

# Human-Like Intelligence and Algorithms

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This presentation describes a model of our brain information processing. It is grounded on the idea that Homeostasis<sup>1</sup> is not only physiological, but also the goal of our cognitive adaptation<sup>2</sup>.

## Introduction:

### A) Homeostasis and the launcher of our brain processing.

Similarly to our physiological body which adapts to survive, we, as individuals, have to adapt to the external world in order to stay alive. From this point of view, any lack creates an imbalance which launches the process of adaptation. Reversely, equilibrium is restored when the lack is filled through the adaptation process. Any lack can be seen as a threat to survival and has to be processed as such. We can say that equilibrium is reached when the threat has disappeared<sup>3</sup>.

Here there is a tricky aspect of our human equilibrium. Saying “equilibrium” suggests a point where the balance is done, the set point. But our awareness allows a flexibility which defines an “area” of equilibrium, something we hear as “the comfort zone”. If the baby screams because he is hungry, it is surely not the result of a complicated algorithm’s calculation. And the signal he gets, feeling hungry, does not tell him how much of what his body needs.

The purpose here is not to set a new definition of a stress, but to emphasize its flexibility:

Any disequilibrium created in the brain by any type of signal becomes a mental tension, a stress. This tension can be expressed on a scale of stimulation, from the set point of equilibrium to the breaking point. In fact, the range differs according to the individual, because it depends on each life. Moreover, it is built up and becomes more specific over time with learning and experience. It is therefore not possible to define a standard scale, which is constructed by itself with life and experience.

If an initial stimulation induces a high level of tension, like a flash, it is modulated with repeated exposures. An increasing tension becomes what is named “pain”, the release of the tension creates “pleasure”. This gauge is self regulated through tools of knowledge and experience; the more tools we have for adaptation to a frequent signal, the lower is the level of tension. Reversely, the less tools we have to answer a repeated signal, the higher the tension’s level is.

This regulation is not something we decide or control. It belongs to our singular physiology and builds up as an adaptation tool with our endocrine system. This to say:

If we are able to define some survival rules for a human-like intelligence engine that we create, then this machine will set up its own regulation and acquire a true flexibility.

## B) A Human-Like Intelligence, grounded on a single process:

*“Artificial Intelligence has by now succeeded in doing essentially everything that requires ‘thinking’ but has failed to do most of what people and animals do ‘without thinking.’”* says Donald Knuth<sup>4</sup>. In fact, the very reason why actual Artificial Intelligence fails today is here: We cannot race a Marathon without having learned how to walk. It is that simple, but shows the limitations of deep-learning.

Taking in account that everything we do is a perfect representation of our brain processing, it makes sense to approach any expression as a pure image of our intelligence. In order to understand this processing, we need to constantly discriminate the information from its processing mechanism.

From this discrimination surfaces the idea, that a unique mechanism orders and processes each part of our adaptation. The fact that cognitive theories usually have in common three steps of expression is not random. Some examples:

- Hans Selye : alarm state, resistance state, exhaustion state<sup>5</sup>
- Lazarus : stress, appraisal, coping<sup>6</sup>
- David Mc Clelland : need for achievement, need for affiliation, need for power<sup>7</sup>
- Victor Vroom : expectancy, instrumentality, valence.<sup>8</sup>

This may show that our brain functioning is precisely built that way.

The hereby theory is not an exception and grounds the model on three aspects of intelligence:

- Narrow Intelligence or Caliber I, task oriented.
- General Intelligence or Caliber II, awareness oriented
- Super Intelligence or Caliber III, expansion oriented

When this unique mechanism is identified, then it applies to any of these three aspects, and can be used whatever the information is.

It is a global engine of processing for adaptation.

## 1 – Artificial Narrow Intelligence or AI Caliber I

The general functioning can be seen as a three axis projection, each using the processing machine in a specialized way:

Axis 1 = Reception of signal

Axis 2 = Ruling

Axis 3 = Emission of signal.

This basic description delineates the basic approach of Artificial Narrow Intelligence, but is also the fundamental of Artificial General Intelligence and Artificial Super Intelligence, and defines three axis points of view.

### 1 - 1 – Main Loop: Axis 1 = reception of a signal

#### 1 – 1.1 - The next diagram represents the brain functioning engine.

As homeostasis reflects a constant stable system, any received information creates an imbalance. Thus, the equilibrium has to be restored through a mechanism of adaptation. This is what our cognition is about.

The start of brain processing is set from disequilibrium, usually a signal received through a sense.

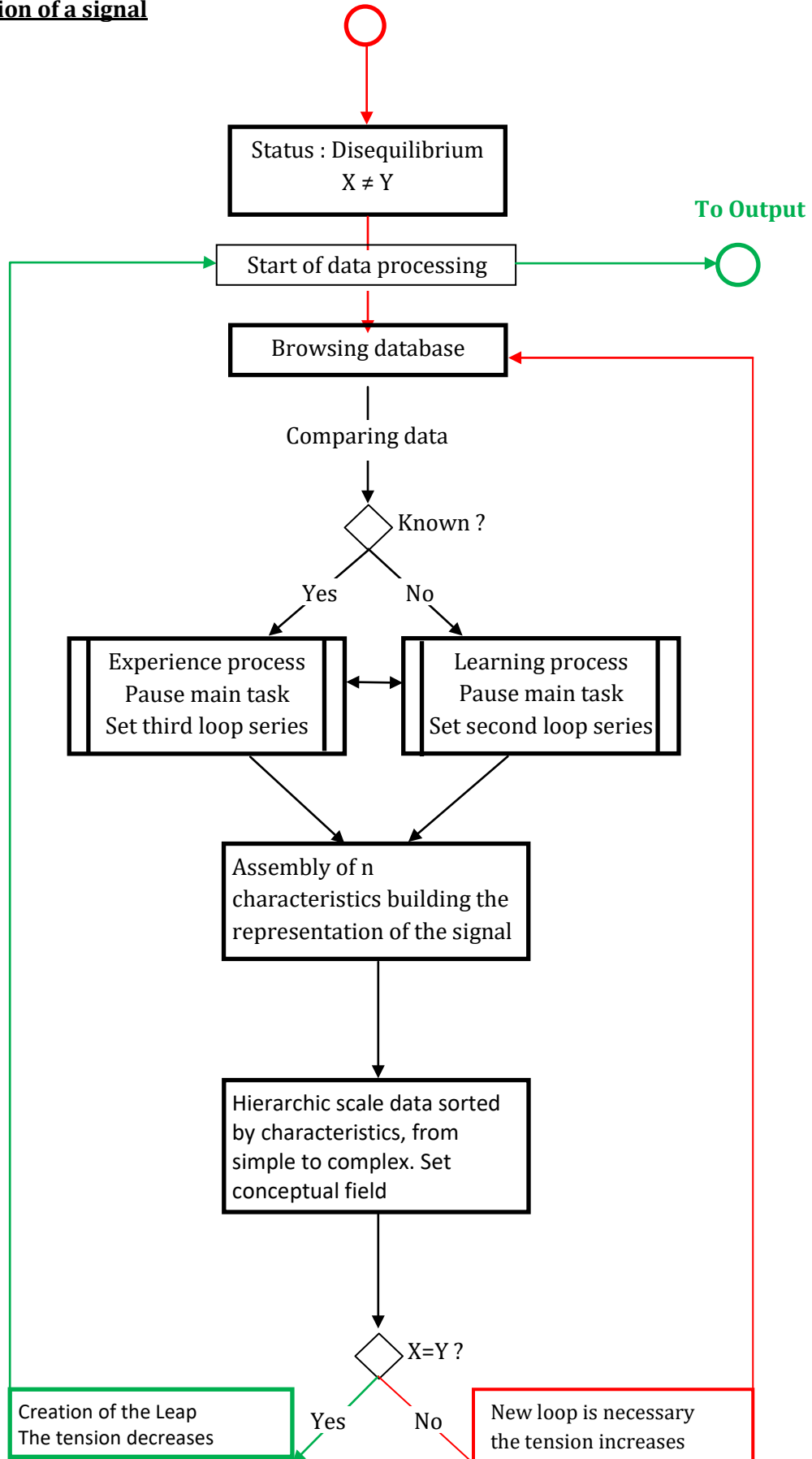
This signal can be exogenous, coming from the outside world like any image, or endogenous, like a feeling of discomfort. Let's keep in mind that:

- Whether internal or external, a received signal is NEVER the signal itself but already a perception of it. So, we can only learn and experience a signal through what we grasp.
- Signal **S** is an incoming message which creates the imbalance. The information is either endogenous or exogenous.
- The received information is defined as **X**, which is already a limited perception of **S** itself. It can be a far cry from the reality of **S** itself!
- The resulting disequilibrium launches the adaptation processing, the main loop.
- **Y** symbol is the result of the processing of **X**. The balance is said reached when **X=Y**.

To be used as an **Artificial Narrow Intelligence, or AI Caliber I**, it has to be set with a symbolic inequality expressing disequilibrium. This inequality is grounded on our lack of information of a signal. For example,  $X=Y$  defines an equilibrium,  $X \neq Y$  creates the disequilibrium and initiates the information processing. **The target of the main loop is to restore the equilibrium**

Axis I - Reception of a signal

Input : Signal S



Input signal is either endogenous or exogenous information, as said, internal to self or coming from the external world. Output is a redirected signal for adaptation.

It works as a constant loop, and stops when the equilibrium of the signal is reached. The main loop, or main process is the one we focus on. Each new signal is a new  $Y_n$  that sets a new loop. The secondary loops are steps of the main process. The third one is training when the step is acquired, and allows it to implement automatism. The number of loop defines the accuracy and the depth of learning in terms of knowledge. Equilibrium is assumed reached when the signal is defined. Then, both information and process are memorized,  $X = Y$  as the main result, and the process as an underlying path leading to this result.

### **Example:**

In the next spreadsheet, the first columns describe the main loop processing to reach the goal.

Each line is a second level loop using the same diagram as the main one.

When information and processing are acquired, it defines a complex level which becomes immediately available, without recalling the steps of learning. This is the creation of a leap  $X=Y$  and the basis of automatism. Each time the main process is used, its availability increases, up to automatism. This is its valence.

The baby sees everybody standing and walking around him. This information is the event which triggers his need to stand and walk. As he is structuring, his behavior is to mimic what he sees. What we usually grasp as an instinct call is in fact, just the need to adapt to his environment. This fact creates an imbalance to solve.

Does the baby know anything about his gravity center? No. But he uses it. He will use it, without knowing anything about it, learning to bicycle, or practicing gymnastics or any sport. Later, he will learn about gravity. And the process will merge with the previously described one.



## 1 – 1.2 - Typology of the database

The database collects all information received, processed and transmitted. It can be seen as a 3 aspect mental projection :

- a) One is X, the acquired information, from the simplest to the most complex which defines the level and depth of knowledge. It is the declarative memory, sorted by complexity levels. The complexity level is defined by the number of steps required to realize the leap  $X=Y$ .

The previous example of “to walk” shows 8 steps – from “pushing on arms” to “start to walk” - plus one which is the sum of these steps, the acquired automatism. The complexity level in the previous example is 9. It means the valence of the conceptual field “walking” is 9. The purpose of valence is to allow sorting and to design what kind of information is instantaneously available and usable. But it allows over all what we name “focusing”. A clear demonstration is shown in *“Conscience, Intelligence, Libre-Arbitre?”*, chapter 4 - Claude Touzet<sup>9</sup>. His example shows 6 levels to recognize a word.

- b) The second, Y = Main process used to reach equilibrium – describing the path of action. It is identified as the functional memory. In this area are learning and experiencing functions, as well as any process like improvement, control, analysis, synthesis etc. It defines strategies. The main processes are sorted by function. **It is a cognitive translation of “how to”**. These functions are built with the same diagram: a main process + second and third loops. They are an implementation of adaptation.

Here comes an important notice about the actual robots: Built with a Human-Like Intelligence, these automats should be able to learn, explore and use their “Caliber 1” skills by themselves. For example: one baby does not need any help to discover what kind of movements his body allows; a genuine Human-Like Intelligence robot should have the same ability.

- c) The third is Z, or the Leap: When the information processing is completed, the equilibrium is restored. In other terms, the signal is known. The projection in the mind is supposed to be a faithful representation of the signal, solving the imbalance. The leap is done when the representation Y reflects the signal X and hides the process which led to this result.

Various main leaps define areas of automation, habits, regular action, as well as seldom processes. These pieces of the puzzle are intended to find their place in a global adaptation to the environment.

## 1 – 1.3 – Valence, tension and processing: how does it work?

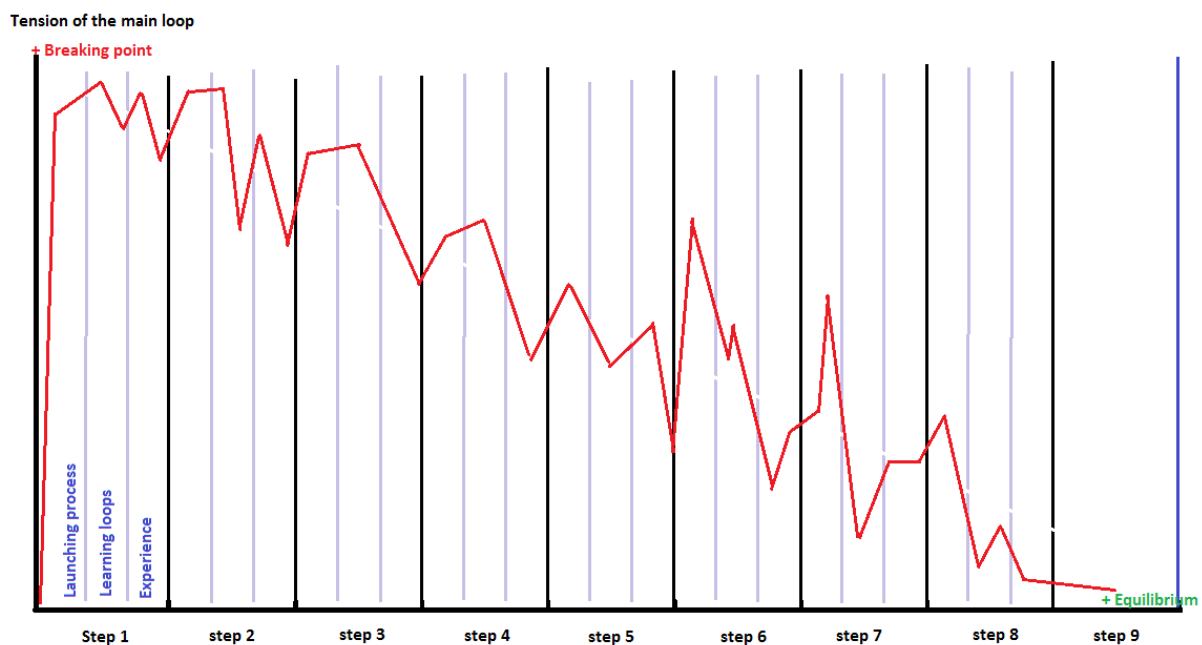
- a) Valence is a tool we conceive for a better understanding of the hierarchic scale of data and its imperatives. It shows there is one way to reach equilibrium, which requires defined and sorted steps. There is no way to make short-cuts in the progression. But... If we need 6 steps to recognize a word, what about a sentence, a paragraph, a chapter or a book?

Moreover, one baby's brain is unable to make complex calculations, as calculation is unknown! In fact, data are simply stacked one after the other as and when it comes. This is why the last data used are immediately available. The sorting of database is spontaneous, a matter of use's frequency. When we say "I am thinking", that means our brain needs time to collect relevant information about what we are focusing on.

## b) Tension

The disequilibrium is expressed through a huge tension peak on the stimulation scale described in the introduction. The more our instinct of survival is threatened, the higher is this peak of tension. We said this scale, from the set point of equilibrium to the breaking point, is singular. It belongs to the person and looks like a quale: it cannot be quantified. Thus, the only clues we have are the tension's variations. This tension increases and decreases according to the different steps used to build an adapted answer and restore the equilibrium.

In the previous spreadsheet "learning to walk", the processing starts with a high level of tension, with the fact that "I feel that I do not move like the others, I need to mimic them". Then, each step acquired decreases the level of tension. Here is a random representation:



This representation could as well be used to show the variations of a single step.

## c) Processing:

- Analysis – comparing data:

When a signal comes in, it launches the treatment process through disequilibrium. The first action is a comparison with the database. Is it known or not? Browsing allows to find or not a perfect connection, as it can link this signal to something equivalent in terms of characteristics.

The baby gets an internal signal. His body says "I am hungry". He does not know what it is; the only thing he knows is the incredible discomfort he feels. As no information in his database can answer this situation, he screams for help. Then he is fed. This is the learning loop. The next time



it happens, he will not wait to feel such a discomfort and scream as the signal appears. This is the experience loop.

- Learning process, when information is unknown:

The internal research has no result; there is no possible meeting with something similar. An external research for more is set to collect characteristics. In this situation, there are: one main process to identify the signal, and as many secondary and third loops for each characteristic taught or discovered. The learning process is complete when the leap is possible.

- Experience process:

The signal is known as  $X=Y$ . The third loop is executed, to eventually increase the level of complexity with the acquiring of a new main process, or/and new characteristics or to adapt to a new context or situation, and increase the valence.

- Control and inheritance:

Most of the time, identification of a signal is built on parted characteristics: some are known, some are not. Here appears the concept of inheritance. A secondary loop coming to complete a known signal may be inherited from another conceptual field, which has apparently nothing to do with it. Learning what a gravity center is will merge with the existing process "walk" as an inheritance. It will be a new secondary loop, added to the main process, whose valence will rise to 10.

- Synthesis - assembly

When all the characteristics of the signal are implemented, meaning that each secondary processing has led to its equilibrium, then a representation of the signal is built. This representation is always imperfect: many aspects elude us. This is one of the reasons why our data treatment is never an exact science. The identification of its characteristics just has to be enough to restore equilibrium. Looking at it that way, leaps and controls can be sources of errors. The more we learn and train, the better is our adaptation.

- Representation test

This step of the process creates a new conceptual field of the signal, or it can also update the existing field of the signal. It is a second comparison with the original signal, to make sure it restores the equilibrium.

- Projection

Restoring equilibrium, or not? If it is not, then the main processing starts again. If it does, then the leap is done too and stored as it is. Leap is the signature of automatism. The higher its valence is, the more accurate it is.

Technically, many processes are permanently not completed, or paused, or inhibited for a lot of reasons. Our being is a precarious balance, requiring permanent adjustments as shown with the next steps.

## 1 - 2 – Axis 2 - Ruling:

As seen previously, there is no option for us to prevent the reception of signals. Our senses are intended to realize adaptation 24/7, to defend and to protect us from threats and dangers. This protection comes from an underlying specialized process which allows or forbids signals, processes and regular storage in a secure way. As shown on the next diagram, this axis uses the same brain engine: a main process, and learning/experiencing paths, second and third processes.

### 1 - 2.1 – Protection:

The defense for this level of intelligence is about “instinctive” answers to threats and danger. The adaptation is based on the ability to find an appropriate answer to the threat. It can be an internal or external threat. The typical answer will be either a violent instantaneous reaction, like “fight or flee”, or a temperate measured answer, as it may also be an adapted “unconscious” behavior, like “I will not go there, it is unsafe”. This defense is mainly built on reflexes and automatism characterizing our specie. It is survival oriented.

The same way the reception of signals brings us knowledge and experience, the same way the ruling axis is designed to protect us. Its functioning is identical in terms of database and automatism. The level of the tension defines our reactivity and its accuracy. The higher the tension, the shorter is identification of the danger or the threat, and the faster is the adaptation answer.

### 1 - 2.2 – Arbitration:

This safety process allows/ forbids the inheritance described in item 1.3 § d.

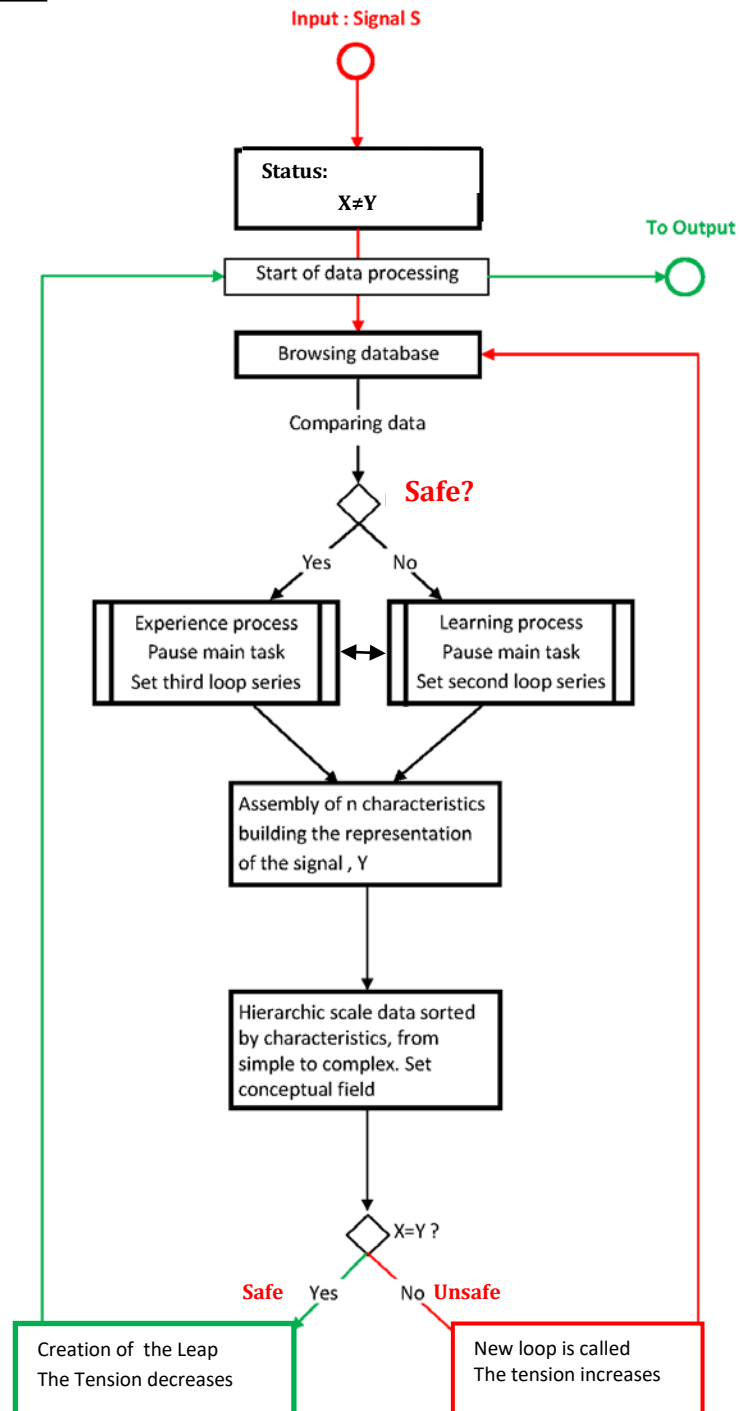
It also intervenes in fuzzy situations. Most of the signals we receive are incompletely defined. Identified characteristics are sufficient to strike a balance, but the share of ignored characteristics can create a threat or a conflicting situation, an unexpected imbalance. The previous process will start again, as an updating, taking in account this new dimension as a complementary second loop of the identification. This signal will be known as potentially dangerous through this new loop.

### 1 - 2.3 – Quotation and Equilibrium:

Conceptual fields are regularly conflicting. This especially happens when two different processes are in opposition, and both are a process designed for survival. For example: the need to eat, while we are in an unsafe area.

A common situation is where the child feels like eating an incredible apple pie, knowing this will create a drama... The permanent imbalance between such information is easily solved. It is a Darwinian competition, the strongest wins. If the tension of the desire is the strongest, then the pie will disappear, no matter what. If it is the fear of drama, then the pie will stay where it is. This looks like a decision, a will. But it is just the result of a comparison between two tensions.

Axis II – Ruling



## 1 - 3 – Expression: Axis 3 – Emission of a signal

### 1 - 3.1 – Main loop: Emission of a signal

The step “learning process – pause main task – set second loop series” not only describes inputs of data, but works the same way for the emission of signals. It shows that the same loop is used for reception as well as for the emission of signals. Notice here, that the step “finding a leg to help” in the main process “walking” is an emission of information. If we focus on this specific step, we can identify other loops “try and fail” which lead to complete this action. The same analysis can be done for “fight or flee”, considered as an instinctive answer to an external threat. It is acquired: copying behavior of others is nothing else than the learning loop, and automatism that is the result of the experience loop. Automatism is nothing else than the main leap.

Reception and emission of signals use the same process, and are a permanent state of ours. We cannot stop incoming information because of our perception; we cannot stop our behavior because we are. Thus, anything we do - with or without consciousness - is a meaningful interaction with our environment that exhibits our level of adaptation.

### 1 - 3.2 - Characteristics of this level of emission:

- a) Emission of information is the secondary loop of a main process. The launcher is the disequilibrium of the step.
- b) This answer comes after an endogen investigation of both the learning loop and the experience loop, which give an “unknown” feedback.
- c) Even if it looks like a will, there is no will here, but just the result of a process which leads to the best solution for adaptation. It is a need for adaptation.
- d) Moreover, there is no intention too. We could see in the first example an “intention to walk”, but there is none, just a process for adaptation.
- e) This need for adaptation initiates the interaction with the outside world.

In fact, this level of emission is just the responses to situations, like Artificial Narrow intelligence, that only provides answers to settled questions.

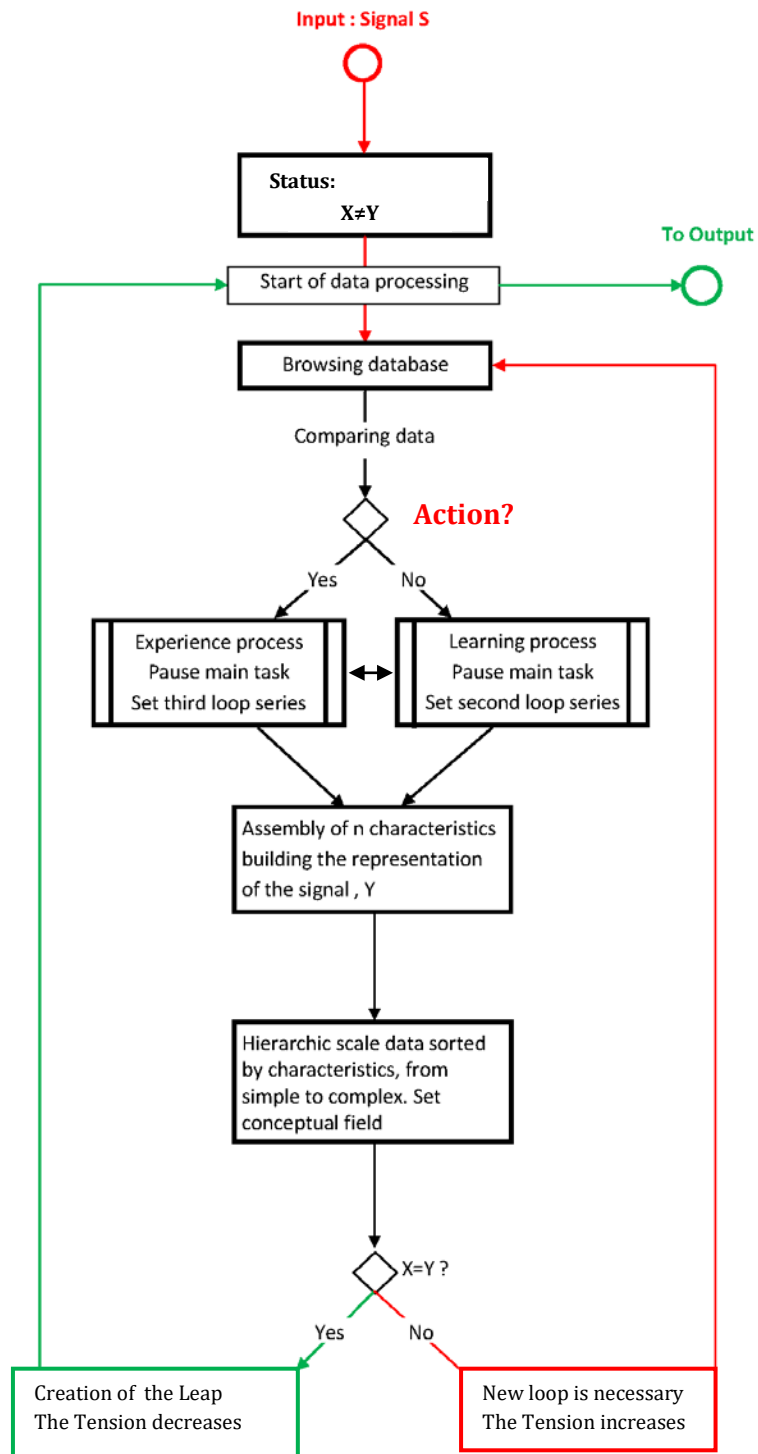
### 1 - 3.3 – Action

Emission of a signal is an action, a feedback. As the most complex information is instantaneously available, action is too because of automatism. The first mechanism to be used is a leap.

Therefore, the diagram of action is the same as shown for the reception of a signal. The very difference is just the question “known?” changed to “action?” as shown on the next diagram.

The signal S “input” is an output of the first level of processing which calls a feedback. Action of any kind will be an answer after this third axis processing, in order to restore the equilibrium.

**Axis III - Emission of a signal**



## 1 - 4 - Remarks:

This approach describes the first level of human-like intelligence, what we usually call **AI caliber 1** or **Artificial Narrow Intelligence**. Some points need to be enlightened:

### 1 – 4.1 - The disequilibrium:

The baby linked to the mother gets what he needs to live. When the umbilical cord is cut, he starts to live on his resources. We could say, like a battery in a laptop. As these resources are limited, a first huge stress appears, starting all survival processes. This stress initiates a first emotional feeling: fear, which belongs to our biological functioning. The only way to mimic this step is an inequality, as there is no fear for a machine.

### 1 – 4.2 - The Perception:

Perception is the function we use to interact with the external world. It is designed to allow our adaptation in order to survive. If we are able to create a cybernetic perception, it has to be linked to this idea of survival. The survival mode for such a machine may be built on hardware scales: Low/High temperature, Low/High clocking and Low/High energy, could reproduce safe/danger areas, as well as frustration/satisfaction, pain/pleasure areas. Then, the machine has the ability to control and regulate these functioning levels of scales.

### 1 – 4.3 - Scales and tensions:

The diagram describes a nominal functioning of the brain, from a rational point of view. Some aspects of data are neglected as secondary. For example:

If we focus on “wave”, we use three secondary loops to define it: amplitude, wavelength and frequency. These three characters may be hugely aggressive and have a dangerous impact on our psychological and physiological equilibrium. They are processed as such through Axis II.

In a nominal situation, amplitude and wavelength are seen as neutral. That means this specific wave belongs to the comfort area. But if this data has an aggressive property, the tension will increase and overfill this area. Then, this signal will be identified as a threat. The same rule is applied to the frequency; the use of the main process is benchmarked in the same way. The aggressive character of this specific signal stays “activated”, meaning immediately usable as a automatism of defense .

Each person reacts differently to events, due to sensitivity. This does not exclude the possibility of huge jumps in the use of data for adjustments reasons.

## 2 – Artificial General Intelligence, or AI Caliber II

Professor Linda Gottfredson describes this intelligence as *“a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly, and learn from experience.”*

ANI works with layers of loops for elementary learning and improving functions. The goal of ANI is adaptation. The Artificial General Intelligence is reached with the development of a meta-engine using the same diagram, for a general target bringing a solution to the question: “Now, what can we do with all of this?” Think, conceive, create, invent, and conceptualize. This is a superior level of the use of the machine, playing with thoughts, complex ideas and strategies. This meta-engine covers the basic one as a new layer of treatment. And it starts with reflection which creates our consciousness.

### 2 - 1 - Know thyself:

Look how hard it is, when someone ask you: “How do you define yourself?”

Consciousness is nothing else than a projected mental representation of ourselves. That said, the process we use to develop this incredible ability is nothing different from the first level of intelligence. The difference resides in the focusing target. The first level focuses on the external world to get a representation that allows adaptation and restoration of balance; the second level of intelligence, grounding awareness, focuses on our internal world, our endogenous characteristics in the same way and for the same reasons: adaptation and equilibrium.

#### 2 - 1.1 – Launcher:

Similarly to our survival mode launched by an external event - the cut of the umbilical cord - our self mode is launched by an external event: the reflect recognition. During the first year of existence, one baby starts to explore his body, identifying some part of it through perception: Hands, feet, arms, legs. But he does not identify himself yet as a global entity. When he sees his own image in the mirror, he comes to identify this image as himself, as a separate entity. This time part “what is inside” and “what is outside”, the data of separation between the external world and the self.

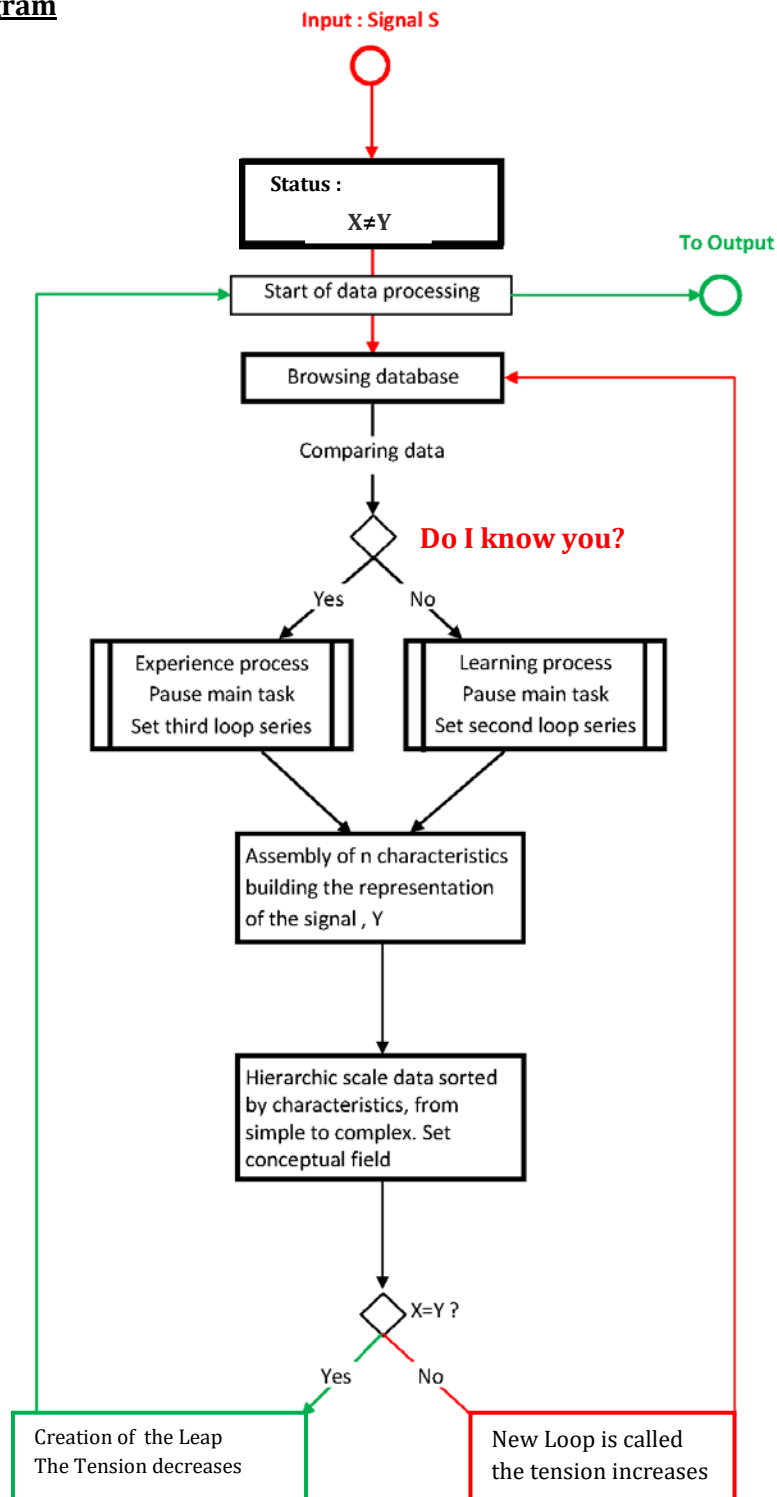
Then, the meta-engine is launched in the same way as previously described, a new disequilibrium in identification of signal: “What is this entity I see in the mirror?” At this point, X being the representation of oneself as part of the external world; Y has to become an aware representation of X. The target of our awareness is an equilibrium  $X=Y$ , as Y is the way to learn and experience “self”; this disequilibrium is expressed through  $X \neq Y$

In the same way our perception focuses on the external world for adaptation, the meta-engine will focus on the internal world, per se, self. This investigation fills secondary loops, the parts of the body, leading the engine to identify the global self as a main loop. It uses the same diagram, hereby again, and the same three axis of processing.

During this structuring, the meta-engine is used as a tool to learn and experience the perception of the self, similarly to learning and experiencing the external world. It is a lap of time dedicated to acquiring any reachable information. Here is why we say that a baby is a sponge.

**Know Thyself**

**Meta-engine Diagram**





In this diagram, the input signal S is the mental representation of the external world, including this strange image we get of self, acquired through the first level of processing. The meta-engine, or second level of intelligence, has to identify what is this thing which looks like a spacesuit. **Do I know you?** is the question we all ask the mirror.

Launching comes from the disequilibrium between what is known, this external world and what is unknown, this strange vehicle in which we are. The target is to build a self representation which fits and restores this precarious equilibrium. Then, the output will be “who we are”, in the whole aspect of our being.

### 2 - 1.2 - Axis I – Designation :

In the same time that our first level of intelligence learns how to adapt to the external world, because of the disequilibrium, the second level “wakes up”, acquiring some new tools.

The hard place is to acquire a designation of the unknown. As we collect information from our perception about exogenous data, we also collect information about our “spacesuit”. All of these characteristics do not make up the whole identification. But we learn that adding separated data one at a time brings a bigger view. As this bigger reflected image takes shape, it is “named” by others, despite the unknown characters. So, this entity survives, feels, sees, moves and has a singular name! Here starts awareness, with the body appropriation. The meta-engine does its job, identifying what is endogenous and what is exogenous, making the difference between “self” and the world which is around, the time of narcissistic development.

As the first processing engine is permanently functioning, the meta-engine has to adjust in the same time. Restoring equilibrium between external representation and self representation is a constant adjustment, a permanent adaptation for homeostasis.

### 2 - 1.3 - Axis II – Structuring:

Using the same diagram of processing, what we define as “structuring” builds with learning and experiencing of endogenous data and adaptation. This Axis II settles actions, according to what is possible, allowed, or not. There are, of course, automatisms, but also learning and experiencing of various paths. Seduction and rage are two main tools for the baby to improve parental feedback. This is a huge part of testing interactions with the outside world.

A special characteristic of this structuring is, that we learn and experience in the same time, our own rules – our limitations – and the parental and social rules. Thus, our self has to acquire how to reach a goal, despite obstacles and rules. This step is a main key of our character, personality and behavior.

As we shall see further on, it is also the origin of what we identify as will, thoughts, intentions and strategy.

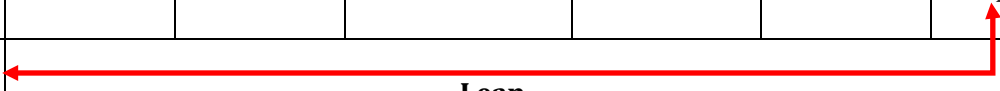
2 - 1.4 - Axis III – Idea of self:

Due to the need of information about the self, the permanent introspection leads to enriching acquired mechanisms and complex data. The more we learn about one’s self, the more we need to explore this conceptual field. At some point, this second level of treatment allows us to appropriate our physical appearance. This self representation merges with our body to define who we are. It is the precarious equilibrium between X and Y answering the “Who are you” questioning of the mirror.

Thus, another level of development needs to be reached, which is this relation between the self and the external world.

The new target is to close

the loop of global adaptation “self-external world”.

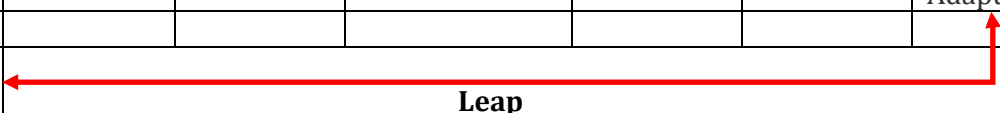
	Perception	First level treatment	Representation	Second level processing	Awareness	Self
External world	Input	Adaptation	Output			
Internal world			Input	Adaptation	Output	Merging & Adaptation
External world	 <b>Leap</b>					

Here is another key of structuring and development, when the last connection is initiated. It is a jump from the narcissistic state “I am, and there is the world around me” to the aware state “I am a part of the world in which I live”.

This leap is the signature of a nominal adaptation.

## 2 - 2 – Some tools of intelligence

As we can see on the spreadsheet above, perception – adaptation – representation, or the first level of intelligence become the input of our meta-engine of consciousness. It is very tempting to see it as a reversed image of the process, as it looks like a mirror below.

	Perception	First level treatment	Representation	Second level processing	Awareness	Self
External world	Input	Adaptation	Output			
Mirror ?	Input	Adaptation	Output	Adaptation	Input	Reflect?
Internal world			Input	Adaptation	Output	Merging & Adaptation
External world	 <b>Leap</b>					

This is precisely what creates confusion, because this idea of a mirror comes from our ability to look backwards on our first level of processing. In fact, there is no mirror, but the meta-engine which allows everything.

For a better understanding, this meta-engine can be illustrated with Universal Turing's Machine<sup>13</sup>. The first level of intelligence is defined through the tapes. To allow an UTM a "self treatment" like caliber II, we need to create a new machine working specifically on the first one. Then, the mirror's effect is just one of the multiple possibilities of this engine.

### 2 - 2.1 – Symbols:

The first language we acquire allows us to designate for a limited time, what has no name. A typical approach would be this:

Survival alarm => need to be fed => breast feeding => adaptation => security => satisfaction. The conceptual field "mother" is not yet acquired, but sensations are, actions are too. Then, not only the idea of "being fed" comes with "Mom", but other feelings about security, pleasure and care. The first representation is built with our senses, without knowing the word 'Mom'. This conceptual field will be extended during the life with other field expanding up to "the earth, foster mother". In fact, these data from our senses build a representation of care and love.

The same development can be built about rules, discipline, authority and laws, usually with the "father", even if it looks nowadays, like an antiquated cliché.

And of course, there is here the mother language starting with these symbols named "letters", and the construction that goes with it. Giving a designation to what is identified allows us to create new levels of complexity in our hierarchic scale, the accessibility of global information.

This scale starts with letters and goes up to concepts. Using symbols leads to higher levels of abstractions, right?

### 2 - 2.2 – Language:

Language learning is a perfect illustration of our brain functioning. It reflects as well our database and our processing. If we mostly look at it as a tool of expression, it is a central skill for structuring, understanding and adapting, no matter the mother language.

It allows the building of thoughts, reasoning, conceptualizing, creating, inventing, and expressing.

In fact, we are able to create, understand and use a lot of different languages: mathematics is one, music another one. No matter the level of abstraction, all human languages have something in common: this diagram of data processing.

Technically, as Claude Touzet says, one computer is enough today to create an artificial awareness.<sup>10</sup>

### 2 - 2.3 – Thoughts:

If someone asks: “What is a thought? Where does it come from? How is it built?” the answer may be very complicated, especially from a neurobiological point of view. Looking at it from this cognitive approach, however, makes it quite simple.

Let’s start with this basic definition:

A thought is a mental construction intended to solve an imbalance.

Considering that data processing requires the elaboration of an argument, the work of our brain is to find out the best way to balance. From the point X, any external information, to the point Y, which settles the best adaptation, there may be numerous paths. Thinking is an abstract projection of possible paths, a labyrinth that suggests directions. Thought is thus a representation of the process used to go from X to Y.

Does freedom of thought exist? Per se, no. Here are some reasons why:

- a thought is always an expression, a required answer for adaptation.
- our adaptation depends on our cultural inheritance, our education.
- the path is dictated by our rules and own practices
- the choice is a result of a Darwinian competition between tensions: the strongest wins.<sup>11</sup>

This description shows that there is no real will in any case. We adapt the way we have to.

## 2 - 3 – Arbitration:

A recurring issue comes out from this dismantling of our brain processing. Where are these concepts that we name free will, decision tree and strategies? Vanished. What about intention, intuition or even behavior?

In fact, when a conflicting situation appears, it is always about adaptation. That means it concerns the mental representation we have from data/process and the way our awareness can deal with it.

- On the basic level of intelligence, the conflict is solved in nanoseconds. Because this level of intelligence is archaic and data oriented, the strongest wins.<sup>11</sup>
- When our consciousness is involved, it seems quite different thus. This second level of intelligence implicates the idea of self into the conflicting area. Here appears what we identify as will, choices, decisions and strategies. But what happens?

A short story:

I need a new car, I have limited financial resources. This is a conflicting area.

The need of new car is not a fantasy, as I do need it to go to work. This already results from a first level of processing: Why a car, or not a bicycle or a horse? Could I get a job near my home? This processing done, the level of this need is already high on the hierarchic scale. Is it free will? A choice? Already a decision? Obviously not. This is the result of a deep slow process of adaptation that leads me to this fact: I need a car.

The same observations can be done with money. Is it my will to not have enough money? Surely not. It results from the first level of processing that my expenses are already sorted by importance. Savings are sufficient, but if I use it, I will have nothing left and will feel very insecure. This is neither a will nor a choice. It is a fact: I do not have enough money.

And now, on top of it, these two options are conflicting. It should be easily solve, as the strongest wins. But the meta-engine is also here to help in this conflict. This car may be a part of my social representation too. Maybe I want to use it as a seduction tool. Maybe I just want the pleasure of it. On other hand, there are a lot of possible options to explore: buying a second-hand car, or asking for a loan or any other financial proposition from the seller.

I will make a “decision” when my “will” shows that an option is stronger than another. It is that simple. Is there any free will in this? No, there is only a list of pro and con that leads to the adaptation.

An other example of arbitration is clearly enhanced by Eric Berne:

*“What is allowed to the child is forbidden to adults. So, the adult I am is childish”<sup>12</sup>.* This is a great illustration of the arbitration of our meta-engine.

### 3 – Artificial Super Intelligence, or caliber III

It is the creation of a new layer, a meta-meta engine in charge of global functioning, using the same diagram, again. Its target is to ensure creation, improvement, maintenance and use of all second level engines able to work together, as well as independently from each other.

Most of the time, people do not realize how they behave, even if it seems to them they are aware of their behavior. Like the surgeon “disconnecting” his human sensitivity to practice scary surgery. These layers of processing, which look like nesting dolls, are perfect tools of adaptation.

Meta-meta-engines are dedicated too, showing again three level of processing:

- one on basic adaptation, should we say our animal need to survive.
- one on main processes, improving our consciousness and personality
- one on meta engines, expressing our processing flexibility and plasticity.

In fact, when the brain process is mastered, we can decide to create as many engines as we want or need; we can stack data, processing functions, engines, meta-engines, meta-meta-engines, our only limitations are our storage capacity and our biological clock. It looks like nesting dolls.

	Triggers	Valences	Utility	Level 1	Level 2	Level 3
<b>ASI</b>	Optimisation	Machines	Improvement			Loop on meta - engines
			Discoveries			
			Progress			
			Engine creation			
<b>AGI</b>	Conceptualization	Processing	Reflection		Loop on loop	
			Creation			
			Strategy			
<b>ANI</b>	Adaptation	Data	Learning	Loop on data		
			Experience			
			Decision			
			Action			

## 4 - Conclusion

This global theory emphasizes the points we miss today in order to realize the leap between conventional Artificial Intelligence and a genuine Human-Like Intelligence, that is to say:

- The launcher, which sets the disequilibrium,
- The tension, which is both a warning signal and the order of adaptation processing,
- A simple diagram of functioning, in accordance with the modalities of operations of a baby's brain,
- The meta-engine, which allows our consciousness state, building thoughts and strategies,
- The meta-meta-engine, as smart bandmaster.

Now, we just have to build it...

## Definitions:

- **Adaptation process:** mental calculation targeting the restoration of stability.
- **Adaptation:** defines the restored state  $X=Y$
- **Conceptual field:** any identified information belonging to an intrinsic signal
- **Data:** All processed information in storage
- **Endogenous:** inside oneself
- **Exogenous:** from the external world
- **Experience process or third loops series:** mastering acquired characteristics, from a random use to automatism.
- **Homeostasis:** "*characteristic of a system that regulates its internal environment and tends to maintain a stable, relatively constant condition of properties*". We describe it as  
Lack + Adaptation = Equilibrium
- **Lack:** unknown part of information or signal, internal or external, which creates an imbalance.
- **Learning process or second loops series:** acquiring characteristics of information into main processing
- **Main process or main Loop:** treats the cause of imbalance. It points the information we focus on.
- **Signal or signal S:** any endogenous or exogenous incoming information.
- **X :** perception of the signal S. It launches the adaptation process.
- **Y:** result of the process for adaptation.
- **Leap:** acquired automatism to answer a recurring imbalance
- **Valence:** defines the complexity level of a signal. This level is the number of identified characteristics of the signal used to restore the balance.
- **Thought :** A thought is a mental construction intended to solve an imbalance



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