

Can a Machine Design? A disturbing recreation of Turing's Test for the use of architects

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In 1950, fifty years ago, Alan Turing published a much-quoted paper that has given rise to a long list of articles and books. It presented, perhaps for the first time, in a clever and somehow sarcastic way, what has become one of the main big questions raised by the use of computers in human societies. The title of that paper was "Computing Machinery and Intelligence" (Mind, Vol. LIX, No. 236, October 1950) and the game proposed in it, called by Turing "the imitation game" has come to be known as "Turing's Test".

The paper presented here is a rather simple adaptation of Turing's Test. It may, I hope, present in a, perhaps, not too serious a way, some central points related to the way that computers have integrated themselves in architect's, engineer's and building enterprises and, through them, in the way that architecture evolves in our times and adapts itself to modern societies.

Introduction

Can a machine design? A first answer could be Claude Shannon's: "Of course. We are machines and we design. Don't we?"

A second answer, less sarcastic, could be: "Obviously. There are a many applications running, for many years that, given some conditions as input will produce a form as an output".

But a third answer, expressed with no less conviction would be: "Impossible. A design is, by definition, something specifically human. It is the reply to beliefs, intentions and emotions. Machines cannot have beliefs, desires, intentions or emotions"

I do not want to give any other answer. I just want to defend two ideas: that such a question must be necessarily reformulated to be properly answered; and that, through such a reformulation some crucial matters, related directly with the crisis in which western architecture is submerged will come to the fore. I am also conscious of the fact that this last statement may be discarded with a "Crisis? What crisis?"

The Test

So let us imagine the following scene. A room, several armchairs arranged in front of a wall. Three tables on this wall with a label, a slot and a small display. Seated on the armchairs are the members of what we shall call "the jury", composed by 12 people of different status.

Behind the wall, inside three big rooms equipped with all kind of facilities appropriated to each case, there are an architect, an engineer and a computer.

The jury will prepare a brief specifying the requirements for a particular building. This brief is presented to the three designers through the three slots, provided with a special mechanism to isolate them of the jury's room.

If the designers need additional information a message appears on the display. The jury, acting as a client, provides the information required. This may lead to some changes on the program. That is, we accept that, as happened with the Turing's original test, there will be some sort of dialog. It should be

noted however that the conditions of our test are simpler as this dialog is restricted to a much more limited number of possible variations; it is, actually, a lighter version of Turing's Test.

Let us leave aside all the interesting outputs that can easily be imagined and assume that the result of this test is that the members of the Jury do not have means to decide whether a particular design has been developed by an architect or by a computer. The first point that needs to be clarified in this embarrassing situation is which are the qualifications of this abstract jury. Can we accept following Turing's Test tradition that anybody is qualified to decide what is "a proper design"?

And, also, is it possible to generalise up to that point? Are we allowed to speak about an "architectural design" without taking into consideration the different types of designs that we meet in practice and that would imply quite different degrees of automatism?

On the rejection of such a test

Before proceeding we should take into account that the position of many sensible people would be: this is a funny game but is very far away from reality. As far as we know there is not, at the present time, any computer that may be able to perform it in such a way as it described above.

Let us come back to the fifties. A few years after Turing's paper, in 1956, AI was supposed to be born during a summer symposium in Dartmouth College. The names of Minsky, McCarthy, Newell or Simon must be quoted not only for being there but, mostly, because they manage to get the funds to start a good number of fascinating research projects most of which ended in a fiasco. Some of the provocative statements they issued during those days helped them to earn a reputation but, as time went by, turned against them as their patrons started to ask for concrete results. At the beginning of 1970s most research projects came to an end and, for quite a long time, everybody preferred talking about Expert Systems or Knowledge

Based Systems which appeared as less ambitious and more respectable.

But the attacks came first from the academic side. Around 1961 there was a famous quarrel between a professor of philosophy, Hubert Dreyfus and the AI people. Dreyfus rejected through a mixture of sound arguments and aggressive remarks the assumptions of the AI. But, on the heat of the discussion he went further on and, to prove that no computer could play chess better than a human being he accepted a duel against a computer. And he lost. He took refuge in his lack of practice and he stated, even more emphatically, that no computer would ever win a chess master. And some 30 years later, as everybody knows, the world chess champion, Kasparov, was beaten by a computer.

What about AI and Design? The most audacious forecast were thrown by Negroponte at the end of the 1960 just before funds were going to get cut and AI was going to give way to Expert Systems. We could say, a bit maliciously, that perhaps Negroponte was following the steps of his masters and that he knew for certain that the best way to get big money is to aim high.

The beginning of his book *The Architecture Machine* is anything but timid. He stated that computers could assist design in three ways: helping to automate current procedures; modifying current procedures to make them computable; through an interchange between two different species, the man and the machine, working together. He dismissed the first two and focused on the third one, on a machine "able not to solve problems but to anticipate them" in a "creative way" working "side by side with the architect". The subsequent career of Negroponte throws little doubts about his capacity to get people involved in this promising future.

But, to be fair, we do not have to wait many years to find computers able to design if we take the word "design" in a somehow restricted way. Of course what is meant by "restriction" is the core of the discussion. But let us leave that aside for a while. We have programs able to produce form specifications starting

with a few assumptions. Expert Systems, Shape Grammars, Fractals and, in general, Formal Languages can do that. Although there are not, strictly speaking, applications able to conduct a dialogue in the way we have outlined in our version of Turing's Test there is little doubt that there will be something very similar in a few years if there is demand for it. The question we are approaching is precisely this: whether there would demand for that and, if so, of what kind.

Creativity and morphology

So, let us come back to the test and to the embarrassing idea that, perhaps a good design could be produced automatically. To go deeper into that idea we can proceed by questioning the naive idea of creativity *ex nihilo*. In 1928, Vladimir Propp published a famous book, *The Morphology of Tales*. He analysed many Russian tales to demonstrate that all of them followed a series of basic types, a universal scheme that it was repeated, with many variants, not only in the stories of his country but in many others. The idea is familiar to a professional writer since a long time ago. Goethe maintained that there were no more than 40 possible tragic situations.

The idea of creativity as a development of variants starting from a given formal structure is common to literature, music, painting or architecture. Variations can be obtained modifying the structure itself. But, more often, it is obtained by inserting into it unique expressive means, tied to a place and a time.

During the past twenty years there have been quite a number of programs that make automatic drawings and paintings, write haiku, play jazz or produce chamber music compositions.

Why should one reject this when Modern Art has praised automatism, the role of hazard and the mysterious attractive of the *objet trouvé*? Have not quite a number of modern thinkers, from Heidegger to Derrida, too much quoted in architectural magazines, talked ad nauseam about the eradication of the self (an idea that it is curiously found in

magazines devoted to the consolidation of the architectural star system).

Two projects in search of an author

At ECAADE 98, two particularly interesting and relevant papers were presented, during the same session, on the use of computers for architectural design.

On the first one ("IT as Design Enabling Technology" by I.K.Petrovic, Belgrade, ECAADE 98, Paris, p 178) we could see how a single person, with the help of an Expert System, could produce in a few hours, a few hundreds of single family houses.

On the second one ("Virtual Design Studio: Multiplying Time", by B. Kolarevic, Hong Kong, G.Schmitt, U.Hirschberg, D.Kurmann, Zürich, B.Johnson, Seattle, ECAADE 98, Paris, p. 123) we could see the results of a collaborative team work of students and teachers from Hong Kong, Zürich y Seattle, to design one single family house.

Obviously, both works belonged to rather different lines of research. In one case the focus was on Expert Systems; in the other case the focus was on collaborative teamwork through Internet. I do not know if they appeared together by chance or due to the perversity or the sense of humour of the organisers. But, for me, what was particularly interesting was the way in which, in both cases, the idea of authorship was diluted.

A very prosaic way of asserting this would be to ask: should these houses be really built who should get the fees? The author of the Expert System? The owner of the software? The user? Or, in the second case, The teachers? The universities that provided the media? Everybody, students and teachers? (They would hardly get a couple of beers for that).

We find this strange or funny. But, however, a great part of the architecture that we admire, medieval villages or vernacular architecture all over the world, has no author.

Perhaps we can condense our previous questions like this: what is the semantic structure of: *can xxx design?*

Play and players

The fact that there are artificial machines running quicker than man has not had any effect on people fond of athletic courses. The fact that there are artificial machines that can beat any chess master has not had any effect on people that are fond of chess. And there is not, as far as I know any artificial machine that solves crosswords although it could easily be produced; the reason is, most probably, that nobody would buy anyone.

But these are games. What about the, more respectable, professional activities? The answer is that they are best performed when they are played as games. As Frederick Schiller said (in 1795): “ man only plays when he is a man in the full sense of the word, and he is man in the full sense of the word only when he is playing”.

And this applies, no doubt, to the relationship than a good architect establishes with a good client. In this **essential** sense I do not think that anything important is going to change because of computers. But something **inessential** is going to change. And it is worth trying to bring it into full air so that it gets rotten as soon as possible.

The role of the client

Nobody cares if computers perform heavy tasks as long as results can be trusted. To jump to professional activities seems, however, much more problematic. The reason is that other factors come into play. These factors are quite diverse but they unfold around words such as “creativity”, “play” or “politics”. Words that human beings consider that belong exclusively to the human race.

I have asked a few people how they would react in front of a situation as our Turing's Test for architects. As most of us live in buildings or houses designed by somebody that we haven't met the possibility of a remote kind of interchange is welcomed. And it comes out that a significant number of answers are in favour of the computer. Why is that so? Because, and I quote

literally “The computer would give me more freedom to play. It would not try to impose its criteria upon me. It would attend objectively my demands, it would modify things I do not like without objections, offering me other alternatives”.

This answer points to a crucial aspect. Frank Lloyd Wright said that the architect should be as a priest or spiritual guide capable of opening his client's eyes to their “true needs”. Le Corbusier looked for sophisticated clients, of refined artistic taste (and a healthy bank account) able to be at the same level of his *avant-garde* proposals. Mies van der Rohe imposed despotically his designs, filtered through years of careful elaboration, even if this would lead him to court, as it happened with Miss Farnsworth.

But, more often, the architects try to satisfy their clients, slipping, more or less surreptitiously, some solutions that they hope the client would learn to appreciate. In the better cases these are good solutions. In the worst cases these are visual topics, fashion details that, for the architect, are a justification of his position and his fees.

So, the first thing that our version of Turing's Test reveals is that there is a very complex, very contradictory and very badly analysed relationship between an architect and his clients.

The role of the architect

Architectural schools keep on denying, stubbornly, what the real world looks like. Real clients are absent of the simulation that is carried out in the school studios. And the role of the architect is based on prototypes like those of Wright, Le Corbusier or Mies and a notion of *avant-garde* that is blindly accepted.

And what does *avant-garde* mean? Something purposely surrounded by a profound obscurity. Let us put just a couple of examples.

Is it *avant-garde*, 50 years after Maxwell demonstrated that primary colours, in the proper sense of the word, are red, green and blue, theorise that a painting must be based on the “fundamental colours”, yellow, red and blue? And that green should

not be used because it is a “secondary colour”? This is what Kandinsky, Van Doesburg or Mondrian wrote in the 1910s and 1920s. Some architects, teaching at architectural schools in the 1980s, were still saying this kind of things.

Is it *avant-garde* to reject scientific criteria and use as criteria to judge the quality of an student project, ambiguous and subjective notions, dressed with a collection of pseudoscientific terms that are crying for an Alan Sokal to write another book on the language used at architectural school studios? What is the role of the architect in this play so ambiguously defined?

Design as “problem”, “proposal” or “agreement”

Engineers tend to consider design as a “problem”. There is an initial state, some previous data, and some objectives to achieve. We have a beginning (the brief) and an end (the form and the materials). And, inside this black box some procedures will take place, which can be described as “to design”. But in most cases it does not happen like that at all.

On the one hand, in those cases that have more cultural relevance, design does not appear as the answer to a problem but as an innovative and unexpected proposal. Great architects do not use to respect the conditions of a competition or a contract. They manage somehow to convince the client that he should change those conditions to adapt them to the idea they have in mind. If there were not architects like that, architecture would not exist as an autonomous discipline, as a creative force with a millennial tradition. Nor would exist poetry if everybody would respect the rules and the given lexicon of a language.

On the other side, when we speak, daily, to communicate with each other, we do not innovate in that sense, we do not make poetry, and we are not unceasingly creative. In most cases, design does not pose itself neither as a problem nor as an innovative proposal. How then? As a transaction between familiar possibilities that have to be evaluated. Design is the

name given to this interplay where a complex number of confronting interests gets balanced.

The role of the architect in those cases is that of a dealer carrying with him a very complex task. He has to satisfy the immediate interests of a private client or somebody representing a particular group of citizens. But, at the same time, he has to satisfy the interests of a society that has given him power to build on condition that he should defend some general values.

The frame in which this confrontation is given is a *political* frame. Design, so viewed, comes to be a particular form of political activity. This is the reason why the role of computers is so easy and, at the same time, so difficult to integrate in this activity. Computers are the seeds of robots, of “submissive slaves” according to the origin of the name and the modern mythology constructed upon it. The name “robot” comes from a Czech word that means “servitude” and it appeared in a theatre play “R.U.R.” by Karel Capek, in London in 1921. Isaac Asimov understood that very well when, in 1950, at the beginning of his “I, robot”, put the supreme rules, ethical and political rules that dictated the activity of robots in the future societies he imagined, at the beginning of his book.

The need for a new frame and a new script for architecture

To use a computer, as a tool for design, in those cases when it can take the place of a human being is, again, a political question, That is, under which circumstances that substitution would be acceptable.

It is enough to have a walk around some town suburbs to reach the conclusion that to substitute architects by computers would not have serious consequences. Probably, in some cases, the results would be better; it is difficult to do it worst, and the computer would not need to introduce some horrible “artistic” details to justify their fees.

Most of the things built at the present time are not architecture in any of the senses we have outlined before. They are neither the solution of a problem, a

new proposal or an agreement. Unfortunately, many “architects” have collaborated in building those suburbs trying to convince their inhabitants that it is the only way to do it. The biggest challenge in AI is how to simulate common sense. But how can do that when sense is no longer common?

The terms *frame* or *script* were proposed by Marvin Minsky and Roger Schank as notions that could be incorporated to artificial applications to advance in the simulation of common sense, to have a global understanding of a situation as a prerequisite to get a particular understanding of something.

There have been during the past few years a number of interesting developments in CAAD that did not have the least influence in real practice. In some cases the reason was, I think, that some central issues such as the notion of architectural type were not sufficiently analysed. But, in general, the obstacle was the social condition of the architectural practice.

In the western world architecture is evolving from being a profession to be a business. Twelve years

ago, after a decade of legal quarrel, in the US, the AIA was obliged to modify its code of practice and accept that architects should accept the same market rules as any other profit making activity. Other countries followed and the results of that are that there is only one frame of reference for what means being an architect: the ability to get a job and get well paid for that.

Nobody, any longer, discusses other alternatives or how the role of the architect could be diversified to meet the many variants of relationship with the clients that occur in real practice. Under this conditions my bet is clear. In 50 years the big firms of architecture will have a big computer as project chief and architects will be trained as actors to get good jobs for the firm. So, we that do research in computers and architecture have a good future ahead. The only problem is that the budget will probably move to the training of these good actors and to commercial computers laboratories and nothing will remain to do research in computing in architectural schools.

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