AI and Regional Architecture

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"...there is nothing wrong in uncertainty.It is better to say something, not being certain, than not to say anything at all." (Richard P. Feynman)

In 1976 Richard Foqué established periods in the development of methods of designing. The first stage (the 50's and early 60's) – automatization of the designing process – properly identified language of description that is understood by a machine is vital. Christopher Alexander publishes 'Pattern Language'.
The second stage (late 60's) – the use of the Arts – research techniques as interview, questionnaire, active observation; ergonomic aspects are also taken into consideration.
The third stage (starts at the turn of the 60's and 70's) – co-participation of all of the parties involved in the designing process, and especially the user. The designing process becomes more complex but at the same time more intelligible to a non-professional – Alexander's 'Pattern Language' returns.
It's been over 20 years now since the publication of this work. In the mid 70's prototypes of integrate building description are created. We are dealing now with the next stage of the designing methods development. Unquestionable progress of computer optimalization of technical and economical solutions has taken place. It's being forecasted that the next stage would be using computer as a simulator of the designing process. This stage may be combined with the development of AI. (Already in 1950 Alan Turing had formulated the theoretical grounds of Artificial Intelligence.)
Can the development of the AI have the influence on the creation of present time regional architecture? Hereby I risk a conclusion that the development of AI can contribute to the creation of modern regional architecture.

Keywords*: Design process, Artificial Intelligence, regional architecture*

Development of methods of designing

Let's start from a small revision. In 1976 Richard Foqué proposed periods in the development of methods of designing. Accordingly he distinguishes three stages:

a. the 50's and early 60's
b. late 60's
c. starts at the turn of the 60's and 70's.

In the author's opinion in the first stage it was believed that the designing process could be automatized. Technological progress, new branches of science, such as cybernetics or information theory

being created, confirmed such an opinion. However, a well defined description language, which is understood by a machine (computer), is necessary for the process of automatization. Finding out such a univocal language would also be suitable for better communication among designers. In the 50's and 60's Christopher Alexander analysed the existing architectural and urban solutions using a pioneer programme HIDECS. He wanted to use the results of the analyses to create methods for new designing solutions. Shortly afterwards his 'The Timeless Way of Building' is being published. Alexander established a set of components needed to build 'everything', for instance a town.

According to Foqué in the second stage the use of the arts in the designing process becomes meaningful. Research techniques, such as interview, questionnaire, active observation are used. Ergonomic aspects are also taken into consideration. All these measures are to stimulate the designer to closer analysis of details of a project.

In the third stage the development of co-participation of all of the parties involved in the designing process takes place. The user is admitted to the 'designing mystery' and he is of a special importance. Professional jargon is suggested to be abandoned. The designing process becomes more complex but at the same time more intelligible to a non-professional (Maver 1976). Alexander's 'Pattern Language' starts to be meaningful. This time 'Pattern Language' is to simplify the communication between the designer and the user. Dealing with 'Patterns' Alexander abandoned mathematical methods. The technology of project work does not change.

It has already been more than 20 years since the publication quoted in the introduction was written. Meanwhile a radical evolution of computer techniques has taken place. It has resulted in a development and broadening of possibilities to use digital machines modelling. Computers have mastered all the spheres of our life. They have changed our perception, and accordingly they have changed us (Kerckhove 1996). In the mid 70's prototypes of integrate building description are created (Eastman 1992). Visualising programmes increased the degree of user's participation in the designing process. The possibilities of contact and co-operation in the designing group have become greater, together with the communication with the user. Computer optimalization of technical and economic solutions has been developed. What is more, it seems that present technical possibilities theoretically allow for the simulation of a designing process for a 'given topic', according to the hierarchy established by the designer. One is certain. If a machine is programmed to perform this task, it can compare, evaluate and verify the variants of a project. Nowadays we are looking for methods to aid the designer using a computer at the stage of idea. Designing (understood as a process of creation and not as a technical study of a project) is an intellectual process dependent on very many subjective, immeasurable factors (Laszlo calls them facts of mind). These factors, being difficult to define, slow down the application of computers in the conceptual stage of design process. Language of communication between creator and machine remains still the unsolved problem. Object–Oriented Analysis and Design might be the solution (Eastman 1992) (Rychter 1997). The use of computer as a creation process simulator is predicted (Computer Simulation Design). The authors suggest that this stage can be linked with development of Artificial Intelligence (Szymski et all, 1996, Verbeke 1996).

Artificial Intelligence

And now some selected historical facts. Artificial Intelligence (AI) is 'a branch of computer science which aim is to build machines showing features usually attributed to human intelligence, such as ability to learn and reason, pattern recognition, understanding of speech, and consciousness'. (Coveney, Highfield 1997)

Alan Turing, an English mathematician, a genius code hacker and outstanding computer scientist is regarded the father of artificial intelligence. In his work

from 1950 he formed such a general definition of intelligence that it applied both to living creatures and machines. In his opinion intelligence is conditioned by the ability to learn. Turing constructed an abstract machine as he was fascinated by the possibility of finding purely mechanical rules of solving Hilbert's mathematical problem *(1928 – Is there a general algorithmic procedure to settle mathematical problems)*. The rule was simple and it came from a typewriter. One can copy all Shakespeare's works using a typewriter and similarly one can copy all mathematical theorems using Turing's machine. Turing speculated that it is possible to construct a Turing machine which is able to read an instruction from another Turing machine and apply it. It would be a universal Turing machine. It irresistibly, but in fact correctly comes to our mind that the universal Turing machine is a theoretical scheme of a computer. This idea led Turing to a conclusion that decomposition of logical and calculation operations may be suitable for a description of a brain. This suggestion became the basis for research concerning artificial intelligence. Turing was interested in construction of a real Turing machine which would turn abstraction into an existing device. Attempts to build it helped him in his secret project on breaking the code of Enigma.

In the 60's there appeared an idea of GOFAI (Good Old Fashioned Artificial Intelligence). Its enthusiasts claimed at the beginning that it was only a matter of time when GOFAI would imitate people. It assumes dividing AI into 'modules' responsible for particular domains of knowledge: perception, planning, activity, as the way to construct AI. It was assumed that a machine would show features of intelligence when it gathers complete knowledge concerning a given realm (doctors, lawyers). Due to such assumption expert systems have been created. They are used to perform sometimes very complicated tasks. To such belong: financial problems, air routes planning, medical diagnosis, pharmacology, playing chess etc. Expert systems are very 'delicate' and can't deal with inaccurate or ambiguous information. However, real problems of GOFAI are: recognition of faces in the crowd, speaking and language interpretation and avoiding flying stones. Interpretation of visual scenes is a sphere in which AI falls far behind the possibilities of a human brain. It is not unlikely that human intelligence can be simulated quite precisely. However, to do this one needs new and faster computers with definitely bigger memory. Roger Penrose even suggests that construction of machines simulating brain activity might require new rules, which are completely unknown to us at the moment.

Many advocates of AI state that conscious perception is a result of algorithm operation. Some doubts concerning our consciousness arise here, though. Is our consciousness also a result of algorithm operation? Supporters of extreme opinion (the so called Strong AI) state, however, that the only difference between a thermostat and a brain is limited just to a degree of complication of the latter. They assume that all the features of mind: thinking, feelings, intelligence, comprehension, consciousness are the result of algorithm operation performed by the brain. On the other hand, many scientists dealing with intelligence and consciousness simulations claim that the real challenge is understanding of biochemical rules managing our brains. It is also said that there exist potential possibilities to construct intelligent machines with the use of evolutional methods.

Regional architecture

Regional architecture of north-east Poland has been my professional interest for many years. In spite of read need for contemporary regional architecture and considerable preservation *in situ* of objects that have meaningful cultural features, present time regional architecture is not created. I was trying to find out the reason of this phenomenon. In the early 90's I was writing about partial awareness of the need for continuity of tradition, about lack of knowledge concerning tradition, about imperfection of tools, e.g. registers of regional forms, about the lack of templates. The barriers of regional architecture creation which were mentioned before are still present nowadays.

Simultaneously, I am interested in computer aided architectural and urban designing. My hopes for a panacea for contemporary regional architecture linked the two of my professional interests. The first attempt to make the professional circles interested in new possibilities to create contemporary regional architecture was a try to make an integrated data basis about traditions. It seemed that Multisource Data Basis can be an advanced template. While using Multisource DataBases there are potential possibilities for regional architecture designing. However, such a source of information, not included into some bigger system, is 'only' a very capacious 'bookcase' (with considerably diminished external dimensions). The 'templates' alone, even very computer 'friendly', give no needed effect. In order to use the stored information efficiently it must be included into some bigger system. The system should allow easy use of data basis elements but it should also allow for modification of these elements. For the modifications to be automatic, I started looking for tools that would make it possible. Because the language of communication between a man and a machine is still the unsolved problem I assumed it reasonable to use the language of mathematics. Hence my search for possibilities of cell automatic machines, genetic algorithms and other mathematical tools to describe and modify elements of data basis concerning regional values of architecture. Therefore, fractal geometry which was to serve in a description of features of architectural objects became one of my interests, too.

It is a special climate caused by some more or less vague features that decides about regionality of architecture. Thus describing the features of regional architecture one can use the templates to a point – perceptible features. However, it is the creator who decides about the final positive effect. My suggestion about the link between regional architecture and AI is the result of the assumption that the regionality of architecture is shaped during very initial stages of designing. In the time of computers present in all the spheres of our life and the dominating CAD (Computer Aided Drafting) such architecture is not created. Looking ahead into the future I put forward the hypothesis that regional architecture could be created as a result of using databases of regional values in the process of creation conducted by the 'artificial brain'. A considerable progress in the quality of designing methods would, however, have to take place. Natural inertia of people and their aversion to new, unknown techniques will not change their routine procedures.

Perspectives of teaching CAAD (Computer Aided Architectural Design) of regional architecture.

In the academic year 1999/2000 a credit-point system is introduced at the Department of Architecture of Bialystok Technical University. As a result of this reform new subjects will be taught. Students from the higher years of studies will be able to choose from them. Nowadays I teach designing classes that include issues of regional architecture. CAD classes are run separately. They do not deal with regional architecture. My suggestion to the new plan of studies is a new subject in an interdisciplinary approach. It would be taught during VIII and IX semester. It will consist of regional architecture designing, elements of mathematics with fractal geometry and CAAD.

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