Why Not Imitate Collectors, Using their Desire, to Address our Content Browsing Issues?

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Abstract. When in 1982 Allen Newell invented a new definition for knowledge, thus enabling computer scientists to reunite the two founding sides of artificial intelligence, he was probably far from imagining the huge success his proposition would come to. The manner in which both digital documents and the interactive tools allowing access to their content were assumed was to be seen in a different way, hence opening up to new innovative applications. However, analysing the systems aimed to help in document interpretation over the last fifteen years and based on Newell's hypothesis, has lead to something quite unexpected: to conceive most of these systems, engineers have in fact been trying to deconstruct the hypothesis. Typically, the notion of collections has been preferred to that of knowledge. Yet perhaps the notion of collection could only appear once that of knowledge had been taken into account, distorted and finally subverted.

1. Introduction

The conception we have nowadays results from a tradition that considers documents were knowledge containers. This figure of containment yet widely exceeds the scale of the phenomenon it is meant to describe.

Why don't we try to remain closer to the very phenomenon, even if this stands for refusing *ad hoc* explanations devoid of any stimulating effect? Here is what we experience first hand: when successfully carried out, the process of "getting to know" a document induces liveliness and an animation of thoughts; it equally opens up new perspectives in terms of investigation and otherness. This phenomenon thus initiates a desire to "know more"; it brings forth a determination to be confronted with the document (or to gradually shift to other documents), and eventually results in the production of new documents. When document reception results from the figures of attraction (continuance/repetition) and not from repulsion, further documents are then conceived and produced.

May a document offer relevant information and/or falsehood, the subsequent process of continuance/investigation remains the same, and should thus complete, detail, confirm or invalidate material from the initiatory document.

Culture precisely never begins, nor does it ends immediately; the real question that arises is thus that of the possibility of its *resumption* and *metamorphosis* [10]. If what I'm saying is not what I'm thinking anymore due to the very fact I just said it, how could thoughts possibly consist of the use of knowledge previously there? How could it consist of a plain reordering of elementary units stocked into those reservoirs we call documents?

Computer scientists are often fervid yet innocent advocates of this tradition which firmly argues that documents are knowledge containers. It's not that they have been hired by some activist promoting such statement, nor are they particularly interested in this debate. It rather seems that the very history of computer science, originating at the same time as that of Artificial Intelligence (AI), logically leads them to holding a tacit position on one definitely strategic ground: in the digital document era, computer scientists are indeed often busy with the conception and realisation of access and browsing systems whose networks and services now cover the whole world [8].

This paper aims to explore the invention of *Knowledge*[1] in the field of computer science; we should argue that it stands for the origin of the *biased vision* most computer scientists have on digital issues.

2. The invention of *Knowledge* in the field of computer science

Despite its yet short existence, computer science nonetheless originates from a rich and complex history; it began with the Cold War, and was, at the time, a vast and ambitious transdisciplinary project with an extremely meaningful name: *Artificial Intelligence*, thus highlighting the second meaning *intelligence* has in the English language.

The research field has been widely influenced by Alan Turing's founding works and has gained strength with Herbert Simon's ecstatic prophecies, not to mention many other significant contributions. Everyone knows that. Yet the paramount part Allen Newell played is often forgotten; building *Knowledge* from a computer science point of view, he literally invented a new meaning for a prevalent notion in metaphysics. It meant building an operating and favourable notion for designers and programmers of computerised systems while trying to convince them they were holding the sacred grail metaphysics had been trying to define since the dawn of time. Many discerning computer scientists have tried setting up innovations grounded on Newell's assumptions, many more have been influenced by his ideas, while totally unaware of these origins.

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1 In order to emphasise the fact there is no concurrence between the notion of *Knowledge* computer scientists understand and the commonly assumed notion of knowledge – despite the use of the very same word by computer scientists aiming at forcing such concurrence – a capital *K* letter should be adopted so as to highlight the intrusive meaning of the word.

2.1 The state of artificial intelligence in 1982

What was the state of AI when Newell began writing his famous "*Knowledge Level*" [11]? To say the least, the AI research programme was on the verge of collapsing, torn as it was between two sides. Its field of action was a utopia ironically established by Alan Turing via the two figures he had set: his Machine and his Test [24].

A Turing Machine is a virtual logical machine, later designed architecturally by von Neumann [27], and eventually materialised in the silicon of computers. It allows the operationalisation and simulation of some temporal and/or causal phenomena via the assimilation of the necessary reason *(Modus Ponens* or deductive reasoning) with causality, then via the automatic effectuation of the logical inference transformed into calculus [23]. In a Turing Machine, AI lies in a corpus of programming techniques that have been specified to tackle issues of Problem Solving[2], the ones Newell engaged in with his *General Problem Solver* (GPS).

As for the Turing Test, it puts together the intersubjective dialogue and the mystery contained in its *continuation*: an interlocutor is deemed intelligent as soon as he answers back. Any intelligent party must remain in a constructive form of dialogue, and should hold the other party spellbound by submitting stimulating cues. Breaking the dialogue is an initiative both parties intend to use correctly so as to serve their own interest, each one wanting to gain power over it. This is how a Human may personify an artificial interlocutor as soon as the latter is deemed intelligent, and is capable of continuing the conversation in time and of remaining at the mercy of the human speaker[3]. Hence, as far as the Turing Test is concerned, AI is a phenomenological investigation on the issue of the dialoguing subject[4].

One should bear in mind that AI developed without ever reuniting its two equally founding poles. In 1982 the break was reaching a critical state as it was impossible to reunite the two sides despite presumptuous undertakings[5] and massive investments. The research project kept evolving on the Machine side; yet AI remained stuck with computer programming and attempts at meeting the requirements of technical environments and specific interfaces – under the cover of the dominating paradigms the Theory of information induced. It was gradually being reduced to a techno-science. Inversely, the project remained undeveloped on the Test side, still nothing but a gnosis consisting in asking oneself, in an open loop manner, on the similitude between an intelligent Machine and the human nervous system. In consequence to this schizophrenia, AI systems failed to significantly escape from research Laboratories; it was getting harder to hide the facts and not to acknowledge the failure. It meant either giving up or opening new ways, trying it “no matter what”.

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2 In this paper, all words referring to specifically classified notions in computer science are to be written with a capital letter.

3 See the ELISA system [29]: the system played the part of the psychoanalyst and not that of the analysed patient.

4 In fact, even if the Turing Test has a dialogical dimension, things get more complicated as Truth issues frame the cues. Indeed, in the imitation game, the dialogue the man and the woman set up with the questioning agent is carried out via typing. The man can lie whereas the woman must say the truth. The computer replaces the man. Its tasks is thus to dialogue, yet it has the possibility to lie. The use of lies is precisely what makes it difficult to discover the identity of the computer. Lying is also was enables the latter to prove itself capable of intelligence.

5 Intelligent systems were meant to replace Humans even in the fields/activities the latter were engaged in and that were regarded as intelligent; Taylorisation was thus reaching extents it had never been close to.

Newell wanted to defend the AI approach and he totally refused the reduction of Turing's ambitious research programme to a type of engineering meant to serve the Theory of information. As a result to his own culture as an engineer fascinated by the engineering side of AI, Newell got involved with the Machine, suggesting computers be considered as layered systems *(Symbol Level)*; he also suggested adding a superior layer (the *Knowledge Level)* built so as to reach the Test side of AI and to finally get rid of the menacing crisis. This also meant putting a stop to the seeping questions that were gradually cutting into the area.

2.2 *The Knowledge Level*: Allen's Newell proposition

Newell invented *Knowledge* in order to bring a solution to the Human–Machine problematic issue found in artificial Intelligence. His answer to the controversial question "Who, between Man and the Machine, is intelligent?" is "Let them both become intelligent together; as a multiagent hybrid couple/group/organisation, Knowledge being the junction enabling the coupling and the interdependency between the human and the machine".

In computer science, Knowledge refers to the condition of possibility for the hypothesis of Newell's Knowledge Level. An interactive Human-Machine cooperation is based on a principle of rationality (we like expressing this principle the Montaigne way: tell me what want, what can, what know, I'll tell you what do). In that it may be handled by Man – who can therefore assume his thinking as a rational and finalised tool – Knowledge exhausts/reduces/describes the phenomenon of thought(s). In that it can be represented and implemented in computer science systems, Knowledge gives computers information on the situations and levels of freedom of human actions, the machines may therefore mobilise the operation of instantiation[6] as well as logical inferences in order to embark on various types of rational reasoning.

Thanks to Newell[7], AI left both the limited field of computer programming and Turing's poetics to finally gain power over organisations. The latter being considered as communities of interacting human agents; it then meant productively inserting rational artificial agents. For even if Newell's priority was to address the Human-

6 Instantiation is one major unthought-of notion in Computer Science, which fiercely links the *singular* to the *particular* [17], through the well-known subsumption, when Aristotle himself [1] already claimed that Science could only talk about the *general* and remained powerless to mention anything about the *singular*.

7 Even if the description of computerised systems in terms of layers, which is to be found in Newell's *Knowledge* Level, is not the main issue of this paper (the reader may refer to Newell's article to fully understand this essential aspect of his vision), it is important to specify the consequences of organising for the status of Knowledge. Newell's Knowledge isn't anything new, it is something usual but considered differently. In so far as it is a level in which the system should be considered, and not a new element of the system – even if this changes their individuation and behaviour criteria – the "knowledge level" applies to the man/machine interaction. Yet, interpreting symbolic structures in terms of knowledge inevitably tends to reduce the first to the second ones: if Knowledge is only found in the interpretation/interaction with a symbolic programming structure, "the Knowledge Level" therefore reduces Knowledge to symbolic structures; it then stands for nothing more than interpretations. Newell's conception reifies and objectifies Knowledge into symbolic structures.

Machine couple, much larger multi-agent societies[8] were to be modelled alongside the Knowledge Level.

Newell's talent was precisely to go through with the conception of this rescuing move: naming the area dedicated to the dual monster[9] he has just created and in coaxing and domesticating the latter via due baptism. The monster's den had already been localised by Turing as being the Human-Machine interaction: a place that exceeds both protagonists in the mysterious union of the Machine with the Test. How was that possible? By sharing knowledge. The Human enables the Machine to acquire its own knowledge when the Machine itself stands as an interlocutor worthy of the Human. As soon as it was operationalised the notion of Knowledge was associated with the common sense knowledge thus turning it into a recognised and operating figure (Teratology, the science of monsters, tells about the subterfuge).

2.3 Consequences of Newell's move: feedbacks

Newell's Knowledge is logical – teleological, to be more specific – *out of time and out of human desire*. His Knowledge may be regional/domanial, or job oriented, yet it cannot be located since it is literally uninhabited. This is illustrated by the type of aporia Newell conceded facing *(The Lady and the Tiger)*. Newell was doing research in problem Solving and achieved his GPS: he considered life as a large problem and living as a large mechanism aimed to solve the problem (a large solving mechanism for this problem). Newell's Knowledge claims the reduction of the trivial knowledge extended in time – both *narrative* and *discursive* – of the human mind, in order to categorically stifle it with an instantaneously finalised rationality.

If need be, the requirements of rationality Knowledge demands shall brand narrative knowledge with irrationality: what's your *problem*? If you have none, or if you fail to express one in a formal and canonical manner, you therefore have *no problem*, you are fine. Knowledge (the word begins with the letter K like Kafka's short story) may therefore sometimes be seen as Kafkaesque.

When taken at face value, Newell's proposal surely impoverishes the human thought, yet it also displays productivity and a capacity for innovation of its own. What's more, ways to deconstruct it may be explored, for instance focusing on less severely reducing inventions such as the notion of *collections* [25] – a more precise singular notion, happening here and now, in a field of dynamic attraction. The course may thus become choreographic/scenographic and hence relinquish the topological characteristic – assuming it may still be mapped – of its own inscription, as we shall later discuss.

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8 The worth of such approach is that it natively offers representations and Knowledge extraction/acquisition devices. Practically speaking it will actually often lead institutions (that will take Newell's proposition at face value and will comply with the orthodoxy and will almost stretch to a new and unprecedented type of Taylorisation) ordain their organisations and their knowledge (1982 is only two years prior to George Orwell's disturbing dystopia).

9 Like the Roman God Janus, Knowledge has two faces, one turned towards the *Symbol Level* of the Machines, the other turned towards human actions which, according to Newell, are always rational and finalised.

The major issue stemming from collaborative interaction is indeed to establish it on a fair and fruitful ground as well as making sure it lasts and spreads with time[10].

Analysing examples of computerised systems we are familiar with – having taken a more or less important part in their conception/realisation – will lead us to a critical study focusing on the productivity of Newell's Knowledge. The analysis should be based on browsing systems found in digitalised collections of music extracts – namely LE MUSICOLOGUE and CUIDADO – and should also focus on situation control systems – CHEOPS and VIRTUALIS in particular.

3. Browsing digital musical documents

Setting up a browsing system via digitalised musical documents entails preliminary complicated problems, mainly in terms of acquisition and restitution but also relating to representation and to the Human-Machine interface. When such problems are finally overcome, the major difficulty arises: making use of tools based on Newell's *Knowledge Level* in order to subvert his initial propositions, and lessening a *priori* instantiation and classification so as to reach situation similarity and a collection encompassing *singularities*.

3.1 Introducing LE MUSICOLOGUE, a music browsing system

The MUSICOLOGUE system was conceived and realised by a small team of computer scientists and musicologists between 1987 and 1990. Among the various ambitions of such a system, one of them was that the system should suggest a new piece to work on [19] to a student who had just practised music dictation on a certain piece. This being performed with optimal coherence in terms of corpus, namely a collection of elaborate exercises adapted to the student's improvement. LE MUSICOLOGUE was conceived as a large method panel, each method being prepared by a teacher and based on a collection of selected musical texts and a range of analytical tools for the piece, alongside evaluation tools for the student's progression.

The subsystem in charge of practically suggesting new pieces to work on – a process depending on the piece currently being dealt with and the student's own difficulties – incited us to use the DISCPLE system. The latter had been developed a few years before in the automatic Learning research team of the Paris 11 University – a project we were also involved in [9].

DISCIPLE is a learning apprentice help system for browsing in a logical problem solving process which evolves via goal regression, and mainly used in planning. DISCIPLE learns by searching how to put together the two fields of Knowledge it has so they may be coherent. On the one hand is practical Knowledge, namely rules

10 Newell would have probably argued his model enabled channelling the duration issue by reducing it to the dynamic variation and to a Knowledge update. Yet the dynamics is only efficient when it can actually see nothing else in statics but a particular case of movement, and not the contrary. Newell's conception lacks the "Differential calculus" on Knowledge.

for decomposing problems, and on the other hand is theoretical Knowledge on the field itself, represented in a large semantic Network [4] – as ontology was not yet brought into play at the time – which would put the objects involved in the rules into a network.

DISCIPLE had been developed in a theoretical formalist logic of learning, hardly taking into account the Human-Machine interaction, and reducing it to a vote-catching sort, typical of Expert Systems: the Human is expecting solutions; some are suggested by the system; yet only when the computerised system fails to provide some, is an expert sent to engage in an updating and learning Knowledge process guided by the machine.

3.2 Seeing the corpus as a collection of pieces worked on

LE MUSICOLOGUE helps the student build a collection of pieces he worked on. Collecting is more original a word – as relating to an origin or beginning – than categorising. It goes with time, a sort of *Lebensvelt*. It is mostly true when working on music pieces, as in this very case the key to success is the continuance of an activity which never stops nor repeats its object. Indeed, it expands into sequences of objects standing for the navigation path of a collection [17], quite similar to when one builds a collection of art works (although the appropriation of temporal objects cannot be compared to the appropriation of spatial objects). Yet, if the impression an activity leaves behind in the world is nothing but its continuance, how may one set up a Human-Machine dialogue? Which medial Knowledge should it be built on?

In the insertion environment of LE MUSICOLOGUE, the student leaves impressions of his exercises – impressions or trails different from the preliminary selection of the piece he is working on –: both the evaluation of his work and his level in the corpus have been carefully thought of in order for the learning apprentice system to have grounds on which stimulating the student's interest by offering him a number of *interesting* pieces to work on, which the student may choose to select. Yet what about the act of purely listening to music – implying neither note taking no any other trace but the sole desire for its continuance –? Could a system which would offer the listener some help to set up a navigation path/collection be considered even if no goal outside the actual activity may be assigned to the system? This is precisely the objective set for the *Music Browser* Sony-CSL developed as part of CUIDADO, a European project coordinated by the Ircam between 2000 and 2003 [26].

3.3 A study of the CUIDADO browsing system

Music browsing inside large corpora of digitalised pieces is widely influenced by the notion of *genre* which itself originates from the need to physically choose the CDs one wishes to get in the various shelves and departments specialised shops contain. The end of the CD as a medium entails the end of the hegemony this purchase activity has had so far. It has also given rise to a number of competitive activities laying claims to the cut of indexation, hence the advent of plethoric and competitive index-linking regimes. For this reason, CUIDADO's *Music Browser* presents – jointly with

an editorial metadata indexation – the user with *cultural* and *acoustic* search possibilities. It also leaves aside the imposing of exclusive categorisation based on those types of index, while encouraging the user to shift via a search for similarities as transversal[11] and interactive as he wishes [12][13]. The idea of collection is once more brought into play; the system offers the collector/listener opportunities combined on different levels and yet which may always be simultaneously activated if need be. He is therefore free to choose which he may locally have power on.

3.4 Partial conclusion and first teachings

The differences between the two systems – LE MUSICOLOGUE and CUIDADO – are not so much technical as epistemological. From one system to the other, there is a shift from (LE MUSICOLOGUE) a world filled with formal categories, in which the Machine tends to be in charge of the loop of interactive events, to (CUIDADO) a situation dealing with singular collections and in which the Human tends to remain responsible for – and the ultimate master of – the loop of events and the results of the Human-Machine system. In CUIDADO we do not even refer to results anymore but to *paths*, knowledge being here constantly engaged in a sustainable narration devoid of the need for exogenous or endogenous goals of the system, simply by shifting from/to similarities.

In LE MUSICOLOGUE the very ruled and utilitarian characteristic of the information system is precisely what enables it to come along in terms of instantiation, managing the content as facts instantiating its knowledge. Yet if what is aimed is an open system undefined by a primary use, which role should it play in the context? It is therefore necessary to tackle the issue differently as it is not possible to reduce contexts of uses to predefined generic cases. It is therefore necessary to shift from the particular to the singular.

The notion of systems founded on the instantiation of generic moulds is thus abandoned in order to shift towards systems offering paths among contextually built singularities.

4. Browsing through carto/scenographic digital documents

In this second phase of system analysis, we should focus on achievements dealing, this time, with documents of a cartographic or scenographic type. Following the same movement as that from the MUSICOLOGUE (1990) system to CUIDADO (2000), and by removing the explicit or implicit teleological requirements from the conception of the information system, we should introduce both CHEOPS (1995) and VIRTUALIS (2005), and highlight the same type of evolution from one system to the other.

11 A combination of descriptions is precisely what is being built by the Human in *Music Browser* – following the *and/or* type rather than the *or* one. It allows shifting one's desires, and grounds itself on similarities that are always partial, yet stimulating. Quantitative aspects are thus being immediately grasped qualitatively; the Machine kindly stepping back to let the human user step in.

4.1 A study of CHEOPS, a critical situation follow up system

CHEOPS [16] is a system meant to help in decision making in case of geopolitical crises. It was conceived and achieved between 1990 and 1995, and contained data processing components to reach the possibility of contradictory debates of a strategic level between a Human and an argumentative artificial agent. [15][30]. The agent always tries to show the decision maker the other sides of the tactical and strategic situations, preventing the decision maker from omitting latent fructuous contradictions (especially those that may lead to the triumph of a potential opponent or adversary).

In CHEOPS, the essential digital documents were geographic maps *(raster* and/or vector) implemented with symbols describing a current situation; the assumption was that the interpretation was almost objective in terms of tactics; to then search for reasonable/justifiable interpretations in terms of strategy (the relation between tactic and strategy is somewhat similar to the local and global relation one finds in the sol-fa describers in music).

Yet CHEOPS may also be used for legitimising decisions as well as decision making. The strategic intentions of the decision maker therefore inflect the interpretation of the situation competing with the tactical analyses arising from it. As far as the explanations meant to proceed up from ground to headquarters are concerned, they are rivalled by justifications of intentional actions conducting ground interpretation.

CHEOPS clearly shows that the status of Knowledge – introduced by computer scientists in the Human-Machine area – may influence organisations, and even directly affect their very institution. Knowledge – which was first to be "extracted" upstream from the conception cycle of intelligent systems – has rapidly become the stake of Knowledge Acquisition as a "constructive modelling principle" [6]. This moderate principle has finally become an organisation and management principle (to reach normative unifications of views inside an organisation, for example) and therefore an organic principle of institution. This is precisely how Newell's innovation tends to shake the tool insertion field it helps producing – that is to say the organisation itself, summoned to clear the way for artificial rational agents; consequently the organisation is eventually finalised and normalised.

In fact, CHEOPS is only relevant when one considers the possibility of putting the situation at a distance so as to proceed with decision making; decisions are hence considered as partial reorganisations of some parts of this situation. The situation would be somewhat *frozen* before the operation, and it wouldn't be affected by the deliberative perspective. Yet a large part of our philosophical investigation – when in charge of the "Reconstitution of the politico-strategic decision" research group of the Collège international de philosophie, between 1997 and 2000 – aimed precisely at showing how limited such a vision was.

The idea of VIRTUALIS, the scenographic help system, is in fact a continuation of this philosophical quest. This Human-Machine device is precisely intended for exploring other decision contexts.

4.2 The VIRTUALIS system: generating collections of interactions

VIRTUALIS is a system grounded on the idea that a performance may be considered as a collection/procession of interactions that are under constraint; setting up processes that retain several interactive exchanges may open the work – understood here as in Umberto Eco's open work – by densifying the interactive space [18].

For instance, Alain Bonardi, the main conceptor of VIRTUALIS [2][3], has set the system up in a play by Geneviève de Gaulle. The play staged a narrator and a Noh female dancer, as well as a gigantic screen at the back of the stage on which mobiles were sketched; the mobiles were directly animated with the particular emotions felt in the narrator's voice. The immediate influence of the voice was thus jointly meditated via the screen; it therefore reached further remanence and a wider range in terms of temporal density.

What we thought was interesting in such a project was to try to lessen instantiation[12] [18] – the very unthought-of concept in computer science – by suggesting the direction of the play should be conducted and specified by a shift in situation controlled by the situation itself, rather than by variations of instantiations in the ontology of characters and actions.

With an interactive data mining approach we may see the example as a specialisation of overall cases; other similar specialisations may be searched for yet without the help of a predefined ontology. The user therefore accepts shaping it in an *ad hoc* manner, using the machine's interactive help.

The multi-mode interaction system set up in *La traversée de la nuit* is based on a « autarchic » man-machine system: an actor delivering the whole text of the play – Valérie Le Louédec – a dancer achieving a certain type of gesture directly inspired from the Noh theatre – Magali Bruneau – and a multimedia computer – artificial player. The computer shows its presence via images projected on a very large screen at the back of the stage (both the actor and the dancer always see a part of it even without turning back), and induces reactions from both players, more particularly that of the dancer who adapts her own gestures to the movements and qualities of the image. In fact, the two female actors onstage are the two sides – conscious and unconscious – of the same character according to traditional Noh theatre: *shite* and *waki*. The actor's movements are also influenced by that of the dancer; she adapts her own delivery of speech, not to mention the times she too watches the screen. To loop the loop, the computer receives the emotions stemming from the actor's voice.

12 *Instantiation* refers to the word *instance*. Instantiation somewhat generalises the operation, used by mathematicians, that assigns a numerical value to a variable: to talk about reality, computer scientists instantiate abstract classes, deciding that such or such entity is a particular case in a class, itself being linked to other classes via general hierarchies and/or formal properties; the overall device composes what is called an Ontology (Ontology is supposed to describe large panels of commonplace knowledge very often used in artificial intelligence) or sometimes an *design with objects* (a design with objects is made of legacy graphs meant to establish computer programmes with the simple instantiation of key parameters).

4.3 New conclusions and additional teachings

Through VIRTUALIS, Alain Bonardi and we discovered that technology escaped from the concepts it originated from, or to be more accurate, it deconstructed them – as Derrida defined it. Indeed, even immediately after it surreptitiously started encouraging organisations in its work and conception methods, Newell's molecular and mapped knowledge could start being deconstructed. The notion clears the way for as much scenography – and as many choreographies – as experiences of the work; this development recalls Simondon's definition of *concretisation* [21]; the innovation consists in deconstructing Knowledge and be done with its artifice, while still using the tools the dogmatic notion helped set up.

It was then becoming clearer that Newell's attempt was a fiction meant to work in the representation field, in order to freshly address the never-ending crisis of representation, in partnership with computers. The latter may potentially contribute to the elaboration of less frustrating representations for they encourage more sensorial and conceptual investigations (for instance, with virtual reality and multimedia Magritte's well-known pipe, painted in 1929, in *The Treason of Images*, visitors would breathe the smell of tobacco, feel the heat in the curve and taste the bitterness, they would also experience the use of it). Computers should therefore be granted means enabling them to be part of the interactive mediation of representations.

Even with tremendously high rational requirements, it was probably very clever to immediately propose a radical solution: a two-sided type of Knowledge featuring a static side turned towards computers and a dynamic one turned towards humans. Yet today it is clear that a part of the dynamic one may be turned towards computers and that the hypothesis of rationality may even be alleviated – and should be – as long as one renounces the two-sided Knowledge to prefer a horizon filled with synthesis and desire, better inspired by the notion of Collection – as an art collector may experience it – than by the notion of rational Knowledge.

After Information, and after the form/substance Relation, it is now time to question Knowledge and Contents of digital documents.

5. Deconstructing *Knowledge* and the invention of *Collection*

By revisiting prior experiences in conceptions of intelligent systems helping with the interpretation of digital documents, we have noticed that the proposition for a description of knowledge in principle – outside any experienced situation – had left us often quite unsatisfied and that we had preferred that of shifting to and from situations, hence creating a Human-Machine interaction in time – through narrative forms – and thus enabling the setting up of motivated collections with lively and dynamic intentions.

Digital documents do not *hold*/*contain* knowledge; the material they retain may be looked upon as nothing more than "buds" of a tree network spread throughout a path for "acquiring knowledge" – then allowed by gathering and confronting all the information cropped up. Thus, "acquiring knowledge" is much rather a process

elaborating collections, targeting both its completion and continuance, both prospects being necessary together because they maintain their reciprocal possibilities.

Let us think about art work collections and about Gérard Wajcman's analysis (*Catalogue de l'exposition inaugurale de la Maison rouge,* page 89) on the status of excess in collections: "Excess in a collection does not mean disorganised accumulation. There is a founding principle: for a collection to be so – even in the eyes of the collector – the number of works needs to exceed the material capacities of displaying and stocking the entire collection at home. Someone living in a studio apartment may very well have a collection: he will only need to not be able to display at least one work in his apartment. It is for this reason that the reserve is one full part of collections. Excess can also apply to memorising abilities: for a collection to be so, the collector should be incapable of remembering all the pieces he possesses (…). In fact, he either needs to have enough pieces to reach the "too many" and to "forget" he had this or that one, or needs to be compelled to leave some outside his place. To put it in a nutshell, what makes a collection is that the collector should not have total power over his collection".

"A private collector's scene is not his apartment but the whole world. It's important to stress that the major part of his collection in not to be found at his place, his collection is yet to come, still scattered all over the world. Any gallery or fair represents the possibility of chancing on his collection yet to come." [28]. Also: "No one can ever look at "one collection" since it is not a whole work but an infinite series of singular objects, a piece + a piece + a piece, etc.".

The process of extending a collection is potentially infinite even if the collection is necessarily undetermined, *temporarily* finished. Practically speaking, a collection ceases to exist as something else than a commonplace correlate whenever the collector loses interest in its extension: he then stops reiterating the acquiring gesture and/or the reconstitution of the collection in an intimate dwelling comes to an end. Both acts have the same essence: in order to keep the collection in an intimate sphere, the collector pays a visit to his sheep[13] and re-generates the collection, working on his very logic of growth, yet unaware of it. Re-production balances the collection's heavy trends and facilitates new links among the pieces, hence setting up new similarities that will eventually influence the acquiring logic. Strangely enough, desire becomes knotted to difference. Object enter the collection via the *being different* predicate; they only become similar later on, as being different is what they have in common, hence setting up what Jean-Claude Milner calls a paradoxical class.

If after Simondon we may talk about material realisations, what about the genesis of symbolic systems and outgoing technical tracks originating from this? Could we

13 At the beginning of André Gide's *Symphonie pastorale*, the good shepherd who has welcomed Gertrude tries to dispel his wife's premonitory worries. He defends his peculiar interest in the young blind girl by spiritually recalling the most particular devotion implied in a secluded life of infirmity. When later in the novel the wife is surprised the shepherd abandons his own children, he hides his consciousness behind Matthew's Gospel and answers back that "each sheep of the herd, taken on its own, is more important in the eyes of the shepherd than the overall herd taken as a whole." We've always seen this as another collection metaphor; the shepherd sees the overall herd as an abstraction. As soon as action is needed for an endangered sheep, the figure of the herd fades away and gives way to the singularity of the needy sheep.

possibly have practice paths and conception tracks? Shouldn't we begin considering a new technicality in computer science?

References

1. Aristote (1993) « Métaphysique ». Garnier Flammarion.
2. Bonardi A. et Rousseaux F. (2001) « Interagir avec un contenu opératique : le projet d'opéra virtuel interactif Virtualis ». *Revue d'Interaction Homme-Machine*, numéro spécial *Interaction et Documents*, Volume 2, n°1, juin 2001.
3. Bonardi A. et Rousseaux F. (2004) « A la croisée de l'informatique et du théâtre : similarité en intension *vs* en extension ». *Conférence Internationale ARCo*, Compiègne, décembre 2004.
4. Brachman, R-J. (1979) « On the Epistemological Status of Semantic Networks ». *Associative Networks,* Academic Press, New-York.
5. Cavell, S. (1999) « Le monde comme choses — collection de pensées sur la collection ». *Les Cahiers du Musée national d'Art moderne,* n°69.
6. Clancey, W. (1993) « Notes on Epistemology of a Rule-based Expert System ». *Artificial Intelligence 59*: 191-204, Special issue Artificial Intelligence in Perspective.
7. de Galbert, A. (2004) « L'intime — le collectionneur derrière la porte ». *Catalogue de l'exposition inaugurale de la Maison rouge,* Fage.
8. Enjalbert, P. et Gaio, M. (2004) « Actualité d'une approche sémantique du document numérique », *Conférence Internationale sur le Document Electronique*, La Rochelle, 22-28 juin 2004.
9. Kodratoff, Y., Tecuci, G. et Rousseaux, F. (1987) « DISCIPLE: a LAS for Weak Theory Domains. *Cognitiva »*, Paris, mai 1987.
10. Merleau-Ponty, M. (1969) « La prose du monde ». TEL Gallimard.
11. Newell, A. (1982) « The knowledge Level ». *Artificial Intelligence*. Vol. 18, p.87-127.
12. Pachet, F. (2000) « A Taxonomy of Musical Genres ». RIAO, Paris.
13. Pachet, F. (2003) « Nom de fichiers : Le nom ». *Actes du séminaire STP,* MSH Paris.
14. Pylyshyn, Z.W. (1991). « The role of cognitive architecture in theories of cognition ». In K. VanLehn (Ed.), *Architectures for Intelligence*. *Hillsdale,* Lawrence Erlbaum Associates Inc.
15. Rosenthal-Sabroux, C. et Rousseaux, F. (1996) « Systèmes informatisés d'aide au traitement des crises ». Article "acquisition des connaissances, aide à la décision et gestion de crises", *Gestion de crises et médecine des catastrophes,* dirigé par Renaud Vié Le Sage, Elsevier, novembre 1996.
16. Rousseaux, F. (1995) « Contribution à une méthodologie d'acquisition des connaissances pour l'ingénierie des SIC : l'exemple de Cheops pour l'aide à la gestion de crises collectives à caractère géographique ». Mémoire d'habilitation à diriger des recherches, rapport de recherche LAFORIA.
17. Rousseaux, F. (2004) « Collecting or classifying? — Intimacy clarified: a collector's ritual ». Special Interest Group on "Philosophy and Informatics", *Professional Knowledge Management International Conference*, Ulm, octobre 2004.
18. Rousseaux, F. et Bonardi, A. (2004) « Music-ripping : des pratiques qui provoquent la musicologie ». *MUSICAE SCIENTIAE*, numéro spécial 2003-2004.
19. Rousseaux, F. et Saoudi, K. (1991) «Informatique musicale, pédagogie et communication ». *Revue de pédagogie musicale MARSYAS de l'Institut de Pédagogie Musicale*, dossier n°20 "Informatique et pédagogie", décembre 1991.
20. Rousseaux, F., Bonardi, A. et Zeppenfeld, C. (2004) « Une mise en scène inspirée de la fouille interactive de données ». *Conférence Internationale sur le Document Electronique*, pages 205-112, La Rochelle, 22-28 juin 2004.
21. Simondon, G. (1989) « Du mode d'existence des objets techniques ». Aubier.
22. Stich, S. (1983) « From Folk Psychology to Cognitive Science: The Case Against Belief », Cambridge, MA: Bradford Books / MIT Press.
23. Turing, A. (1939) « Systems of Logic based on Ordinals ». *Proceedings of the London Mathematical Society* n°45.
24. Turing, A. (1995) « Computing Machinery and Intelligence ». *Mind LIX*, n°236, 1950; réédité dans les Collected Works of A-M. Turing, vol 3. *Mechanical Intelligence*; traduction française dans A-M. Turing, J.-Y. Girard, « La machine de Turing », Seuil, Paris.
25. Vignaux, G. (2004) « La notion de collection : genèse, développements, valorisations ». *Rapport interne CNRS du RTP 33 "Document et contenu : création, indexation, navigation"*.

26. Vinet, H., Herrera, P. et Pachet, F. (2002) « The Cuidado Project ». *Actes des conférences ISMIR*, Paris.
27. Von Neumann, J. (1996) « Theory of Self-Reproducing Automata ». London and Urbana, University of Illinois Press; traduction française : *Théorie générale et logique des automates*, Paris, Champ Vallon.
28. Wajcman, G. (1999) « Collection ». Nous.
29. Weizenbaum, J. (1975) « Raisonnement de l'homme, intelligence de la machine ». Edition de l'informatique.
30. Zacklad, M. et Rousseaux, F. (1996) « Modelling Co-Operation in the Design of Knowledge Production Systems : The MADEINCOOP Method - An example in the field of C3I systems ». *Computer Supported Co-operative Work : The Journal of Collaborative Computing 1-22*, Kluwer Academic Publishers, the Netherlands.