Well-Organized Complexities: A New Theory of Life

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Abstract. Unfortunately, humanizing nature becomes the dilemma instead of the solution. Imposing improper man-made systems on existing realms would destroy them. Mostly, they failed to respond and coexist effectively with their surroundings. In fact, they need both, adaptive and survived qualities to compromise between inner self-organizing and outer space-occupying structures together. The degrees of adaptively organized-complexities, emergent self-preserving structures, are presented and estimated by unique adaptive dimensions (DA). In addition, other different dimensions (called survived dimensions/DS) are produced to measure the degrees of survivably organized-complexities and their evolving self-maintaining structures. Anti-patterns appear because of deliberated destructions that need to be repaired and ignorant interruptions that need to be completed. Hence, properly fixed and continually guided anti-patterns could be livable again accordingly. It is claimed that living patterns of healthy systems have well-organized complexities that can be detected, estimated and explained by new living dimensions (DL). They are sensitive parameters of wholeness as indicators of life. LAS (DL=DA/DS) is presented as a new formula to estimate living dimensions of (2D) systems according to their adaptive and survived dimensions. It is concluded that livable systems have specific living dimensions that approach to (DL≈1). Also, sustained systems have equivalent values of (DL≈DA≈DS≈1). Accordingly, it is possible now to recognize, trace and create optimal well-organized, coherent and livable systems. On the urban levels, these new findings open the way ahead to diagnose, treat and cure different unhealthy or inefficient performances of architectural and urban systems by optimal interventions. More different (2D) and (3D) ill-diagnosed systems would be of future hopeful investigations and researches.

Keywords: Living patterns; anti-patterns; living dimensions (DL); wholeness; optimization; LAS formula; LAS test.

1. Introduction
Living patterns are obvious signals of life. Their systems should not be dealt with as inanimate machines of rigid structures that could be entirely controlled from outside. Instead, they have flexible structures with intrinsic biological needs and high degrees of adaptive and survived tendencies. The issue is about having similar systems’ behaviors when responding to different stimuli by ultimate organizing of their complexities. Their structures tend to re-arrange themselves adaptively to save their entropies and to coexist survively with their surroundings. The question is about how to preserve these entropies by suitable adaptive responses and how to maintain them by proper survived behaviors as a coherent and harmonious whole.
Wholeness provides optimal organizing of these complexities to produce life. According to Christopher Alexander, it is defined as structures that exist in spaces by all various coherent entities (called centers). He explained how these centers are nested in and overlapped with each other. “It is possible that one day computer programs designed for cognition might be able to pick out these centers and rank order them by their degrees of life” [1]. Distinctively, it is claimed that living adaptively-survived (2D) systems behave alike when they respond to different stimuli. Hence, they should have both, appropriate self-organizing and optimal space-occupying, together. In other words they have flexible structures that can invest their potentialities to their upper extents economically to preserve their energies and to maintain their required information.

A different method of analysis is produced to investigate survived systems with their adaptive processes quantitatively. It can detect systems’ behaviors and estimate the degrees of their lives according to new living dimensions ($D_1$). These dimensions depend greatly upon the notion of having similar responsive and coexistent behaviors of the same adaptive ($D_2$) and survived ($D_3$) measurable dimensions respectively. The easiest way to check out such claims is to testify different planar living systems.

It is well known that scale and size are playing a crucial role in fractal applications. Spontaneous informal settlements and slums have positive qualities like the traditional fractal cities although they lack of infrastructures and higher-scale networks connectivity. However, in order to effectively recognize, fix or create living structures in artifacts, buildings and cities, we need to examine their geometrical and topological properties. They have deep self-organizing and space-occupying complexities that are affected by humans daily-life functions and activities. Real (physical) and virtual (visual) networks connections imply each other in every single process of urban complexities. "By focusing on adaptation and organization in each design step, the result will adjust to human use and physiology" [2]. The issue is about having a new syntax of spaces to economically combine virtual and spatial connections in relevant to their outer surrounding realms. Modernist planners and architects confused geometric visual order for well-functioning and sustainable social order in the built environment [3].

Portugali [4] specified that cities emerge either autonomously or in some self-organized manners when he referred to the complexity theory. Like organisms, livable cities are complex systems of holistic mechanism that tend to connect their internal parts within specific boundaries in optimum ways to save and maintain their entropies. Fabricated structures are of optimal complexities if their processes emerge and evolve together properly. Most effective decisions of adaptive (generative) processes and survived (evolved) products in living urban fabrics are made by local people who live there.

2. Aims and significances
Theoretically, cities consist of multiple and different sub-areas, each with different configurations, that need to be quantified. Practically, space syntax analysis would provide quantitative measures for each and every street, and allow researchers or planners to easily identify an area which has undesirable qualities and may require an intervention. A new approach is presented to identify living (2D) structures and to measure their degrees of life according to survived and adaptive qualities.

3. Method
3.1. Life-Giving Patterns
Living patterns reflect systems with adaptively-survived solutions to different problems. From one hand, they try to keep their entropies and to preserve their existence by adaptively managing of their complexities. Their structures try to re-organize themselves continuously by generative and emergent piecemeal processes. On the other hand, they tend to exploit their entropies to coexist with their surroundings by maintaining their complexities survivably with flexible evolving structures. Optimal combinations of adaptive and survived complexities, while investigated locally or globally, would guarantee various patterns to be alive.

Complex systems are large systems of interacting components that, through nonlinearity, can produce emergent phenomena and self-organized structures [5]. Their genetic subdivisions, emergent processes
and evolved morphologies must act in unison. Natural growth structures organize themselves properly to keep and preserve their entropies. They resort to continuous self-interweaving at each tiny generative process in a way that preserve their existence as a coherent whole. Everything is coming into being, continuously [1]. At the same time, they try to coexist with their environments by developing new maintaining mechanisms of information and entropies distributions. Living patterns imply solutions with dynamic management of changes and their living structures reflect the degree of their organized complexities. Life-giving patterns are optimal solutions that can be adaptively-survived to ensure suitable responses toward different stimuli. They reveal different systems with proper combinations of internal restructuring and external reshaping. These systems might shrink, compact and regress with extreme compressing causing destructed patterns. Or they might evolve, extend and grow with over tensioned stretching causing their patterns to be interrupted. In both cases, improper local or global behaviors would produce anti-patterns. The organized complexities of living structures could be classified into two groups according to Christopher Alexander’s fifteen fundamental properties, as shown below in figure (1):

| Adaptive Structures | Survived Structures |
|---------------------|---------------------|
| (Compact to keep their entropies and to preserve their existence with compressed boundaries by restructuring, rearranging and self-organizing) | (Extend to coexist, occupy and fill the affordable spaces of their surrounding environments with tensioned boundaries) |
| Strong centers | Thick boundaries |
| Local symmetries | Roughness |
| Alternating repetitions | Good shape |
| Gradients | Echoes |
| Contrast | Positive spaces |
| Voids | Not separateness |
| Levels of scales | Simplicity and inner calm |
| Deep interlock and ambiguity | |

**Figure 1.** A new proposal of living, adaptively-survived, structures in relevant to the significant fifteen properties of Christopher Alexander.

Living structures are of both adaptive and survived properties. Adaptive properties embody strong centers with contrast, voids, local symmetries, alternating repetitions, gradients and deep interlock and ambiguity across multi levels of scales. While survived properties can be elaborated as thick and rough boundaries of good shapes that reflect simplicity and inner calm, and embody not separated, echoes and positive spaces.

Patterns are livable only if they preserve themselves and maintain an extremely delicate equilibrium with their environments. Inanimate patterns are opposed to living patterns as they respond incorrectly to different stimuli. They abuse their potentialities and waste their entities by improper restructuring and inconvenient coexisting. In such cases, they might be destructed by bad self-organizing or interrupted by incomplete self-maintaining. The results produce unhealthy (anti-patterns) accordingly. It is important to deal with existing urban patterns as living solutions. Natural and livable systems entail recognizing emergent self-organizing structures with evolving rational hierarchies of connections. Traditional cities began as spontaneous informal settlements that could eventually emerge and evolve into complex fabrics with livable patterns. It is necessary to know the correct systematic rules of organized complexities under which their living urban fabrics are structured. Obviously, there are strong interrelationships between people daily-life’ activities and how they shaped their urban spaces and networks for these activities. Every living urban space must be surrounded, even partially, by a framing perimeter that gathers and contains self-organized...
components (nodes) and connections (paths) as a coherent whole. Good visual complexity tends to reach an optimum at some balance point between order and disorder, with unity in variety [6].

A city is a whole complex system. Today, prominent urban design movements such as the new urbanism and smart growth openly embrace the notion of this complexity [7]. Complex systems need to combine different components according to humanistic and comprehensive rules. In this regard, many practical ways of creating living structures, that are guided by scientific principles rather than artistic standards, have been thoroughly discussed [8]. Wholeness-oriented designs, guided by the previous (15) properties of Christopher Alexander, are differently produced, adopted and advocated here. Unfortunately, the twentieth century architecture lacks these kinds of rules. It imposes unhealthy or anti-pattern solutions that extend beyond the adaptive potentialities and the survived entities of complexity. Crucial and improper injections of ill cities might not be able to save or cure it. Also, limited incorrect interventions in a living city can ruin and destroy them. The big issue is to find appropriate healing treatments depending upon these living, adaptive and survived, properties.

3.2. Degrees of Life

Space syntax has been criticized for 'Edge effects' that produce mathematical anomalies and arise from analyzing only a portion of a larger urban environment such as one suburb in a city. Its methodologies were criticized for being overly sensitive to infinitely small angular variations in urban environments that would result in the analysis producing one axial line, or multiple axial lines, and consequently impacting the mathematical analysis, despite this infinitely small angular variation being virtually imperceptible. A unified theory for living systems is achievable and desirable depending upon space syntax analysis.

Intuitively, living systems balance between their adaptive and survived properties. They try to preserve themselves and coexist with their surroundings by proper reactions and responses toward different stimuli. Unique methods to calculate new dimensions for adaptive (DA) and survived (DS) behaviors were presented, testified and adopted earlier in other works. New dimensions (living dimensions/ DL) to estimate (2D) systems' wholeness as living entities are produced here accordingly. They can determine animate systems by a new syntax of spaces. The new method provides a tool to analyze their structures differently. It depends greatly upon the inter-correlation between physical (real) and visual (virtual) connections. Scientists have relied heavily on visual and qualitative approaches, a perspective first developed by Henri Poincaré in the late 1800s, to discover and analyze the fascinating dynamics of nonlinearity [9].

From one hand, adaptive (2D) systems have flexible structures of continual, generative and emergent processes. These structures reorganize themselves properly to keep their entropies and to preserve their existence. As Al-Guesbi wrote, they tend to arrange their components and connections in a way permits the whole system to run and work properly. Shortest connections with maximum changes in directions within a specific visual field (field of influence) are suitable adaptive mechanisms. Summation of physical (S) and visual (V) connections, (S+V), provides new crucial parameters of systems' adaptive behaviors. Also, multiplying the total accumulated lengths of connections (L) by the total number of components (nodes or vertices/ N) are used, as (L×N), for the same purpose. The proportional ratio of ((L×N)/(S+V)) indicates structures' adaptive flexibilities. It is rationally proposed that this ratio is in simple relation with the trend of the extended perimeters (P) to stretch and in quadratic relation with the trend of the affected areas (A) to compact. According to these variables, the resultant logarithmically derived formula of (2D) adaptive structures would be:

\[
DA = \left( \log\left( \frac{LN}{S+V} \right)^2 - \log A \right) + \left( \log P - \log\left( \frac{LN}{S+V} \right) \right)
\]

A: Total area of the whole visual field (zone of influence).
N: Total number of vertices.
V: Number of all probable, extended visual connections between vertices.
S: Number of all physical segments of direct connections between vertices.
L: Total connections' lengths (physical and visual).
$P$: Perimeter length of the whole visual field.

$DA$: Adaptive dimensions [10].

Adaptive dimensions ($DA$) reflect distinct self-preserving tendencies for each existing (2D) structure numerically. The estimations of these dimensions are always approaching to ($DA\geq 1$) because of their dominant preserving potentialities. They can detect and point out systems’ complexities with their lives-preserving tendencies. Dense spatial (2D) structures would be necessarily of more complexities. In other words, the more fractality or roughness means the more complexity. Any accretion or reduction of components in existing structures would affect their adaptivity. Figure (2) illustrates how to calculate the adaptive dimensions for Sierpinski Triangles across different levels of magnifications.

Figure 2. Calculating adaptive dimensions ($DA$) for multi sizes of Sierpinski Triangles.

On the other hand, survived systems coexist properly with their surrounding environments by occupying and filling all affordable spaces. Their structures respond effectively by optimal distributing of their entropies across multi scales. Al-Guesbi wrote before that "each (2D) structural configuration has two types of entropies ($E$), real ($Er$) and virtual ($Ev$). They are both distributed in relevant to three related factors: 1) number of interacted nodes (vertices) ($N$), 2) length of connections ($L$) and 3) repetition or frequency of occurrence ($Q$). Each sub entropy ($E_{sub}$) is obtained by applying and multiplying these three factors on physical and visual connections together. Estimating the resultant entropies ($E$), whether real ($Er$) or virtual ($Ev$), is obtained by the summation of sub entropies of the same type according to the number of probably or physically existing (real) and all visually extended (virtual) connections respectively. Thus:

$$E_{sub} = N \times L \times Q$$

$$E = \sum E_{sub}$$

$$\therefore Ev = \sum (N \times L \times Q) \times V$$

and

$$Er = \sum (N \times L \times Q) \times R$$

Actually, virtual entropies ($Ev$) are of equal or greater values than real entropies ($Er$) because of their extended tendencies. Their estimated survived dimensions’ values approach to ($DS\geq 1$). The logarithmic proportional relationship between these two types of entropies provides new sensitive parameters of coexistence called (survived dimensions/ $DS$). They are calculated as:
\[ DS = \log \frac{E_v}{E_r} \]
\[ DS = \log \frac{(NLQ)_v}{(NLQ)_r} \]

[11].

Systems' survived dimensions \( (DS) \) can numerically detect lives-maintaining tendencies according to different magnification's factors. They can indicate their properly worked scaling levels rather than their living properties. Each instant (fixed scale) structure has its own intrinsic \( (DS) \) locally and globally.

Fractal geometry produces sensitive parameters (fractal dimensions/ \( D_f \)) to detect self-similar patterns of behavior across multi scales. Basically, some apparent and exact self-similar fractals provide the required proof by their bifurcated branches which can be visually perceived as replications of their origins. Other similar fractals act alike according to other estimated fractal dimensions. Changing the directions of bifurcation affects the shapes of these fractals. Similar behaviors might produce other shapes which are absolutely different from their origins though they bifurcate according to the same fractal dimensions. Figure (3) shows how survived dimensions \( (DS) \) are estimated for Sierpinski Triangles. The estimations are made by changing the scales and the resultant survived dimensions \( (DS) \) differ accordingly.

![Figure 3. Calculating survived dimensions (DS) for Sierpinski Triangles across different and multi levels of magnification.](image)

Obviously, self-similar subdivisions of alike patterns (Sierpinski Triangles shown in figure (4)) according to their fractal dimensions produce other patterns with similar behaviors of adaptive and...
survived dimensions \((D_{s}=D_{s})\). Systems' fractal dimensions can show us the appropriate scale for comparable estimations of \((D_{a} \text{ and } D_{s})\). In other words, the values of adaptive dimensions \((D_{a})\) are the same at each level of magnification, so it is recommended to make the estimations of the survived dimensions \((D_{s})\) according to fractal subdivisions and dimensions \((D_{f})\). They can point out the fit scale for each (2D) structure to exist with in relevant to its surroundings. Hence, the fractal dimensions can specify the proper scaling levels to intervene in.

Rationally, living or well-organized complex systems tend to behave similarly under different stimuli and conditions. The big challenge, about trying to have specific (scale-size) thresholds for each living system to respond and act similarly across them, are almost overcome by adopting fractal subdivisions. It is claimed that multi levels of magnification according to \((D_{f})\) versus different processes of growth can show similar degrees of adaptive \((D_{a})\) and survived \((D_{s})\) behaviors together. New dimensions (living dimensions/ \(D_{l}\)), as sensitive parameters of systems' wholeness, are presented to estimate the degree of life accordingly. They can reveal both, the piecemeal processes of growth and their shapes' differentiations. The mutual relationship between \((D_{l}, D_{a} \text{ and } D_{s})\) can be mathematically formulated as:

\[
D_{l} = D_{a} / D_{s} \quad \text{(LAS) formula}
\]

(LAS) formula provides a new tool to estimate degrees of life. Each homogeneous or mono-cells built up healthy fabric has a unique combination of adaptive \((D_{a})\) and survived \((D_{s})\) dimensions. We can control the estimations of its \((D_{a})\) by size-changing (accretion, reduction or changing the positions of the components). While changing the scales according to fractal dimensions \((D_{f})\) can make similar survived effects \((D_{s})\). These adaptive \((D_{a})\), survived \((D_{s})\) and the resultant living \((D_{l})\) dimensions, can be tuned optimally to make suitable decisions for better qualities of life comparably.

4. Results and Discussions

4.1. Real Life applications
Together, cellular automata and fractality, are defensive and offensive mechanisms that always produce new self-organizing complexities. These complexities accommodate plasticity of the structure, sustainability of the pattern and adaptivity to human needs and sensibilities. It is well known that deterministic systems have predictable behaviors. Detecting, estimating and controlling of such behaviors require suitable measurements and computations of their adaptive and survived tendencies.
In chemistry, for example, it is distinctively found that any existing planar compound has a living structure with \( (D_L \approx 1) \), see figure (5). These results are useful and promising in chemical interactions, polymers and drugs industries.

![Figure 5. Existing chemical compounds are systems of well-organized structures \((D_L \approx 1)\).](image)

From construction industry, the trusses are designed and erected according to precise estimations of different intercorrelated factors, like: spans, materials, tension and compression forces, trusses types. Their rigid structures affect the calculations of \( (\Psi E_r) \) because the connections represent only the real existing (physical) links not the whole probable connections. Each truss pattern, presented in figure (6), have a specific amount of \( (D_A) \) but a changeable value of \( (D_S) \) depending upon geometrical and contextual limitations. Thus, tuning \( (D_S) \) values to have living properties \( (D_L \approx 1) \) would affect choosing the more suitable truss type and its proper geometrical configurations. In other words, the new method helps to choose the most appropriate truss type for a specific site among multi other living ones.

For architects, it is important to manage adaptive and maintain survived complexities in a way permit the whole system to run, work and live optimally. We can sustain our lives by correct related and desired interventions accordingly. Design thinking needs an accurate theoretical framework to consider the interactions among humans with nature, cyber and artificial systems [12]. Further applications from different fields of sciences and real life systems are required to support these new approaches.
4.2. Calculating Adaptive Dimensions (DA):
Well-organized complexities ensure systems to be livable. One might wonder about the possibility to have specific patterns of living systems depending upon their adaptive and survived properties. As previously claimed, healthy (2D) systems behave similarly under different stimuli. They all try to preserve their existence by adaptive responses and to maintain their lives by survived coexistence with their surrounding environments. In the former, they tend to self-compactness to save their entropies as a defense mechanism. While in the latter, they tend to evolve, expand and sparse through their surrounding environments to maintain their lives.

It is possible to recognize living patterns by estimating the degrees of their systems’ organized complexities ($D_L \approx 1$). Other anti-patterns, as shown below in table (1), whether destructed or interrupted, have different living dimensions of ($D_L > 1 > D_J$) which indicate damaged or incomplete patterns.
Table 1. Types of patterns according to their living dimensions.

| (DA), (DS) and (DL) relationship | Pattern Type       | Conclusions                                                                 |
|---------------------------------|--------------------|-----------------------------------------------------------------------------|
| 1 DA = DS = DL = 1              | Sustained patterns | • Optimally organized systems with optimally emerged and evolved structures |
|                                 |                    | • Well-organized complexities                                                |
| 2 DA = DS                      | Living patterns    | • Optimal emergence (self-preserving and managing) and optimal evolution     |
|                                 |                    | (self-maintaining and distributing)                                          |
| 3 DA > DS                     | Destructed        | • Have more adaptive properties                                             |
|                                 | patterns           | • Incomplete self-maintaining                                                |
|                                 |                    | • Bad evolving and distributing                                              |
| 4 DS > DA                     | Interrupted        | • Have more survived properties                                              |
|                                 | patterns           | • Improper or damaged self-managing                                          |
|                                 |                    | • Bad emerging and preserving                                                |

A new vision to produce the concepts of emergence and evolution of life together is presented. System’s dynamics can be explored and modelled with mathematical equations, statistical regressions, machine learning algorithms, cellular automata, or agent-based models [13]. Abstractly mimic systems’ generative processes of growth can be modelled according to (LAS). It depends basically upon simple analogical and experimental rules for creating different possible (2D) structural configurations. It tries to depict how living structures can properly organize and maintain themselves with piecemeal growth when they are configured according to similar adaptive and survived tendencies. Their living dimensions (DL) are the same at each tiny (level-process) of their (scale-size) changes. The model, presented in figure (7), is built according to self-similar repetitions of initial postulated mono-segment generator with different probable configurations that depends on the fractal dimension (DF=1.18). The attempt successes to have a pattern with values of (DL≈1) by trial-and-error changes in the direction of bifurcations that can keep similar adaptive (DA) and survived (DS) behaviors. The illustrated resultant pattern are claimed to be livable and sustained in relevant to its origins.

Figure 7. A piecemeal natural growth prediction according to probable (2D) structural configurations of mono segment repetitions.
Depending upon compactive self-preservation and connective space-occupation rules, another theoretical model of natural (living and sustained) growth is elaborated in figure (8). It makes some unique predictions for the morphologies of systematically mono-based units’ aggregation (growth).

Figure 8. Livable patterns of mono-based units’ aggregation according to trial and error (2D) structural configurations.

These new findings show new applicable mechanism that can be reliably adopted in different scientific fields like: architecture and urban design, (2D) and (3D) spatial analysis, DNA structures, nonlinear complex systems, identifying and tracing cancer cells, anti-viruses active structures etc. It is possible now to detect, diagnose and treat different anti-patterns and ill systems by suitable interventions.

4.3. Healthy Urban Fabrics
Cities are livable systems with different networks' structures of real (physical) and virtual (visual) connections. Existing urban fabrics organize human connections and interactions by their flexible structures that prevent cultural and social fragmentations. Their complexities are preserved and maintained by proper generative processes that evolve and coexist suitably with their environments. Each single process responds to human needs, demands, functions, well-being. Individual decisions have local (instant) and global (futuristic) effects on systems' complexities [14]. Healthy urban networks of flow can define life. The need is to focus on discovering the scientific relationships between urban systems and their adaptive and survived tendencies.

Traditional cities with similar urban generatively-based codes as adaptive solutions and evolving networks as survived tendencies, are necessarily alive. Creating healing environments or curing ill fabrics are crucial goals to be targeted. From one hand, traditional bottom-up approaches of simultaneously irregular patterns work hard to invest spaces. Their systems tend to act adaptively by restructuring and self-rearranging while missing their overall surviving reactions with their environments. On the other hand, modern top-down approaches of urban networks with their common grid-iron urban patterns try to maintain their relations with the surroundings. They miss people’s adaptive self-responses toward stimuli. They achieve surviving with an inevitable pushing of invasive and ill slums areas to spread out. The results produce inhuman cities which are unhealthy for their habitants and waste enormous amount of entropy to work.

In a specific area of an urban fabric, urban pathologies are diagnosed by experiencing urban rhythms of behaviors, see figure (9). This theoretically postulated model is useful to explain, manage and to somehow predict the success or the failure of urban life. \((\text{LAS})\) formula and the new dimensions \((D_0, D_s\) and \(D_L)\) are adopted, tested and applied for comparison and assessment. Examining enormous numbers of all probable and smaller differentiations was of great help in selecting optimal configurations. A sick piece of urban fabric might need some regular repairs to be fixed or less or more bifurcations than existed to run frequently. In both cases, of wasting or abstracting, urban fabric is diagnosed to be pathologically diseased. The relative connections (axes or edges) between different locations in urban fabrics are economically emerged at each of their evolving processes. Urban fabrics need dynamic management for their changes just like human lives. As shown in figure (9), the calculations and the comparisons between several scanned portions of existing (2D)
fabrics are practically made, examined and tested. Obviously, urban networks have flexible structures with dynamic combinations and emergent links that evolve economically across time. Over-simplified plans and interventions cut the living tissue and kill the vital social processes. While healthy complex adaptive systems are resilient to perturbation, their resilience and adaptability can be compromised by too many simplifying interventions [15]. Living cities extend in (time-space) together with healthy mixture of piecemeal uses due to morphological, geometrical and topological changes. Questions about the ability to diagnose, treat and cure diseased or unhealthy urban fabrics can be answered differently now.

Figure 9. Diagnosis of different portions of the same postulated urban fabric.

Living systems are of similar behaviors and responses to different stimuli. Portland, San Francisco and Rome networks patterns, depicted in figure (10), are presented as samples of existing urban fabrics with approximately similar scaling ratio but different ($D_s$). Hence, it is possible to say that the urban network pattern of Portland has the highest survived dimension ($D_s = 1.18$) than others which reflect more self-maintaining qualities. While Irvin, which has obviously different scaling ratio, can be
compared singularly with other fabrics of the same magnification factor. Also, Rome records the highest level of adaptive dimensions and self-managing ($D_a=1.33$). Locally adjacent or globally layered spots of the same urban fabric with equivalent values of both, adaptive ($D_a$) and survived ($D_s$) dimensions, are optimal configurations for such fabrics to be livable ($D_l=1$). Portland's urban pattern has the closest living properties, ($D_l=1.052$), which indicate proper organized complexities of their adaptive and survives qualities.

![Figure 10](image1.png)

**Figure 10.** Depending upon (Boeing, 2017: 136), estimating living dimensions ($D_l$) for different urban networks patterns are of reliable and healthy-test comparisons.

Living architecture passes time-tested challenges differently but successfully. Instantly satisfying human solutions are adaptive processes that properly organize their complexities. Also, suitable responses to different stimuli keep systems survived with their surrounding environments. The resultant solutions and responses become living patterns to be inherited in traditional architecture.

### 5. Conclusions

*Instead of conflict, humans need to reconcile, harmonize and integrate with their environments as a coherent whole.* As organisms, they both need to respond, react and coexist, with each other by suitable compromising. They produce living and sustained patterns of behaviors accordingly. The structural configurations of their systems imply flexible combinations of adaptive and survived properties together. Basically, ill-diagnosed systems behave improperly toward any possible stimuli. They reveal destructive or interrupted anti-patterns with adaptive responses that might differ from their survived tendencies.

Living patterns in nature is essentially the same as that in what human beings trying to make. The argument that (2D) sustained patterns can tell more and reveal deepest secrets of their nature is mathematically verified. They imply systems with flexible structures that achieve wholeness by measurable parameters of their livability. A new formula (LAS formula) is presented to estimate theses parameters mathematically. It provides a new method to calculate and combine different adaptive ($D_a$), survived ($D_s$) and living ($D_l$) dimensions as vital indicators of life ($D_l \approx D_a/D_s$). Furthermore, it enables us to testify (2D) structures, like urban fabrics, in multiple scales and in multiple locations to identify problematic areas. It is possible now to interfere properly in these areas to fix, repair or even revive them. Undesired, unhealthy or harmful (2D) structures can be destroyed, deconstructed or fixed accordingly.

The two properties of *adapting* and *surviving* help us not only to conceive correctly, but also to create beautiful things of ($D_l \approx 1$). It is useful and hopeful to address why these things are beautiful and how
much beauty they have. Modern architects and city planners inevitably produce dead or lifeless buildings and cities. Their products lack proper adaptive and survived qualities. Hence, they lack wholeness and life.

The same analytical approach method, *(LAS)* formula, is recommended to be used and testified in further (3D) complex systems for futuristic researches and investigations. More promising results for this new unified theory of life can be developed accordingly.

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