisely have pointed out, that "…language has a heart as well as a mind of its own", which serve as instruments to the expression of our own minds and hearts, and therefore as the mirrors upon which our identities are reflected.

Notes

1 An earlier version of this paper was presented by Laura Alba-Juez as a plenary talk at the *First Conference on the Discourse of Identity*, Santiago de Compostela, Spain, June 2012.

2 The concept was used originally in Astronomy for the 'phases' of moons and planets.

3 This claim is made on the grounds that sophisticated cognition demands structural complexity in the cognitive system. Cognition is then seen as the simultaneous, mutually influencing unfolding of complex temporal structures, and therefore we should think of cognitive structure as laid out temporally. Thus, dynamical systems in cognitive science might be defined as quantitative systems, supporting a geometric perspective on system behavior. Since dynamical models work with numerical variables, DST will allow researchers to understand the structural properties of the flow, i.e. the entire range of possible paths.

4 As Santamaría (forthcoming) notes, "a survey conducted by Yus (2011) shows that 55.3% in a group of 56 students at lower secondary education think that virtual interaction presents advantages over face-to-face interaction, such as more freedom for expression, due to the fact that they are freed from their physical appearance and from the consequences of the immediate physical reaction of addressees", which presents evidence related to the frequency of use of these networks.

5 Bednarek's (2006) parameters are the following: 1) Comprehensibility, 2) Emotivity, 3) Importance, 4) Seriousness, 5) Expectedness, 6) Mental State, 7) Evidentiality, 8) Possibility/Necessity, 9) Reliability, and 10) Style.

6 In the examples of Nick's case, the participants' complete names and photos (which are a common feature of *Facebook*® interaction) have been erased, in observance of the ethics of data collection and of the participants' legal right to remain anonymous.

7 A differential equation's role in the movement of a pendulum, for example, is illustrated by the fact that, once the bob is released, the equation determines how the system will evolve in state-space.

8 All these paralinguistic features can be made manifest through pictures, emoticons and other types of symbols commonly used on the *Facebook*® wall.

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