

Global Comfort: The Occidental View of Temporal Design

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Does temporal design represent a magic word or an instrument able to help the man to really design a human's sized world? This was the first question that arose when Prof. Cocchi met Prof. Yoichi Ando in Rimini about ten years ago: in this occasion Ando tried to explain its new idea, resulting from his experience in the field of human sensation of stimuli coming from the world surrounding us. In the time elapsed from then on, already three International Symposia on this subject have been carried out in eastern countries, the forth will be held in Korea, may be the fifth will be organized in Europe: if this will be the idea, it seems very important to involve the western researchers and try to met Occidental and Oriental approaches to human well being in a world that becomes more and more adverse.

1. Introduction

The unifying element can be identified in the concept of "global comfort", goal of any kind of architecture, from the original cave to the actual hyper technological buildings. But what does it mean "global comfort"?

During the centuries, the amount of people able to say that quite all is OK is time after time growing, as they are in good health, they are living in a comfortable home, they have a car and many other benefits, they feel (or believe to feel) free to do what they prefer, and so on: in this frame, "global comfort" becomes a subjective sensation, like beauty, but really it is not so!

A technician cannot found his design only on sensations, he must make measurements, and everything must agree with rules, mathematical equations, and today computer programs.

We can find in our body a structural frame, a set of systems that make it alive and self-sufficient and a central nervous system that controls and manages everything. It still remains out from this scheme a portion of brain that relates with the world out of any imposed rule, able to express its best with artistic and cultural activities: the structural frame, all the systems, even nervous, act so that these activities can be freely expressed.

From the point of view of an engineer, 70 kg serve no more than ½ kg: so we are!

Going on in this way, it seems clear that the "global comfort" can be a condition where the big mass doesn't create problems to the noble part of the body, that we call "brain", anatomically only a portion of the brain, that portion in contact with the world by means of the five senses, so it is from them that we can derive any information useful to quantify what they communicate to the brain.

To be more precise, the thinking portion of the brain does not receive problems if the world cannot give rise to sensations of warm or cold, undesired noises, excessive levels of shining radiations, bad smells or tastes, mechanical injuries.

For the last ones, it is quite easy to classify the minimum level that can give annoyance, even without analyzing the reaction at the brain level, for the others it is necessary to pick up the reaction of the brain, who acts only apparently in a dissimilar way related to the different stimuli.

Among the different sensations, surely the most investigated are those related to heat, humidity, sound and vision, but in the next future also smell and flavours will be deeply investigated; furthermore, while the other sensations are not correlated to global problems, we must take into account that actually we get thermal comfort wasting a common resource like energy, so we must investigate also how we can get it lowering the energy consumption, mainly in buildings.

2. The eastern vision

The ancient oriental wisdom, that we can identify in Feng Shui behaviour, already stated rules about the organization of the space surrounding man [1], surely effective, but not supported by any scientific theory or measurement results: today, architectural design based on Feng Shui doctrine is a mere reproduction of situations that, during the time, do not have brought problems, or have brought advantages, anyway without any possibility of calculations or physical demonstrations.

The statements of Temporal Design in Architecture are surely more rational and the possibility to accept any situation created by nature or by man is based on objective measurements, even if a state of the mind more thoughtful than those that characterize Latin and English-speaking world.

Looking at Ando's papers, for instance [2], the reasons of economy push the humanity towards a world where technology is more and more stifling, and the humanity pursues, and in the same time is pursued to, the fulfilment of classic "Time is Money". Pushed from this mental goal, it would not pass so much time and the humanity will destroy itself, so it is necessary to think at the meaning of time in the frame of "Time is Life".

During the life of humans it is possible to identify three stages, the former devoted to the development of the body, the second devoted to the development of the mind, during which we think to God and we try to investigate the reason why we are born, and the last one when the mind develops the personality: this stage is surely unique and deeply representative of each of us.

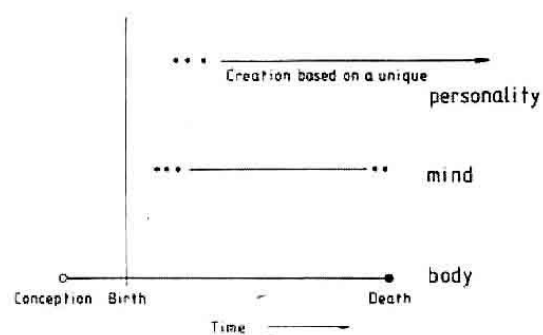


Figure 1 Three stages of human life [1]

Temporal Design is aimed to realize an environment where sensibility and mind can develop individuality, accepting any difference between each of others and us: only in this frame we can develop also our personal creativity. Space and time is the domain where human mind get its freedom, while usually we think that only space is our domain, and time is useful only to gain space. On the contrary, time is our chief domain, while space must be utilized to get freedom for our mind and to develop our best link with time. The extreme target of Temporal Design is to give to everybody the possibility to develop at the best the third stage of his life, that is to say the age of personality.

As already said before, this philosophic way to design the built environment is common to other oriental disciplines, the difference is in the way used to verify the achievement of the goals: this must be done not contemplating the moon stages, not verifying the degree of balancing fluxes of positive and negative energy, but investigating what does it happen inside our brain when stressed in different areas from ears, eyes and so on.

An environment designed thinking to humans in their third stage must allow a strict link with the surrounding world based on harmony rules: like history of music can clearly show, harmony is one of the characteristics that can assure acceptance of music, even if today musicians look more and more for dissonances.

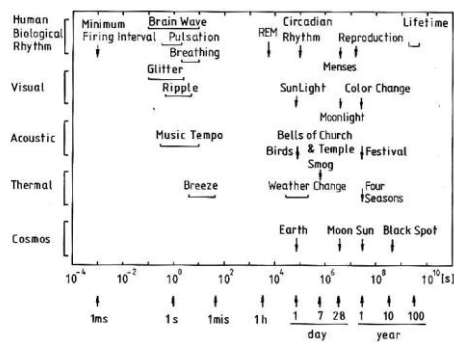


Figure 2 – Biological rhythms and the rhythmic articulation of time [2]

This proposal from Ando must be considered as a mean to verify the possible agreement between environment and brain: anyway, to make acceptable this theory to occidental people it seems necessary to find more user-friendly means and results.

3. The western vision

The idea of “global comfort” is not new even in the western statements towards an architectural design human’s extended.

Eastern statements lean their starting-point on acoustical sensation and hearing apparatus, while in the United States and in Europe the beginning lies on another aspect of the problem, that is to say thermo-hygrometric well being produced with heating and air conditioning in buildings.

Just from its first beginning ASHRAE proposed to verify the environmental quality got with heating and air conditioning plants comparing environmental parameters (like temperature and humidity degree) with statistically evaluated experimental results, organized and presented within a technical and scientific frame: the first issue of Fundamentals’ ASHRAE Handbook [3] refers to 1923 the statement of an “Effective Temperature” as a parameter correlating temperature and humidity of moist air in dwellings to the degree of preference expressed from inhabitants. From that time, adding new experimental data and the increased interest towards metabolic rate, they arrive in

1960 to a set of equations taking into account also the amount of time of exposure (severe environment).

Some time later, the Danish Ole Fanger started to study the behaviour of students in classrooms in the States, then going on in Copenhagen till the statement of a general Comfort equation based on an energy balance of the human body: from it many comfort charts were derived and presented in a book [4]. Now the studies from Fanger are carried on from his fellows, recognized in European and ISO standards, integrated in ASHRAE Charts.

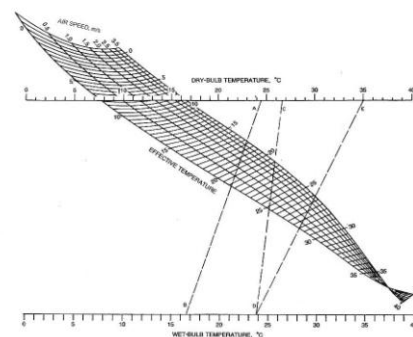


Figure 3 ASHRAE Chart relating Effective Temperature and environmental parameters [5]

Obviously it is not possible to be exhaustive in a so short paper, but it seems enough to support also eastern statements as the result of a scientific and rational work about the human well being in built surroundings: this statement is now extended to perceived air quality and Predicted Percentage of Dissatisfied, as quoted in International Standards [6]

Someone has also tried to link thermal factors to light and noise levels, to find limits within which it would be possible to balance the shortage of one with abundance of the other: some results are presented in [7]

There is no problem to simulate thermo-hygrometric conditions and to expose people to them, even in severe environments; on the contrary, for health reasons it not possible to do so with polluted air, excessive lighting or noise levels. This is the reason why it is difficult to find cross correlated data, so it is also difficult to elaborate

statistics, that to be meaningful needs a big lot of data.

From this point of view, Temporal Design, based on MEG, is more effective as it gives the possibility to pick up at the first beginning any possible damage and to stop any experiment straight after.

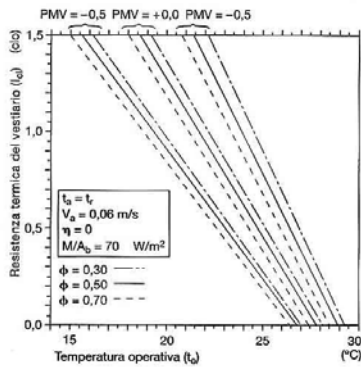


Figure 4 – Example of evaluation of span in values of different environmental parameters [4]

Effectively there is another environmental parameter not yet taken into account from both theories: the possibility to achieve the comfort conditions is growing and reaches a bigger amount of people, but this result means a bigger amount of energy consumption.

It must be our first goal to preserve the planet so future generations will be able to enjoy it like us now!

We must learn that environmental preservation (energy in particular) and global comfort must go on together: this must be the first goal to develop at the best the third stage of human life.

4. Temporal design

A more complete and pragmatic sight of Temporal Design in Architecture must integrate the above mentioned visions, taking from each of them the best available ideas.

Ando began his researches having in mind the listening of music in halls devoted to this kind of performances, and reached the result linking objective acoustical parameters and preference of both listeners and musicians in the acoustic field: in his first book [8] this link is not only based on questionnaires, as for other Authors, but also on a

model of hearing human apparatus, whose mathematical interpretation is strengthened by neurological studies, for instance [9], and MEG observations in Kobe [10].

The step from acoustical to visual response was very short and now Ando proposes for visual apparatus a mathematical model similar to this presented in [8], so deriving good informations about the preference of certain visual fields [11, 12].

5. Concluding remarks

What kind of practical consequences can we deduce now from these studies?

Thermal and hygrometric parameters, joint with metabolic rate, air speed, dressing, are already utilized to optimize the built environment, so giving useful informations for heating and air conditioning plant design; energy conservation is now a “must” quite everywhere in developed countries, hearing conservation and environmental noise pollution are object of specific standards and national laws, while in design of Concert Halls and Opera Houses we begin to connect geometry and listening quality [13], acoustic and lighting preference [14].

Actually available electronic instrumentation is able to measure and register at the same time temperature, relative humidity, air speed, sound and lighting, so making possible to analyze quite all the environmental parameters, but, and this is more important, analyzing the time history of the sound level it seems possible also to get rid of the subjective judgement between sound and noise [15-19]

It is possible to think that in a next future we will be able to speedily quote the waste of energy in building, to control lighting level not only from the point of view of saving energy, to combine a smell with a taste in a thermal satisfying environment, for instance to increase selling of food or sweets, and so on: anyway, the most important thing is the global comfort of human brain to be able to develop the third stage of his life in a frame where energy saving will be the growing care.

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