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ARCHITECTURAL AND URBAN AMBIENCES SYSTEM IN OASIS SPACE: CASE OF TOLGA

Abstract: Assessing an architectural or urban ambiance remains an uncertainty in the absence of a scale for its measurement and its design. The research, specifically conducted in an oasian space, aims to innovate a pragmatic tool of evaluation and application for the conception of the architectural and urban ambiance perceived on the limits of the places' senses and identity. The investigations, which took place on vernacular sites of great Oasian identity in Tolga, are a collection of subjects' drawings. The ambiance, as a system of a great complexity whose value exceeds the sum of its components, is treated through the verbalization of Kevin Lynch's mind map and the entropy of Claude Shannon's communication theory. The analysis checked the periodicity of the appearance, the meanings of the natural identity indicators and those of the built frame on the subjects' drawings. The syntax diagram, result of this research, forms a pragmatic vernacular reference tool for measuring and evaluating the architectural and urban ambiance in oasian space. It is a scale of natural environment, architecture and urban planning indicators, constituting an orientation table for the conception of the oasian city of today and tomorrow.

Key words: ambiance, oasis space, perception, conception, vernacular, Tolga

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Introduction

The qualitative dimension of the desert space can only be felt, reconceived or even reconstructed, through the staging of a set of meaningful elements taken as a set of subtractions. The desert value cannot be perceived where there is abundance, surplus and saturation, since it symbolises thirst and hunger, killing sun heat, purification, emptiness and ephemeral human traces on the sand (Ghobâdi, 2012).

This casts its shadow, rationally, on all aspects of life and especially on architectural and urban productions in this infinite expanse, making the desert a human construction (Clouet & Dollé, 1998). Paradoxically, living in the desert does not mean "lack of comfort or convenience" or even "an undesirable existence". Sustainability, in its optimal values, made sense.

The oasis space, as a tiny portion of the great desert container, marks this illustration and floats to the surface an integration and adaptation way of life, preserving the fragility of its ecosystems and their vulnerability (Côte, 1997). Its ambiences impose their qualities, their originality and their belonging through the magic of a complex, interactive, particularly perceptible and strongly identifiable system. The whole reminds of the desert.

Ancient civilisations that passed through these impressive and coveted geographies (Bisson, 2003), convey an understanding throughout time, emphasising its relevance for the durability of places and man in a continuous and irrevocable journey of dependence and mutuality (Kilani, 1992). However, the evolution of the communication means and the opening up of these territories to information had put this relationship as an issue and the consequences took place in exogenous, imported and repulsive representations.

In southern Algeria, Saharan urbanisation knew a galloping and ceaseless growth (Côte, 2005). Subject to the objectivity of legislative texts, it is moving further and further away from its oasis identity and becoming anonymous. The brand image, imposed by globalization, brings our cities back to the sense of a graft refused by a radically different organism. Palm plantation had not been able to recover neither the quality of the sensitive places nor their determining specificity. This situation had sharpened the need to try to define the oasis town, not only through its architectural and urban components, but also through a more significant, evaluative and encompassing unit, which brings together the material and the immaterial and treating the places sensitivity (Pliez, 2011). In an attempt to recover the oasis city, the notion of ambiance, fundamentally, takes a primordial place in the research path.

Returning to the vernacular productions, is a great opportunity to answer questions related to the quality of oasis and to understand and apprehend the components of their ambiences' design that form, in fact, the fundamental unit of measurement of their adaptation to hostile, fragile and vulnerable environments.

The objectives of this research do not form nostalgia of reproduction nor a simple recall of a socio-cultural representation defined in space and time. However, they constitute an attempt to put into reality a scientific and rational evaluation system, and a scale of measurement of the oasis ambiance on which is based another attempt of recovery dressed in modernity, technology and openness of an oasis city of tomorrow.

Theoretical framework

The ambiance, meaning and etymology

By its systemic quality, this complex whole manifested itself according to the referential diversity, which marked, every time, the supreme value of the senses of the subjectivity behind which the man occupied the heart of the reference (Brossard & Joly, 2004). This great receiver of the senses is considered as the unique qualifier of the substance acquired from an interactional effervescence of an infinity of surrounding components, acting on the whole of its combined sensations. It is at the centre of the whole, receiving the emitted information, analysing their qualities, combining their effects, manipulating their data, processing their combinations and judging their results.

Systemic aspect and sense of complexity

According to the studies conducted by Jean-François Augoyard, Arnaud Piombini and Amphoux Pascal, the ambiance is no longer a simple physical conception or a determined order of a decor resulting from an urban or architectural installation; it is a matrix of great complexity with several variables, which makes enjoy the combinations of the various strata of the sensory (Amphoux, 2004). It is a temporality of perception which summarizes the whole of the effects emitted by an environment (material and immaterial) received by a perceiver. Thus, bringing out the contextuality notion and the big subjectivity related to the psychological conditions, to the cultural identifiers and to the capacities of reading, interpreting and observing what the subject carries.

It submerges the concrete way of life staged through an appropriation of the man in his space and shapes his cognitive and sensory representations that reflect his interactions with his environment, and give birth to the social, cultural and sensitive significations of places (Piombini, 2013). Thus, considered as multi-sensorial, the ambiance, as an indicator of territoriality, as a sense of belonging, spatial and socio-cultural identity, also draws its multiscalarity, which generates the personalization of the act and behaviours. “This complex notion is analysed jointly by the physical and social sciences, which attempt to associate measurable objective elements, ..., more subjective elements which differ according to the differential uses and perceptions of the sensitive ..., and characterizations pertaining to an urban aesthetics of multi-sensoriality which are not reduced to the only aspects of the visual form” (Chadoin, 2010).

Thus, the notion of ambiance carries a more important anchor in the evaluation of spatial qualities, which are not limited to urban and architectural orders, but also allows to apprehend and to seize other determinants of cultural order of the report to the space.

The notion of contextuality, very attached to the meanings of ambiance, as seen by the French sociologist Louis Quéré, comes in two different types. The first one expresses “a context of accomplishment” which is the synchronized situation of a container during the action. The second type concerns “the context of the report”, which is a past described situation related to a completed action. This typology refers to the complexity of this component, which is very marked by the variables of time and space.

Linked to the human sensations, the ambiance could only be seen in this field of definition. The malfunctions that can occur in the various systems of the human body take away from the quality of the ambiance and bring the subjective quality of the evaluation to a higher level of uncertainty.

Formal aspect and conception conflicts

If the ambiance makes sense in an abstract and spiritual human sphere, it is infinitely dependent on its context, which forms its large container of details, diversity, interactions and movements. “All relationships, whether conflicting or not, are strongly determined by the context in which they take place. Thus the "context" is not, as is too often believed, a simple setting in which a scene is played out, but one of the elements of this scene in its own right, in the same way as the identity of the protagonists, the nature of their relationship or the messages they exchange. Like them, it is a stakes holder, codes and values, and as much as them, it orients behaviours. More specifically, its function is to structure the relationship”. (Picard & Edmond, 2012). Although difficult to provide, its definition tends towards the static and dynamic whole producer of impressions and attitudes to an individual who is part of it.

The context, for an ambiance, could be a physical or situational environment, which gives rise to a material or symbolic reading in a set of circumstances that help to understand the message, of which the place and the time are the most distinguished. As it is the carrier of relational norms, codes of communication, rituals of interaction, it exerts a strongly structuring effect on the relationship (Picard & Edmond, 2012). Thus, the context exports its qualities in full to ambiences that are happening there, by staging their relational forms, offering them the exciting force of the background and by qualifying them with its attributes. A musical ambiance is the output of a context of musical instruments, musicians, arrangement, composition…

All the ambiance manifestations cross paths in a common area, which is “the form”. Of course, the term does not refer only to the geometrical sense of the situation, but to the sense of the immutable and unalterable reality as Plato considered it.

If Aristotle saw that the form is part of “four causes” that explain the existence of the object, and that it is its ordinator and the determinant of its essence and its perfection, the mind plays the role of generator expressing the judgments and manipulating the orders within the limits of its sensible quality. Immanuel Kant distinguished four types of form: One of sensibility and intuition, of the custom, of the reason and of the imperative. This typology, installed on a deep philosophical thought, saw that “the form is the mode of elaboration of a given by means of the knowing conscience” (Rudolf. E, 1994). Which implies that the form is not always the seen, in the sense of “the observed”. However, it could also take place in the seen of the imaginary.

In the projection disciplines, the passage from the imagined form to the concrete one constitutes the great mission of designers. Thus, whether it is spontaneous or conceived, the ambiance as a “…sensitive approach of the built environment which implies as well the sound, luminous, olfactory, thermal, tactile, kinesthetic world… and pleads in favour of multi sensorial and multidisciplinary approach (human and social sciences, sciences for the conception, sciences for the engineer” (ambiance. net), takes its form evaluated on the mirror of the imagination and the perception, which redraw the reality according to the knowing conscience, behind which rest the culture, the history, the society, the belonging, the nostalgia, the knowledge, the experience…

Considering the ambiance as a temporality of life, its elementary and basic forms are, in turn, the results of sensory interactions. Sight, hearing, smell, taste and touch converge

towards a perceptive absolute value defined according to their influence's intensities, presence and construction of the holistic ambiance.

Given its systemic form, the ambiance changes value along its temporalities according to the dynamic interactions that result from all kinds of associativity and introduction of its elementary components. The order of the assemblies shapes an order of perceptions conditioning, in its turn, the order of judgments and senses in the subject. Thus, the feeling resulting from a passage of a lighted space towards a dark space is practically different from a passage that happen in a reversed direction. On the other hand, a poem associated with an accompanying music, followed by an action on a scene of theatre, is not worth the same ambiance, for a director, that an action associated with a poem followed by music. It is the proper sense of complexity and the concrete image of the conflict that the design generates on any plan of action and more particularly on the plan of architectural and urban ambiences.

The ambiance is strongly linked to the human sensory. However, the imaginary, like the concrete and the real, could carry its effects and diversify the ambiance qualities. The vision is the locomotive of any evaluation no matter what the ambiance is. It excites the judgment related to the form. In other words, the reports, the proportion, the rhythm, the geometry, the aesthetics, and the surrounding decorations' architecture, are the drawing of the light, which form, practically, the fundamental transmitter of the signals. However, even in the concrete absence of this system, the brain launches estimated illustrations of the luminous ambiance, for performance's reasons of the global ambiance.

Light, manipulator of the reliefs and generator of the forms, could provoke, at the perceiver, a diversity of senses: of the diviner and the sacred, of the consciousness and the knowledge, of the time, of the scale and of synthesis... Its psychic incidences are the conductors of the body reactions.

The sense of smell, also, is a transported image before being a simple detection of an atmosphere. It is accompanied by a physical setting, in the presence of vision, and by an imaginary setting in its absence. However, the olfactory ambiance is a genesis of interactions dominated by odorous representations.

In the same way for the thermal, sound and taste ambiences, the sensory communication accentuates the levels of dominance, decides the ambient quality and triggers the corporal and cognitive reaction.

Approaches and epistemological positioning

Modelling an ambiance, in general, and oasis one in particular, remains an intention whose mastery is relatively delicate. In all cases, its conception, in the architectural and urban production, has often come up against its intrinsic complexity (Siret, 1995). The ambiences modelling methods develop with the evolution of the computer tool. However, the temporality, as much as property of the ambiance, is a unit of phenomena's multitude interaction, which are not any more in an iterative, successive and repeated unfolding, but on the contrary, dynamic, variable and often without possibility of prediction. Its randomness raises problem of concretization as much as result of the architectural and urban design.

The current research focuses more on the modelling of phenomena, situations and objects whose elements of their existence and manifestation are defined and

manipulated by the computer tool that treats “the infinitely small” with great precision. In the ambiance subjects, several softwares allow a variety of simulations that allow understanding the behaviour of the studied object in previously defined conditions (thermal, luminous, sound ambiences…).

Two modelling types accompany the majority of research work: Imperative modelling and declarative modelling. The first type intervenes only at the final phase of the design process, when the selected solution is already almost finalized (Hégron, 2003). The second is an approach that aims at apprehending the causality of the effect.

Approaches, and previous experiences

Between the design objectivity and the perception subjectivity, previous research that dealt with the evaluation and measurement of mental representations proposed empirical approaches through survey methodologies in which cartography was the fundamental tool for recomposing mental images. These innovations, stemming from various research programs, sought a reading of the invisible meanings that architecture and urbanism emit. They converged, by the emergence of these approaches, towards a development of the sensory brought by the landscape and the ambiance suggested by the urban environment in the cities.

Until the culturalist reflections on perception, theorized by William Morris, John Ruskin, Ebenezer Howard and Camillo Sitte (1840-1940), the visual sequence is the visual perception analysis approach towards the urban space. However, the first codification of the analysis of visual sequences goes back to Gordon Cullen who proposed for the first time the term «serial vision» for the representation, in his book *Townscape* in 1961, through sketches drawn by a perceiver along a pedestrian route. At the same time, the teacher-researcher Kevin Lynch was working on innovations that expressed perception through new visualization systems.

Kevin Lynch Visualization Systems

The perception, in the field of the evaluation of the ambiances, was the component carrying the complexity. Its units of measurement remain, in spite of the incessant work of the researchers, closer to the supposed uncertainties than to the real values of an abstract felt situation. However, and in a purely scientific context, a rational staging of dynamic interactive relations resulting from a conceptual order of a set of physical and mental components could bring the ambiance back to its expected values with a minimum of uncertainty.

In Kevin Lynch’s books, the mental representation notion took the sense of an "evaluation" which is none other than a series of subjective perceptions giving rise to an image of the city. Which gathers its visible, architecture and urbanism, to its invisible translated by the perception of the man, as quoted in his book “The image of the City” published in 1960.

The mental map of Kevin Lynch, established, essentially on the notion of “imageability”, marks the urban forms presence intensity in a given temporality, provoking in the perceiver a force of recall, appreciation or repulsion. This resultant is the general rule that Lynch proposed for a voluntary urbanism susceptible of adopting a very particular life to the specific attributes and for deeper ends to the limits of the sensorial.

Communication and Shannon entropy

The perception strongly bound to the immaterial and to the signals, transmitted by the urban environment, is subject to the hazard of the instability of the whole system acting on the man. Indeed, if the entire system exists by the existence of its components, its perception by the man remains fragmentary because of the non-apprehension of the connections, existing, or that can exist, between its elementary constituents and their interactions in time. The human mind drags its own explanations according to what has been apprehended. This confirms that reality is not unique but variable if it is still based on what each individual could apprehend. "Of all the illusions, the most perilous consists in thinking that there is only one reality. In fact, what exists are different versions of reality, some of which may be contradictory, and all of which are the effect of communication and not the reflection of objective and eternal truths" (Watzlawick, 1978). Communication is the determining and signifying driving force of perceptual quality.

Communication and spirits of places

By considering the variety of senses resulting from the variety of the apprehension, the perception became an output of a functional system transmitting signals that form, practically, the keystone, for a personal and instantaneous evaluation. Indeed, this inconstant and periodic mental situation for an urban environment, by the effect of the feedback, makes all the surrounding system an unexpected organization as Edward Norton Lorenz specified: "[...] I realized that any physical system with a non-periodic behaviour is unpredictable" (James, 1991). Communicating with the urban environment, acquiring its complexity through this really sense. The man, fundamentally concerned by this communication, is, from a descriptive point of view, flooded by the quantity of information emitted instantaneously and continuously by his environment that forms the great entity to which he belongs. This entity, however, in spite of its complexity, remains detectable, understood and determinable, not only through what is seen, but also through a second mode of access formed by its emitted senses. William Wimsatt explained that "an entity, whether concrete or abstract, is robust if it is accessible, that is, detectable, measurable, derivable, definable, predictable, etc., in a multitude of ways, through different modes of access, and if it is robust, it is allegedly real" (Jodoin, 2015).

Thus, the detection of a concrete entity is practically feasible by a multitude of tools and means of learning and investigation. The abstract one could have several illustrations to which impose themselves the cultural funds of any perceiver, the quality of the surrounding organization and the intensity and the clarity of the messages emitted by its components.

Places speak. Perception remains a selective and hierarchical translation of definition and identity, constructed by the references to which the entire messaging is directed.

The systemic approach and Shannon's entropy

If the sequential aspect of the architectural and urban ambiance is an unfolding of dynamic interactions in time, between a number of components of an environment, and a sensitive informative background of an individual, its unforeseen events define its entropic qualities. The ambiance as a temporality, is a systemic resultant, and as a path: a function open and accessible to change factors and consequently to the variations of its own values.

Systemic thinking, as much as a cognitive approach, shows that regardless the system form, it is always possible to approach it in multiple ways, and thus generate different reality views (Martin, 2016).

In the science of systems, any "...organization seeks order and determination, and strives to reduce the ambiguity, uncertainty or disorder generated by the actions and interactions of its various constituents" (Hogue et al., 1988). However, it is the ambiguity of the system's behaviour that generates its complexity, which, in turn, reaches high levels through the introduction of the unexpected and the unpredictable. "A particularity of complex systems is to be composed of several subsystems (or subunits) with several levels of freedom depending on several levels of organization" (Jodoin, 2015).

Jean-Louis Le Moigne expresses the system s complexity in five levels where the fifth is related to the unforeseen man behaviour (imagination, design, culture...) (Figure 1).

The entropic aspect, obviously, comes to settle in the uncertain values that can have an ambiance in time, by the association and the adhesion of unexpected factors: "a smile can change an ambiance" (William Arthur Ward quote). Thus, this uncertainty, at the heart of systemic thinking, formed the basis of several paradigms that sought to express the systems behaviour under the unexpected effect.

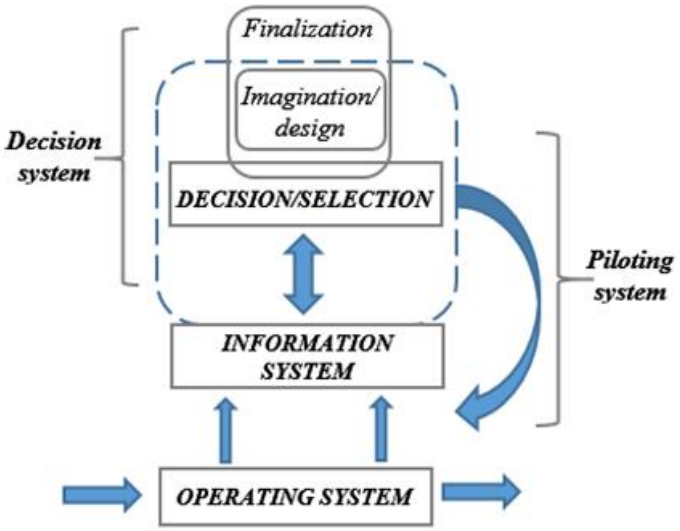

Fig. 1. 5th level of system complexity (source: Le Moigne, 1977)

The Claude Elwood Shannon paradigm appeared in 1948 was a revolutionary act in the communication field. It highlighted the possibility of reproducing a situation through a signal as stated in his book *The Mathematical Theory of Communication*. "The fundamental problem of communication is to reproduce in a point, either exactly or approximately, a message collected in another point" (Claude & Warren, 2018). This theory made a clear distinction, for the first time, on the roles of the source, of the channel and the recipient; of the sender and the receiver; of the signal and the noise (Rioul, 2018).

By considering any message as resulting from a choice in a set of alternatives, Shannon defined its entropy according to a probabilistic model. To simplify his theory, the uncertainty recorded on the quality of the information emitted by a source, for a receiver, is an interval of predicted and selective forms which mathematically obey a logarithmic relationship established under the following formula (Shannon, 1948):

$$H=\sum_x p(x) \log_2 1/(p(x)) \quad (1)$$

where H: Entropy, P: Probability, and x: Variable.

This relation expresses the sense of the "periodic or aperiodic" of a system. The greater the entropy, the greater receiver's uncertainty is. In other words, a repetitive signal appearance, within a system, marks a strong intensity of a variable presence, of a sense or of a reference. Consequently, a definite value, which reduces the entropic values. This allowed Shannon to bring the reproduced situation closer to a real situation and to ensure a reliable reading of the signals.

Epistemological positioning

The spread of the theory of Lynch and that of Shannon is a stage on which our approach of evaluation and measurement of the oasis ambiance settles. The construction of our heuristic model requires a personalization of the reflection order, a systemic rationality and a corpus specification.

Model and modelling process

The model, in spite of its polysemous quality, remains a descriptive, explanatory and apprehension representation of the systems, regardless of their nature. Taken for prototype in its simplified senses; it remains a cognitive illustration in all cases of situations. For Nelson Goodman, the model meaning, between the concrete and the abstract, remains ambiguous (Nelson, 1976). We understand that the ambiguity that a model could undergo is relatively linked to the treated subject, and especially recorded on the analysis of the systems where the model would touch the symbolization, the meanings and the abstract.

"For Rosen, establishing a modelling relationship consists in considering that the events we observe are not arbitrary, but rather obey principles, and that the relationships between the events produced by these laws and principles are understandable. Thus, Rosen clearly distinguishes between a causal relationship, in a natural system, and an implication, which is the relationship that can be deduced from the analysis of the corresponding elements in the model" (Bonin, 2014). Robert Rosen proposed a modelling process diagram that expresses the systems readings, from causality to implication, thus addressing two catalytic concepts of complexity, which are encoding the concrete and decoding the abstract (Figure 2).

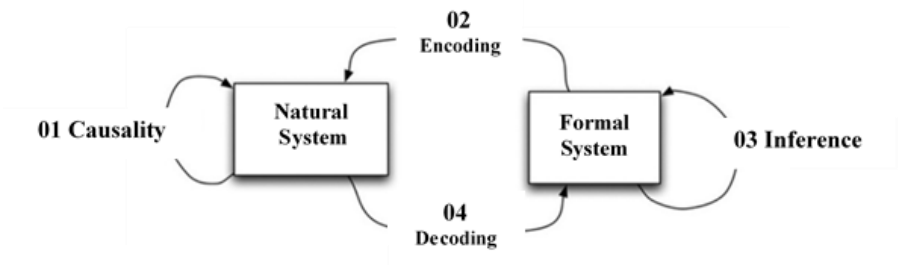

Fig. 2. Robert Rosen's Diagram of the modelling process (source: Rosen, 1985)

Between the perception complexity and the design conflicts, faced by professionals, lies the biggest question of this research that leads us to model the oasis ambiance, seeking to understand its causality and decode its signals.

Heuristic model

While adopting the notion of model, expressed by René Guitart, who refers the idea of the model to a pulsation between ideal to realize and empirical realization of an ideal (Guitart, 2007). The construction of the heuristic research model (Figure 3) claims an in-depth empirical analysis of an existing oasis ambiance state for approximating an ideal sense of projection.

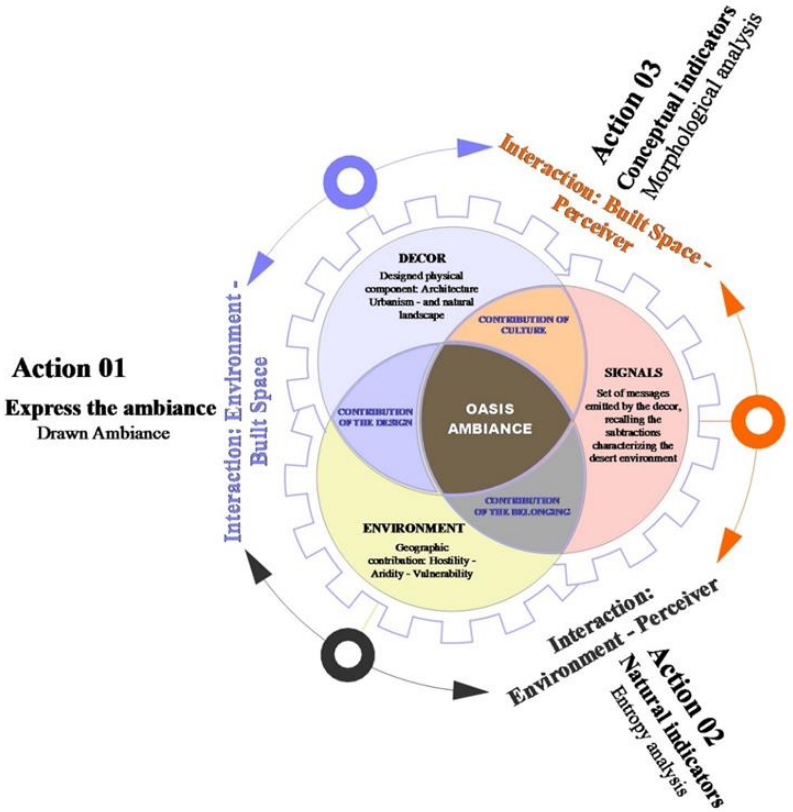

Fig. 3. Heuristic model for the analysis of a vernacular oasis ambiance

In a systemic logic, the oasis ambiance comes to settle in the material and immaterial intersection area. These interactions concluded between the environment, the architectural and urban built framework and the signals emitted by this entourage, form a sensory temporality, perceptible and felt (Belakehal, 2012). This resulting effect whose causality forms and its decoding signal we are looking for will be treated, within the model, in three actions:

Action 1: Expressing an oasis ambiance by smoothing the subjective effect carried by the description. This smoothing action aims to eliminate any influence, direct or indirect, on the subject, from his experimental environment. The subject, thus, will transmit its oasis ambiance experienced in the Ksours of the Zibans, through drawings and descriptive sketches that will form the basis of an analytical work in other levels of the model.

The drawings constitute a statement of the oasis ambiance material component that brings together the natural and the built environments. In other words, an expression that summarizes an interactive value combined by the presence of two elementary components with different natures: the natural container formed by the oasis environment and the human production shaped into architectural and urban forms. It is a morphological reading through which the contribution of the design takes place in front of the requirements of a highly specific environment.

Action 2: The contribution of the environment on the perceiver will be read through the contents of the drawings that refer to the subtractions of the desert space. The senses concluded in presence intensity, deciphered by an entropic analysis of the drawn elements, will highlight the oasis quality of the lived space and will impose the effect of belonging to this environment.

The hostility, fragility and vulnerability of the oasis environment are messages emitted by the environment itself, received by the perceiver and conveyed by this latter to his drawings. The interactive dynamic relationship between the perceiver and the environment will reveal indicators of the oasis quality.

Action 3: The representation mode carries by the built framework in the Ksourian space is a union between senses carried by the form as much as human action and motor senses attached to the life quality imposed by a demanding environment. The interactive relationship between man and his architectural and urban productions refers to his cultural qualities that transmit his expression and representation modes, the quality of his actions and his standards. The responses provided by vernacular architecture are other messages that refer to the paradoxical characteristics of the desert environment in general and the oasis one in particular.

Results and Discussion

Investigations, and the model application

It is worth repeating that the new city of Tolga is an urban and architectural anonymity. And that the research refers to the vernacular oasis ambiance for an authentic modelling, in an attempt to recover the original attributes of this locality and those of the oasis city of tomorrow. All fieldwork took place at the three Ksours of the great palm grove of Tolga (Figure 4).

Fig. 4. Locations of Ksours – Tolga

Action 1: Exploration of the system

At the Ksar of Tolga (Figure 5), as well as the one of Lichana and Farfar, the sites exploration revealed a physical hierarchy and a functional one. The first concerns the settlement environment and the built mass in its compositional dimension, while the second concerns the urban fabric, the building geometry and the urban functions that take place there.

Fig. 5. Ksar of Tolga (source: Alkama, 2001)

Physical hierarchy

Two fundamental components very significant and determining come to define this establishment:

- The palm grove: it forms the great green carpet that embraces the Ksar in a drowning that makes it a tiny particle, and encloses it in the requirements of its extent and its fragile ecosystems.
- The built mass: it is a very small portion, shaped and designed by a local community, forming its living space.

A great relationship of interdependence links between its two components, translated into a bond carrying, on the one hand, the sense of subsistence, and on the other hand, the need for a coexistence that manages their sustainability.

Functional hierarchy

On a smaller scale, the urban configuration of the Ksar refers to different functional levels (Figure 6):

- A primary level of housing: Which takes up the largest portion of the Ksar, and which is the product of houses juxtaposition.
- A secondary level of commerce: which resides in the large streets that lead to open areas and central places of exchange, communication and worship (Figure 7).
- A tertiary level of distribution: which ensures the service in arborescence by bringing together, on the one hand, the whole of the dwellings with the centre of the Ksar, and on the other hand, the interior of the Ksar with its entourage of palm trees.

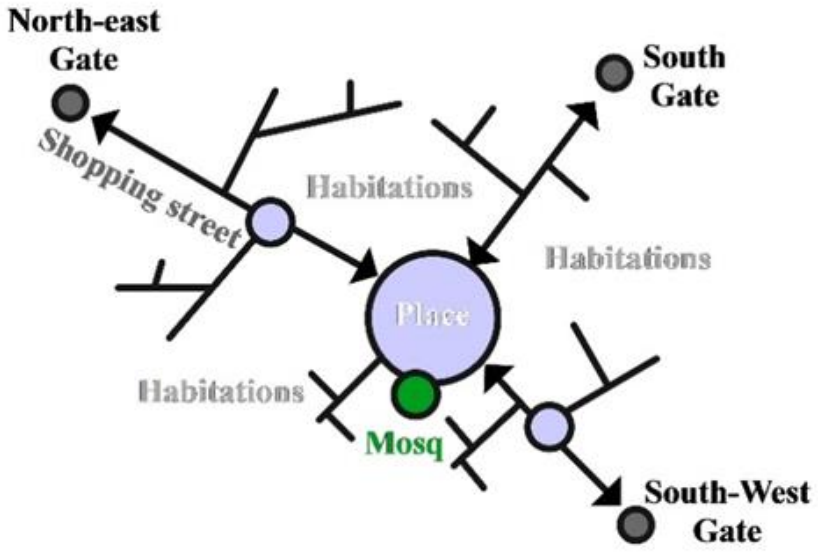

Fig. 6. Road structure - Ksar of Tolga

Fig. 7. Shopping Street - Ksar of Tolga

The spatial and functional hierarchical form had multiplied and diversified the Ksourian ambiences that made this living space go beyond its geographical and statistical definitions, to other definitions of personalization, adaptation and "vernacularization". It is an own production that identifies itself in space and time, lasts, expresses itself, and ensures a vital compatibility of coherence, integration and belonging.

First deduction: Spatio-sensory referrals

The paradoxical quality of the desert environment is the pulsating force of the oasis quality. All the elements drawn were reminders of the subtractions of a hostile, fragile and vulnerable environment.

Action 2: Implications and natural indicators

Action 2 of the heuristic model consists in exploring the sites and frequenting the natural systems expressed by R. Rosen's modelling scheme. The silence of the subjects, having visited these places (Figure 8), is translated into a verbalization of supports drawn in different locations and during different times.

Seeking to live the real values of the oasis ambiances, several companions were organized in summer, in the Ksar of Lichana whose morphology is still legible and the places still tell its stories.

The selected season is the most significant, in an order of scientific research, for a hostile, fragile and vulnerable environment. On the other hand, the pandemic of Covid19 casts its shadow on the initially scheduled course of this mission by spreading it over three consecutive summers (2019-2020).

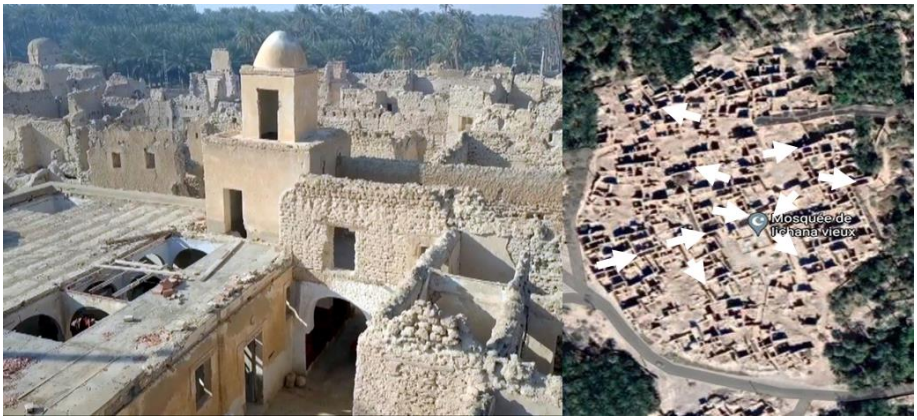

Fig. 8. Ksar exploration companions - Lichana

Having taken a hundred sketches in three separate visits, with the participation of different social categories (academics, artists, users, students and architects), a first level of involvement and decoding of oasis senses, by emission of the natural environment, appeared by enumerating the references to the subtractions of the great desert container (Table 1).

Tab. 1. Natural indicators

Natural indicators (Context signals)			
Referrals	Palm tree	Sun/Shade	Water
Hostility	Saharan plant species	Long and aggressive sunshine	Seguia pipeline
Fragility	Saharan ecosystem	Rarity of life	Scarcity
Vulnerability	Adaptation to water scarcity	Repulsion	Vital condition
Rates	98%	70%	2%

Second deduction: Detection of signals from the natural oasis environment

The palm tree: 98% of the drawings are contained in this figure. It is also present in the exterior space as in the interior of the houses where it takes other aspects: Posts - Lintels - Beams...etc. In situations where it did not really exist on the field of vision (voluntarily selected), subjects had taken it up on their sketches (Figure 9). The palm tree is the strongest signal emitted by the environment, which refers to one of the great subtractions of the desert space – life.

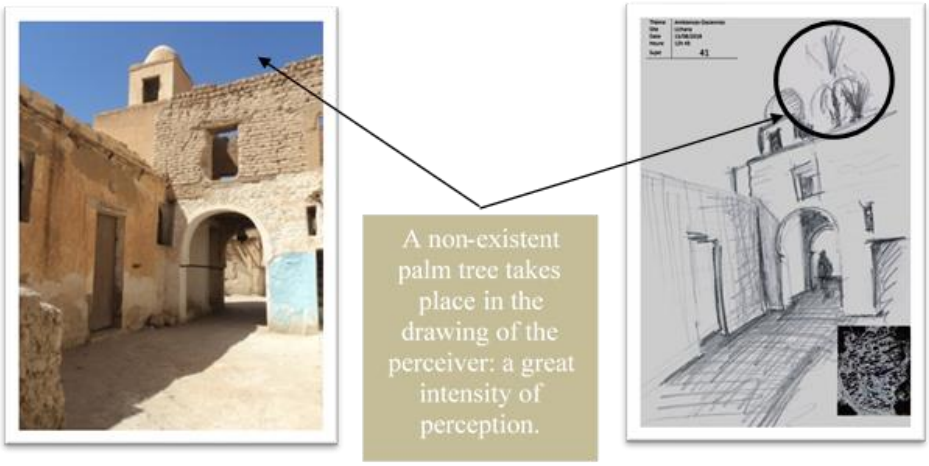

Fig. 9. Ksar of Lichana (Sketch: Subject 41, right)

Shade: The intensive and long-lasting sunshine, especially during the summer, hides its repulsive influences behind the shaded surfaces that invade all the road structure of the Ksar on the drawings of the subjects. This hot climate, unbearable in open areas, is another signal that the environment throws to indicate one of the characteristics of the desert space and more particularly Saharan.

Water: Water scarcity, as one of the desert subtractions, is expressed by its absence in the drawings although the palm tree refers to its existence. Obviously, in this type of settlement the limited appearance of water is along the seguias that form a local irrigation system.

Action 3: Implications, and architectural and urban indicators

This third action was on the signals emitted by the architectural and urban production, which is a material expression of the man towards his location requirements. A second implication and decoding level is approached by putting under light the drawings of the subjects. This operation had led to the following results (Table 2).

Tab. 2. Urban and architectural indicators

Urban and architectural indicators (Signals of the built environment)				
Referrals	Drop shadow	Proportion	Homogeneity	Closing
Hostility	Protective action	Great rationality	Collective reaction	Protective action
Fragility	Densification	Local resources	Defensive behavior	Unit marking
Vulnerability	Sense of the primitive	Sense of lowercase	Vital normative action	Defensive action
Rates	88%	60%	92%	75%

Third deduction: Detection of signals from the oasis-built space

Drop shadow: Practically, 88 drawings out of the hundred studied, having taken up a constructed order, ticked off large surfaces indicating the shadows cast on the ground, on vertical walls or spread under a blanket in the middle of the street (Figure 10). The oasis man sought to protect himself against high temperatures by:

- To become part of an adequate road network
- To confine himself in a closed space
- Allowing himself covered passageways offering a cool area of shade.

This human behaviour gives birth to a signal characterized by its built framework, which refers to one of the most important characteristics of the Saharan desert environment: its hot climate repulsive, while accentuating the sense of protection.

Fig. 10. Ksar of Lichana (Sketch: Subject 5)

Proportion: The notion of the« just necessary» is strongly read on the drawings having touched the Ksours building framework. In an environment that is difficult to access because it belongs to an expanse of an unlimited desert, the minimum is an asset for a certain durability and continuity of life. The heights recorded in the covered spaces of the streets, the lanes sizes, the openings, and the small bays in loopholes on the frontages, excite a strong signal of a site in subtraction and in withdrawal (Figure 11). The human scale made the unit of measure of it.

Fig. 11. Ksar of Lichana (Sketch: Subject 19)

Homogeneity: The indifference reflected in the urban landscape, in the drawings of the subjects, refers to a collective understanding of a locality that aligns itself to face an environmental hostility. The compact built mass is an illustration of a severe and strict normative system that signals a force to protect itself in common.

Closing: All the views backgrounds, on the drawn supports, record a block of the visual field. The escape of the perspective in any situation, in the urban fabric, is at a short distance from the observer, resulting from the broken or sinuous form of the alley, or from a deviation-giving rise to a new orientation. The signal emitted by this blocking of perspectives, which begins with the geometry of the streets and alleys and ends with the «stop» of the dead end, is a designation of the closed, the surrounded and the locked.

Decoding and syntactic values of signals

In a final decoding phase of the places signals, which allows validating the Outputs of the system, which will return in their turn in feedback in Input, apprehend the syntactic order of the senses emitted by the physical component, is an evaluative structure of the oasis ambiance. This step consists in processing the data in two different levels.

Syntactic definitions

In order to mathematically formulate the conjugations and syntactic order of the meanings carried by each physical representation of the natural or built environment, the research adopts a unit for each meaning expressed (Figure 12).

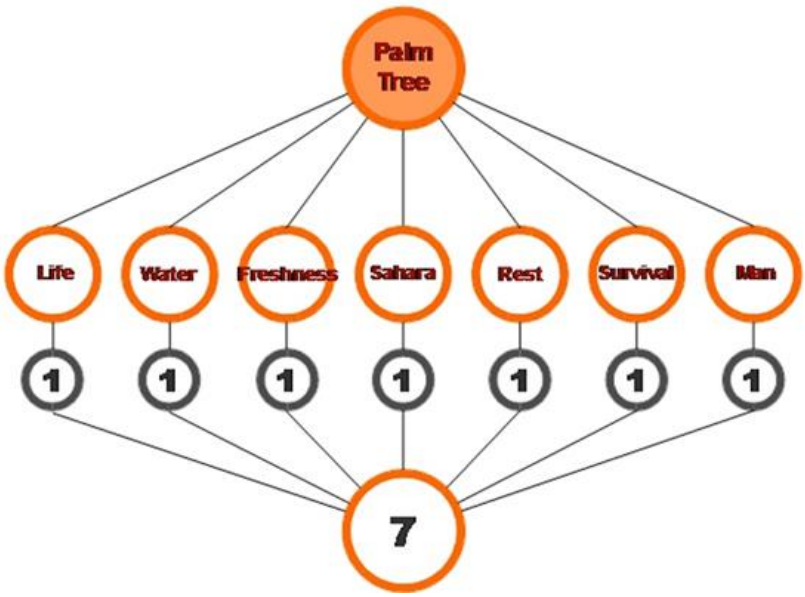

Fig. 12. Syntactic development of the palm tree

Thus, all the indicators concluded from the analysis of the drawn supports will have a numerical value according to the references they emit and the implications they carry within the oasis ambiance as a system.

By approaching a new research technique, which I will call "Sense-syntax", the oasis ambiance will be treated on a first numerical scale of evaluation (Table 3).

Tab. 3. Indicators, and decoding of senses

			Indicators, and decoding of senses							
N°		Indica-tors	Sensory referrals							VS
1	Natural	Palm tree	Life	Wa-ter	Fresh-ness	Sahara	Rest	Survival	Man	7
2		Sun		Thirst		Sahara			Loss	3
3		Water in seguia	Life	Freshness		Scarcity		Survival	Man	5
4	Built F.work	Shadow	Chaleur		Fresh-ness	Protection		Assault		4
5		Propor-tion		Little		Protection			Unavail-ability	3
6		Closing				Protection		Assault	Defense	3
7		Homo-geneity	Agreement			Collective		Limited	Norm	4

The numerical value that any indicator of the oasis ambiance can have will form its perceived power in any appearance on the drawings of the subjects.

Periodicity and entropic order

The entropy measurement in an oasis ambiance, will determine its periodicity qualities and the appearance uncertainties degree of its components in its global effervescence.

Given a sum of probabilities, each indicator entropy is assessed according to the formula of Shannon (Table 4):

Tab. 4. Entropy of indicators of an oasis ambiance

	Entropy of indicators of an oasis ambiance						
	natural Indicators				Built space Indicators		
N°	1	2	3	4	5	6	7
Indicat.	Palm tree	Sun (Shadow)	Water	Drop shadow	Proportion	Closing	Homogeneity
App/100	98	88	2	88	60	75	92
Prob.	98/100	88/100	02/100	88/100	60/100	75/100	92/100
	0.98	0.88	0.02	0.88	0.60	0.75	0.92
Entropy	98/100 x Log2(100/98)	88/100 x Log2(100/88)	02/100 x Log2(100/02)	88/100 x Log2(100/88)	60/100 x Log2(100/60)	75/100 x Log2(100/75)	92/100 x Log2(100/92)
	0.0285	0.1622	0.1128	0.1622	0.4421	0.3112	0.1106
Period	Very periodic	periodic	periodic	periodic	Uncertain	Less Periodic	Very periodic

The numerical values recorded on the entropy of each indicator reflect the degree of uncertainty of its appearance as much as component in the large physical container of the oasis ambiance. The closer the entropy is to zero, the greater is the periodicity, and the more likely the appearance of this element is expected. According to the calculated results, this leads to conclude that the palm tree and the homogeneity of the built environment are two fundamental components with a high periodicity in any urban or architectural environment within the human settlements within a desert environment and that the meanings of «life» and «protection» form the great paradox of the oasis space. On the other hand, the absence of water and its abundance in an oasis environment, and the uncertainty of seeing it, although felt through other indicators, is a structuring signal that configures the mental image in the perceiver and subsequently the deep meaning of the oasis quality.

The most important values of the calculated entropies refer to another level of interpretation. The human scale and the closure, although they flag down an intelligence and a «know-how» of precises time, they seem to give a breakthrough towards their development and the development of the man as much as first manipulator of his space.

This elementary decoding and the implication of the signals emitted by the decoration of the oasis ambiance are an action of deciphering of a perceived temporality, and their entropic values are a reading of its unpredictability.

By applying Shannon's formula on the oasis ambiance, its entropy will have the following value:

H= 0.0285 + 0.1622 + 0.1128 + 0.1622 + 0.4421 + 0.3112 + 0.1106

H=1.3296

The entropic order of the oasis ambiance is much reduced, which expresses the periodicity of the whole system with respect to its detected components, in dynamic interaction.

Nevertheless, and in a precised and restricted action interval, this quality gives rise to an opening and evolution possibility.

Syntactic diagram of the oasis ambiance

The perception as much as resulting from the cumulated senses of the places and the senses felt by an individual, escapes to the precision and to the certainty by its opening to the influence factors, which are subject to the randomness of the diverse events and to the unexpected actions of the physical or moral environment.

However, it is the inside and the deep of any projection, conception and architectural or urban organization. The measurement scale of the oasis ambiance (Figure 13), which gathers the place and the perception, the material and the immaterial, the concrete and the mental, is a whole, which exceeds the sum of the parts.

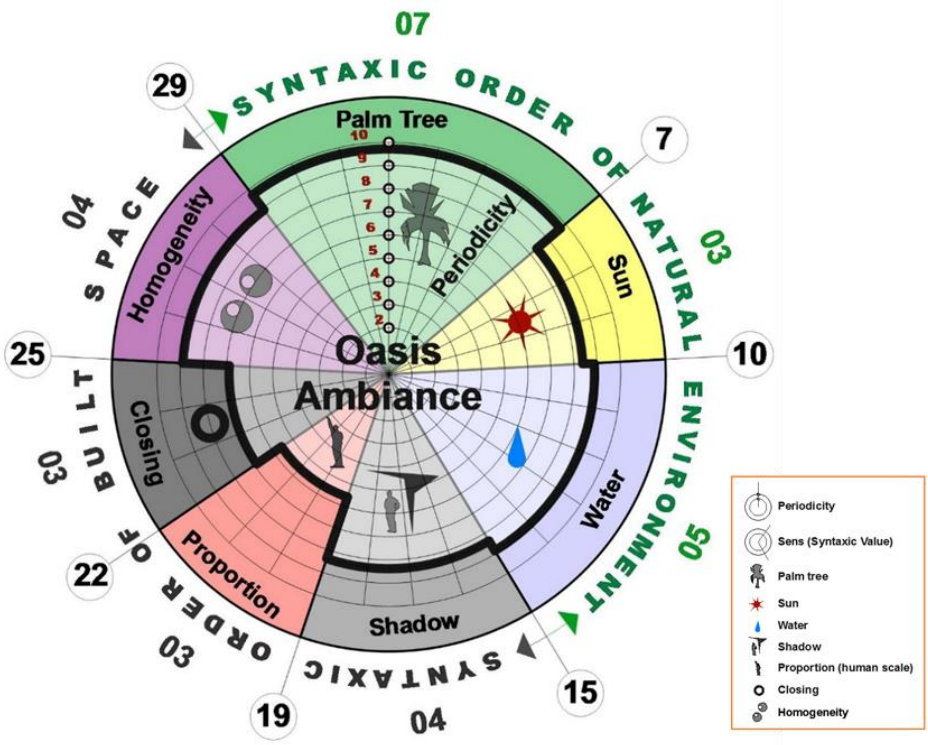

Fig. 13. Syntactic diagram of the oasis ambiance

However, the syntactic diagram, which forms the outcome of this research, is a general orientation table that combines the interactive effect of the oasis senses and spreads them according to their periodicity, within a self-regulating and self-organizing system, to conceive an identifiable, perceivable and authentic oasis ambiance.

This table, although based on fundamental components, is open in depth for a treatment of other sensory dependencies chains.

In the absence of a pragmatic tool for measuring and evaluating oasis ambiences, architectural and urban production, in this container of great specificities, remains a free field

for a multiplication of expressions seeking to satisfy a conformity to places. These actions, whose results reflect the image of conflicts related to design, give rise to unsuitable cities, inconsistent and only hold to the oasis space by their locations.

The research results, in a first stage, have put in concrete an evaluative system and a prescription of projection that preserves and combines the reading code of the oasis quality according to the periodicity and meanings, related to the natural constituents, linked to the place, and to forms resulting from the design of the built space.

The scientific support, having introduced the deep senses of probability, aligns with the perception laws and adapts to the gestalt and holistic form that presents the ambiance, at the limits of its definition. The syntactic diagram, in its first form, opens a developing perspective according to the "sense-syntax" that will condition its relevance and reduce its uncertainties.

The conception of an architectural or urban oasis ambiance is, ultimately, the guiding thread and determinant of the oasis city of today and tomorrow. Subject to the recommendations of the syntactic diagram, the ambiance in oasis space will take meaning and quality.

Conclusion

The desert space is defined by its subtractions, and the oasis space is defined only through its belonging to the first. This opposition of life and desert makes the paradoxical referential sense from which the oasis ambiance takes its definitions and its authenticity.

The contemporary oasis city seems to be lost between its socio-cultural origins and its opening to the world of information. This loss is behind the anonymity all the territory of the Ziban in Algeria is living.

Designing a city is designing life. The soil is only a white support on which the geometry could decide its forms. However, the conception of the ambiences is a manipulation of a whole to give to the city its own pulsations.

The old Ksours, known as «vernacular heritage», show an agreement with their environment. From subsistence to adaptation, the oasis ambiance is strongly manifested to the point where the perceiver feels reduced to a particle of an effervescent whole. Although they reflect systems of representation, expression, action and norms of a society and a specific time, they still preserve the duality and sustainability with the environment. Returning on these productions was a necessity to apprehend the blur, which embeds the oasis quality. Thus, the vernacularization, although it is a new concept, seems to impose itself, not to take back the old, on the contrary, but to recover a lost agreement, between the man and his environment. This attempt opens on the science and technology stakes on the local culture and its evolution.

The sequential form of the architectural and urban ambiance and its subjective side, have brought the research to treat it as a system where the interaction of its elementary components, marks its great complexity whose perception occupies a very high level. The systemic as much as approach had released the vagueness that encompassed a whole constituted by more than the sum of its parts, and the oasis ambiance is redefined at the limits of the sensory.

Previous experiences and research recommended an epistemological positioning that took into considering the meanings and periodicity of the large system that forms the oasis ambiance. The heuristic model, inspired by the work of Robert Rosen, constituted a pragmatic tool for an investigative work that adopt the verbalization of drawn supports, inspired by Kevin Lynch's mind map, and their decoding according to Claude Shannon's entropy.

Interested in architectural and urban ambiences, a smoothing of common data from the climatic and social atmosphere is adopted. The acquired results allowed the elaboration of a syntactic diagram that translates the conjugation of the meanings according to the signals emitted by the natural environment and the oasis built environment. This orientation table for the design of the oasis ambiance had highlighted the indicators of the natural environment and those of the built space and the importance of their appearance in a material setting. Their meanings express their syntactic power, and their periodicities launch the predictability of the oasis ambiance in time.

To alleviate the conflicts of its design and for purposes of adjustment, recovery and projection of the oasis city of today and tomorrow, the orientation table is a scale of measurement and a rationality of operational order for the realization of the oasis quality in architecture and urban planning. It is a first step in this research that opens other avenues of syntactic deepening on a prescriptive oasis typology dealing with the operational side of architectural and urban production in the oasis environment of the great Sahara.

Conflicts of Interest: The authors declare no conflict of interest.

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References

Alkama, Dj. (2001). Essai d'analyse typo-morphologique des noyaux urbains traditionnels dans la région des Ziban. *Courrier du Savoir, 1*, 81-88.

Amphoux, P., Thibaud, J. P., & Chelkoff, G. (Eds.). (2004). *Ambiances en débats*. Bernin: Editions A la Croisée.

Augoyard J. F. (Ed.). (2008). Faire une ambiance: Creating an atmosphere. *Actes du Colloque International sur les Ambiances*, Grenoble.

Bisson, J. (2003). *Mythes et réalité d'un désert convoité*. L'Harmattan.

Bonin, O. (2014). La carte, modèle analogique et calcul spatial. *Communication et Langage, 180*(2), 47-61.

Brossard, T. & Joly, D. (2004). Analyse quantitative des paysages: concepts, méthodes et applications. In E. Raynald & J-P. Pralong (Eds.), *Paysages géomorphologiques* (pp. 21-34). Lausanne: Institut de géographie.

Chadoin, O. (2010). La notion d'ambiance. *Les annales de la recherche urbaine, 106*, 153-159.

Claude, S. & Warren, W. (2018). *La Théorie mathématique de la communication. Le sel et le fer*. Cassini, Paris.
Clouet, Y., & Dolle, V. (1998). Aridité, oasis et petite production, éxigences hydrauliques et fragilité sociale: une approche par une analyse spatiale et socio-économique. *Sécheresse, 9*(2).
Côte, M. (1997). *Choix d'Espace, choix de société. Repère: La ville et l'urbanisation*. Editions Marinoor.
Côte, M. (2005). *La ville et le desert. Le Bas-Sahara algérien. Paris-Aixen-Provence*. Iremam – Karthala.
Ghobâdi, P. (2012). L'étude de l'espace désertique chez Jean Marie Gustave Le Clézio et Antoine de Saint-Exupéry. *La Revue de Téhéran, 78*.
Guitart, R. (2007). Figure, lettre, preuve: la pulsation mathématique au lieu de l'écriture. In F. Nicolas (Ed.), *Les mutation de l'écriture* (pp. 141-156). Publications de la Sorbonne.
Hégron, G. (2003). De la modélisation à la conception assistée par ordinateur. *Annales des Ponts et Chaussées, 2003*(107-108). https://doi.org/10.1016/S0152-9668(03)80004-9
Hogue, J-P., Denis, L., & Estelle, M. M. (1988). *Groupe, pouvoir et communication*. De l'Université du Québec.
James, G. (1991). *La théorie du chaos*. Flammarion.
Jodoin, L. (2015). Emergence et entropie: une analyse critique des stratégies explicatives émergentistes basées sur le concept d'entropie [Thèse de Doctorat, Faculté de Philosophie, Université Panthéon-Sorbonne]. https://theses.hal.science/tel-01228070
Kilani, M. (1992). *La construction de la mémoire, le lignage de la sainteté dans l'oasis d'Elksar*. Labor et Fides.
Le Moigne, J-L. (1977). *La théorie du système général (théorie de la modélisation). Collection Systèmes-Décisions*. Presses universitaires de France
Martin, M. (2016). La pensée systémique analysée à l'aune de l'entropie. *Nouvelles perspectives en sciences sociales, 11*(2), 81–104. https://doi.org/10.7202/1037103ar
Nelson, G. (1976). *Languages of Art. An Approach to a Theory of Symbols* (2nd ed.). Hackett Publishing Company.
Picard, D., & Edmond, M. (2012). *Les conflits relationnels*. Que Sais-je?
Piombini, A. (2013). Contexte spatial des ambiances urbaines et usage des lieux. Revue Internationale sur l'environnement sensible, l'architecture et l'espace urbain. *Ambiances, 261*. https://doi.org/10.4000/ambiances.261
Pliez, O. (2011). *Les cités du désert, des villes sahariennes aux saharatowns* (3rd ed.). Universitaires du Mirail.
Rudolf, E. (1994). *Kant-Lexikon*. Gallimard.
Rioul, O. (2018). Une théorie mathématique de la communication. Calcul et informatique. https://doi.org/10.4000/bibnum.1190
Rosen, R. (1985). *Theoretical Biology and Complexity*. New York Academic Press.
Siret, D. (1995). Modélisation déclarative des modulateurs d'ambiance dans le projet architectural et urbain. *Revue internationale de CFAO et d'Informatique graphique, 10*(5), 523-537.
Watzlawick, P. (1978). *La réalité de la réalité*. Essais.