EVOCATION AND SERENDIPITY IN A CYBERREAL WORLD

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ABSTRACT
Adding two apples to three oranges is not possible in a purely computational way. It takes creativity to see that you have got five pieces of ... fruit. Computation implies exact solutions while creativity is needed when there is an arbitrary gap or bias in a given situation. This paper is about the explicit introduction of gaps and biases in a visually simulated world. The computer is treated as a medium in which reference information from a virtual city model is confronted with sketch objects. The juxtaposition of referential information and sketch information delivers images that can evoke new ideas. The serendipity (gift to pick up ideas) of the designer transforms the given capricious cyber-real world into useful ideas and inventions. This process is supposed to trigger creativity for urban and architectural design.
EVOCATION AND SERENDIPITY IN A CYBERREAL WORLD

Introduction

The conference theme - ‘Creativity & Computers’ - can be split up into (at least) three totally different questions:
How can computers be used to facilitate creativity?
How can computers be used creatively?
How can computers be creative?

In our Media-research at the Faculty of Architecture, we focus on the first and the second question and set the third question aside. This is not remarkable because we consider the computer as an instrument and a medium in relation to an intelligent designer. We do not see the computer itself as a topic of our research and we certainly do not use the computer as a machine for Creative Artificial Intelligence.

We cannot answer the third question because computers are creatively programmed machines which can only re-create according to their algorithms. It takes creativity to design a computer algorithm, not to execute it. Artificial Intelligence (AI), although very useful in certain applications, is based on nothing but (more or less) complex Pavlov reactions. AI produces expected results based on learned actions in known, recognised or similar situations. In contrast to AI, creativity produces new and unexpected results based on inspiration, mistakes and serendipity in seemingly not solvable problems and new situations. Creativity is needed when a problem cannot be solved by mere computation. Many problems that ask for a creative solution consist of two or more incompatible parts that just do not fit. As in jokes\(^1\), humans understand the problem of incompatibility and they react with laughter or creative solutions. Computer programs can produce jokes, but they will never laugh meaningfully. And it is exactly the same with creativity; computers can produce and represent problems, but they cannot solve the problems creatively. Therefore, let us use computers for what they excel in: gathering, manipulating and representing information.\(^2\)

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1 ‘We cannot imagine humor without imagining some unexpected event.’ In jokes ‘thoughts are not presupposed with a current context or situation.’ [Boelen, 1998].

2 In 1997 Donald Schön was a visiting professor at the Delft University of Technology, during one week Schön gave his last lectures and exercises to a group of Ph.D. students in Architecture and Design Research. I feel privileged that I could speak with him and feel optimistic after he agreed so intense with my thoughts about media and their evocative role in design. Two years later I found the following text, which again confirms and reassures my thoughts about AI and Design Media. [Schön, Donald A. and Wiggins, G. 1992]: ‘Some of the best minds engaged in research on design computation have focused on the problem of developing computational representations of design knowledge - in effect, on the problem of building machines that design *. When we think of designing, however, as a conversation with materials conducted in the medium of drawing and crucially dependant on seeing, we are bound to attend to processes that computers are unable - at least presently unable - to reproduce: the perception of figures or gestalts, the appreciation of qualities, the recognition of unintended consequences of moves. It does not follow from this that computers can have no significant use as design assistants. What is suggested, on the contrary, is that research should focus on computer environments
Still we argue that computers can be helpful in creative processes; primarily as a tool, preferably as an instrument but professionally as a medium. The instrumental qualities of computers turn up when a toolbox is refined for a certain task in a specific domain (e.g. detailing in architectural design). An instrument can be used to make precise choices and refinements based on clearly represented design propositions [Breen and Stellingwerff, 1996]. The computer as a medium enhances insights and diversifies the designer’s point of view based on imaginative representations of previously expressed design ideas and gathered referential information.

At this occasion, in which computers and creativity are assigned as the main theme of the 2nd AVOCAAD conference, I would like to develop a ‘creative media theory’ which draws from findings in design protocol analyses and papers of other researchers about design and creativity. First, in a side-step (or even a ‘pas de plier’) to ‘artificial intelligence’, Pavlov’s conditioning processes are reviewed. Then in a next step a similar set of processes for innovation, creativity and ‘media-content-conditioning’ is presented. Secondly the term ‘situatedness’ is clarified and different possibilities to create situatedness as a kind of conditioned-media-content are explored. As an illustrative third step, the juxtaposition of elements is presented as a useful method to produce situatedness in creative urban sketch sessions. All this theoretical fuss about creativity, media and computation should provide more insight in the aspects of computers which can guide our creative design processes with evocative and informative information.

From Conditioned Reflexes to Innovation and Creativity

Figure 1 shows the classical conditioning scheme of Pavlov’s experiment with dogs and their reaction to stimuli. Essential here is the combination of two stimulus-events in the dog’s brain. The dog is conditioned for the combination of hearing a tone (e.g. the sound of a bell) and tasting food in the mouth. After training this results in salivation of the dog when it hears the tone again, even if there is no food provided. The dog re-acts on an acting environment in which sounds and food occur.

<table>
<thead>
<tr>
<th>before training</th>
<th>S (food in mouth)</th>
<th>UR (salivation)</th>
<th>S (tone)</th>
<th>no relevant response</th>
</tr>
</thead>
<tbody>
<tr>
<td>training</td>
<td>S (tone) + S (food in mouth)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>after training</td>
<td>S (tone)</td>
<td>CR (salivation)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

S = stimulus, UR = unconditioned reaction / reflex, CR = conditioned reaction / reflex

If the dog is out of the laboratory it can live in a rich environment with many stimuli. The dog can choose what to do and how to act. Many different actions that enhance the designer’s capacity to capture, store, manipulate, manage and reflect on what he sees.’

are rewarded and thus a rich behavioural complexity is built inside the dog’s brain. I assume this complexity of classical conditioning is what we can see in most of the current AI applications. It is just the amount of conditioned reactions that astonishes and makes people put the ‘intelligence-label’ on it.

The Pavlov experiment is investigating training and animal reactions. The opposite is action-research and the exploration of human volition. Figure 2 shows a scheme in which an attempt is made to introduce real \(^3\) ‘conditioned stimuli’ in a design media environment.

**Figure 2.**

Studying the figure makes clear several aspects of result-directed human actions \((1-6)\). It is important how the different stimuli, actions and results are valued. If we try to do things better, there will be innovations \((2)\). Although innovations can be attractive and useful, they are in fact just better results which replace similar results of the past. Innovation of products (e.g. cars, PC’s and window operating systems) is more important and lucrative to commerce than introducing really new products. New products and results are linked to creativity \((5-6)\). Those inventions provide new possibilities and experiences and they get a place next to what already exist.

Design media play an important role in creative processes. They can represent all kinds of primary and intermediate information concerning a design project. Media can give more insight in externalised thoughts, complex aspects of the design task and the context in which a design takes place. By means of a ‘dialogue’ between a designer and design media an ‘iterative loop’ \((4)\) can be followed until a satisfying result is reached.

Dedicated and skilled use of media can produce content which can be labelled as ‘conditioned stimuli’ for the further development of the design \((3-5)\). This conditioned content of media is extremely specified for the design problem at hand. It gives insight and evokes.

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3 Pavlov’s use of the term ‘conditioned stimuli’ (CS) bothers the fact that it is just the dog that gets conditioned and not the food or the bell. I re-use the term to explain how media content can be refined in order to inform and evoke.
How can we condition our design media in order to be creative and invent things? Personally I would answer: ‘at least DO something!’. When a design problem seems irresolvable you should just start somewhere and try things out. The medium, whether it is cardboard for a scale-model, pen and paper or some kind of computer program, will bring you somewhere…(5) The message of the medium will get conditioned for the problem which you worry over. The scale-model, the drawing or the computer model becomes more precise and represents the design problem at hand. Eventually the medium provides insight, clues and evocation. Then you have to be alert and pick up the ideas, and when you have found what you did not ever expect to find, you can call that your serendipity or ‘generated inspiration’ (6).

Situatedness and Unexpected Discovery
Design Media and media-content can be valued for their ability to inform and their ability to evoke. Thus we can speak of the information value and the evocation value of design media. The properties for information value can be e.g. the amount of data, the reliability and the accuracy. Evocation value is much more difficult to define. Evocation is the ability of media, media content or situations to bring up ideas in someone’s mind. So, evocation value can be anything, as long as it is picked up by someone and as long as it is related to problems that can be solved with it. Evocation is dependant to the serendipity of a designer. Evocation and serendipity will more likely occur if a designer is in an active dialogue with the design-media. Skills, attentiveness and interaction are essential in a good use of design-media. This shows the importance of behavioural protocol analyses in design-media-research.

If media provide such kinds of information that a designer gets enough evocative and informative clues to tackle a demanding design problem, one could speak of ‘situatedness’. The term ‘situatedness’, introduced by Clancey [Clancey 1997] is described as ‘where you are when you do what you do matters’. Most people have experienced that they suddenly got a nice and good idea and immediately afterwards forget the idea because they where distracted by something or someone. When they go back to the place where they first got their idea, they go back to that place in order to remember. This is their appeal to situatedness.

By breaking Clancey’s definition of situatedness in parts, links can be made between these parts and aspects of design media and the application of design media.

‘- where you are -‘ is the actual surrounding of reality and visualised or simulated aspects of reality. In computer Virtual Reality applications (VR) we can call this surrounding a ‘cyber-real world’, because it is partially representing reality and partially result of computed phenomena. Cyber-Reality is ‘defining the area in which our creative activities take place’ [Asanowicz 1998]. Where you are is very important for creative processes. The virtual environment and the real environment provide what can be called ‘the stimuli in design’. If these stimuli are conditioned for giving the right

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4 Serendipity is the ability of someone to find or remark something which he or she was not especially looking for.
information and evocation for a certain problem, there is a good starting point for a designer to find appropriate design solutions. ‘- when you do -’ is referring to an interactive process, doing is acting and reacting to the media content in a sketchy or refining way. Most important is ‘that you do’, for if you do not, nothing happens … ‘- what you do -’ is referring to specific acts of designers. Someone who is very skilled in using media is most likely and possibly consequently a creative person as well. Knowing what you can get from a medium, knowing how to draw and manipulate images is the way to transform air castles into real architecture.

The ‘where, when and what’ of ‘acting in situatedness’ make the role of media in design very clear. Whenever we are inspired or persistent in our design activities, media can provide a more or less conditioned environment with which we can interact.

Situatedness in reality or situatedness which is represented by media can evoke. People can be serendipitous and pick up the evocation. They can do ‘unexpected discoveries’ [Schön and Wiggins, 1992]. This theme of ‘doing unexpected discoveries’ is described in a protocol analyse report. Schön and Wiggins summarise the research as follows: ‘We shall describe architectural designing as a kind of experimentation that consists in reflective ‘conversation’ with the materials of a design situation. A designer sees, moves and sees again. Working in some visual medium - drawing, in our examples - the designer sees what is ‘there’ in some representation of a site, draws in relation to it, and sees what has been drawn, thereby informing further designing.’

In this description of their research, two main aspects of situatedness come together: some representation of a site and a drawing in relation to it. The designer starts a reflective conversation. The site, or context of the design, acts as referential information. The designer sees the site and picks up exactly what aspects are needed for the further designing. Then a movement is mentioned. This can be a shift in point of view, or a ‘re-framing’ of the design problem. Moving and seeing again gives new insight. When the first sketch strokes are jotted down, immediately another new image occurs. The relation of the design in its context is ‘reflected’ by the medium. At that moment it already becomes difficult for the observer (protocol analyst) to be aware of all design steps … the reflective conversation is on its way.

Parataxis to Evoke Creativity

The above mentioned ‘some representation of a site’ and ‘a drawing in relation to it’ are actually the two essential aspects of my Ph.D. research. They form very important primary information in almost any architectural design process. My research focuses on questions like: ‘what kind of representations’, ‘of what parts of a site’ and ‘which relations to a site are essential in the perception of the designer’ and ‘which aspects are forgotten’.

After many pilot studies, workshops and little tests with the Virtual Reality Modeling Language (VRML), I found out that situatedness can be provided if you make a medium (computer program plus the content) that combines ‘representations of the site’, ‘3d sketch matter’, and all kinds of ‘evocative objects’. Ideal prescriptions for these three ingredients are not yet ready.
'Creativity in design by using prototypes can be performed by processes of combination, mutation, analogy and by the use of first principles' [Rosenmann and Gero, 1993]. I think these processes are not bound to just prototypes. They can also be found in less definite aspects such as forms, directions or colours. All kinds of combinations, mutations, analogy and first principles can be used in creative processes. As a, albeit arbitrary, conclusion to this paper, I would just like to mention the imaginative power of combination, which I partially try to explore in my research.

The concept of combination in sketches and drawings is very much accepted in architectural design practice. By drawing on semi-transparent paper and by using a layer system in CAAD, the juxtaposition of different information gives a combined insight. When a sketch layer is placed over a drawing of a site, the above described situatedness may occur. In VRML, these juxtapositions can be made in three dimensions. In my research, I combine (1) the information of the site, (2) the evocation of different evocative objects with algorithmic behaviours or constrains and (3) sketch-matter which can be used for jotting down ideas in reflective conversation with the medium. The 3D layers can consist of semi-transparent images, photos, texturemaps, 3d geometry, text, sections and maps. The possible and adaptable combinations should give insight, evocation, gaps and problems in order to give the designer's creativity a chance to react.

Finally I want to mention the phenomenon of parataxis in linguistics. The parataxis stands for two unrelated words which get a new meaning when they are combined and joined together. For example: “fire-ball” which can nowadays be understood as the sun. As a computer can make all kinds of jokes, it can also make parataxis’s on a word level, in images or in Virtual Reality. The parataxis can be seen as very evocative. Still it is not creative. Creativity comes in when the computer-user sees these images and makes interpretations. Serendipity helps in this process to get unexpected ideas. It would have been serendipity when the electric lamp was invented based on the combination of the two words ‘fire-ball’.

REFERENCES


Breen, J.L.H. / Stellingwerff M.C., (1996), A Case for Computer assisted Creativity through Clarity, Project 12CAD and beyond…, in ‘CAD creativeness’. proceedings of the 4th international conference on computers in architectural design, edited by A. Asanowicz and B. Sawicki, Bialystok, Poland, 1996.


'Parataxis: Kennings. The kenning is one example of a formula in Old English poetry that helps the listener visualize the spoken text. A kenning is a phrase used in place of a simple word. It consists of two words related to the object but not necessarily to each other. Thus world-candle stands for sun, gold-friend for lord, whale-road for sea, and fire-lizard for dragon. A more metaphorical phrase such as “the candle of the world” would not hold up under Old English metrical standards. The kenning serves to slow down speech that would otherwise be too fleeting and to create a powerful, dense image. In this way a kenning might serve like a large picture on a web page that takes a long time to appear on screen.’