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The Unknown Triangle

Le triangle inconnu

Das unbekannte Dreieck

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Summary

In structural engineering, like everywhere else, one is confronted with triangular relationships. Maybe between designer, contractor and structure, maybe between structure, designer and computer or designer, program developer and computer. The need for interfaces never arises from the man-material relation, but from man-man relations. In this paper relation is defined as experience. It is explained that the causes are of missing relations between designer and program developer and how these relations (interface) can be improved.

Résumé

Dans le domaine des constructions de génie civil on est confronté, comme dans toutes les activités humaines, à des relations triangulaires. Soit entre le projeteur, l'entrepreneur et la construction, soit entre la construction, le projeteur et l' ordinateur, soit entre le projeteur, le programmateur et l'ordinateur.
Le besoin d'interfaces ne provient jamais de relations homme-matériel, mais de relations homme-homme. Dans cette contribution, une relation est définie comme une expérience. On explique les causes des relations manquant entre le projeteur et le programmateur et les voies d' amélioration.

Zusammenfassung

Im Bauingenieurwesen wird man, wie übrigens in allen menschlichen Tätigkeiten, mit Dreieckbeziehungen konfrontiert. Sei es zwischen Entwerfer, Bauunternehmer und konstruktion, oder konstruktion, Entwerfer und komputer, oder Entwerfer, Programmentwickler und Komputer. Das Bedürfnis an definierten kontaktflächen kommt nie aus einer Mensch-Material Beziehung hervor, sondern nur aus Mensch-Mensch Beziehungen. In diesem Beitrag wird Beziehung als Erfahrung definiert. Es wird auseinandergesetzt welche Ursachen fehlenden Beziehungen zwischen Entwerfer und Programmentwickler zugrunde liegen und wie diese Beziehungen verbessert werden können.

INTRODUCTION

With this contribution to the colloquium thesis "Interface between computing and design in structural engineering" the writer does not intend to explain what is right or wrong in software or hardware developments, computer-aided design trends, structured programming and all such themes we are so concerned about in the seventies. Neither does he want to go back to the sky-blue sixties where, after a hesitant introduction for computers, everything and anything seemed to be possible, even automated design.
Nevertheless, at the present moment we use for our design work programs that were developed in the second half of the sixties.
The writer has enjoyed and suffered computer use in his profession as a consulting engineer since 1964. His experience, as an individual balance, as a manager, between designer, computer user and program developer and especially his experience in professional organizations, dealing with the problems of using computers in the civil engineering environment, form the basis of this paper.
From this experience the writer wishes to point to developments that he thinks are important for improved computer use by designers and others active in structural engineering.

PART I

Experience as a relation

Like all other human beings, designers and computer program developers are observers of the world around them. Which world? Is your world the same as my world? Is there an objective world? At least I observe "things" around me and most of these things I have learned to name. I will never know how you observe these things. We both learned "the grass is green", but we are not able to compare your impression of green with mine. I look at my grass as a farmer who needs the hay crop. You look at the turf for your important football match next weekend. Do we see the same grass?
"You don't feel what I feel" my little daughter said angrily when I said the pain might have been worse. That is certainly true. I cannot feel her pain. I can only imagine how I would feel if I had fallen down. I go back to my memories and compare her injuries with mine in the past. The only things I can do is tend her wounds and comfort her. At home we tell our adventures.
This little domestic event is a basic illustration to the philosophy outlined in this paper.

Let us go back to the observer and follow the chain of brain activities and phenomena from the observation of the "thing" down to the (complex) reaction of the observer (Fig.1).
Important in this chain is the first filter in the "perceive" activity, where part of the observations are lost. If there is enough motivation we receive the observations, if we are not interested, the filter is closed. Like sitting behind a TV-set at night thinking about difficult problems we met during the day.
The next interesting point is the second filter in the "compare" activity. If we make an observation that we cannot identify because we are not familiar with the subject, we are not able to retain the observation.
If you see a string of Chinese characters, and you have not studied Chinese, you will not be able to retain the observation. If you read the sentence "The quick brown fox jumps over the lazy dog" and you are not familiar with telex communication you may have difficulty in remembering the sentence, although each word is a rather simple English word.
As technicians we will have no difficulty in remembering the sentence "The Eifel Tower is a three-dimensional steel structure".

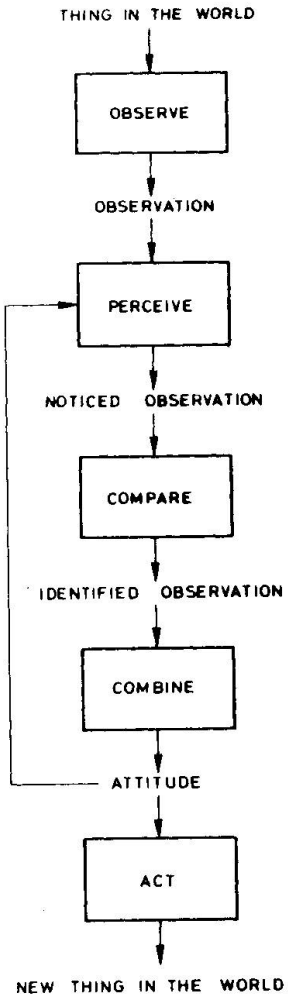

Fig 1 Chain of brain activities and -phenomena
Interpretation from [1]

We are educated and trained to receive and absorb such an observation. And if you once enjoyed a romantic evening in Paris, whenever the Eifel Tower is mentioned you will recall a lot of memories which have nothing to do with steel structures.
In the "combine" activity the observations are combined with earlier observations and stored in our memory by chemical means. This means that the more observations we experience and combine of a subject that we are interested in, and if the work on this subject gives us satisfaction, the more "open", the more "dedicated" we become towards the subject. The relation grows.

Subjective reality

However, as the activities "perceive", "compare" and "combine" are highly dependent on hereditary qualities, experiences from the earliest beginnings of our personal life, and the more or less random circumstances under which we receive our observations, the result must be highly individual.

This explains why two witnesses who observed the same accident will give different testimonies. They may have paid attention to different circumstances and combined their observations with different backgrounds, even subconsciously drawn conclusions. They may end up with contradictions, although they are both telling the truth. Their truth, their reality. (Fig.2)

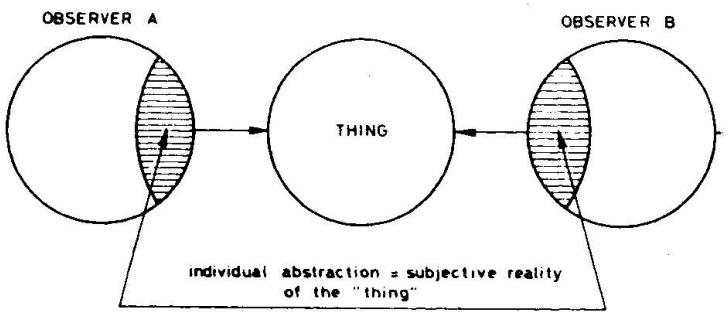

Fig. 2 Subjective reality

How many witnesses would we need to describe the objective reality?
From the described approach it may be concluded that objective reality may be approximated by adding subjective interpretations of numerous observers. But who adds? And what to say about phenomena no observer ever experienced?
The following conclusions have to be drawn

- objective reality does not exist, or at least no one has observed it.
- there are at least as many subjective realities as there are observers.

Intersubjective reality

As two observers observe each other, imagine their mutual feelings and respond to each other, in other words: communicate, sets of mutually tuned experiences grow (Fig.3)

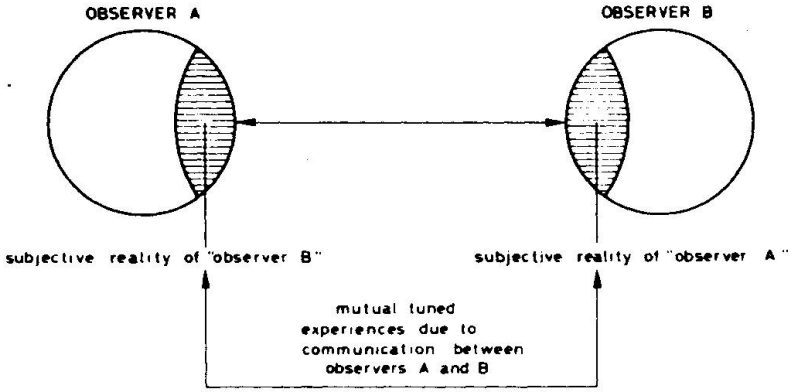

Fig. 3 Mutual tuning of experiences through communication

We all know how difficult it often is to explain things to complete strangers while a friend may understand us so easily. We may call this intersubjective reality. (Fig.4)

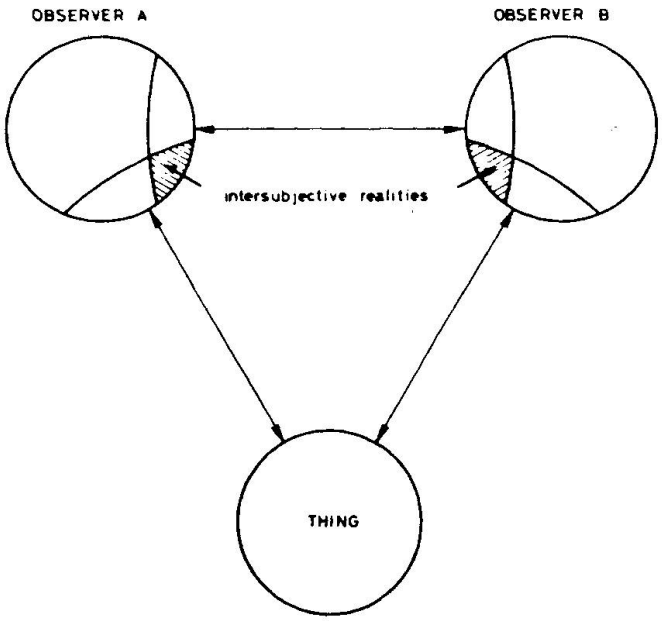

Fig. 4 Intersubjective reality

Each observer has many intersubjective realities. At home, work, club, country, race, religion etc. Those intersubjective realities, necessarily growing only in groups, give a feeling of protection against hostile outsiders who do not share in one's own(ed) reality.
This does not imply objective reality within the group, as the individual subjective reality per observer still exists, but at least they will try to expose their shared reality to the outside world. This group process is one of the strongest stimuli for developments within the group. Examples are many: the Dutch school of painting, the Vienna Circle in philosophy, MIT for computer program developments, etc.
For the individual observer it even is a necessity of life to belong to at least one group, in order to feel safe and find appreciation and satisfaction.

PART II

Contractor, designer, program developer.

The first part of this paper is generally applicable to human actions and relations of individuals. How can this be applied in the subject of the colloquium?

There is a building process of many years' standing, where designers and contractors each play their role. We all know the difficulties that arise if designer and contractor "do not speak the same language".
Too theoretical a designer and too practical a contractor. They both live in their own world, with very few contacts. One contact, however, is unavoidable. In their relation it is essential that they both are related to the same materialized "thing", the structure. (Fig.5). After realization of the structure each of them will be proud of "the structure they built".

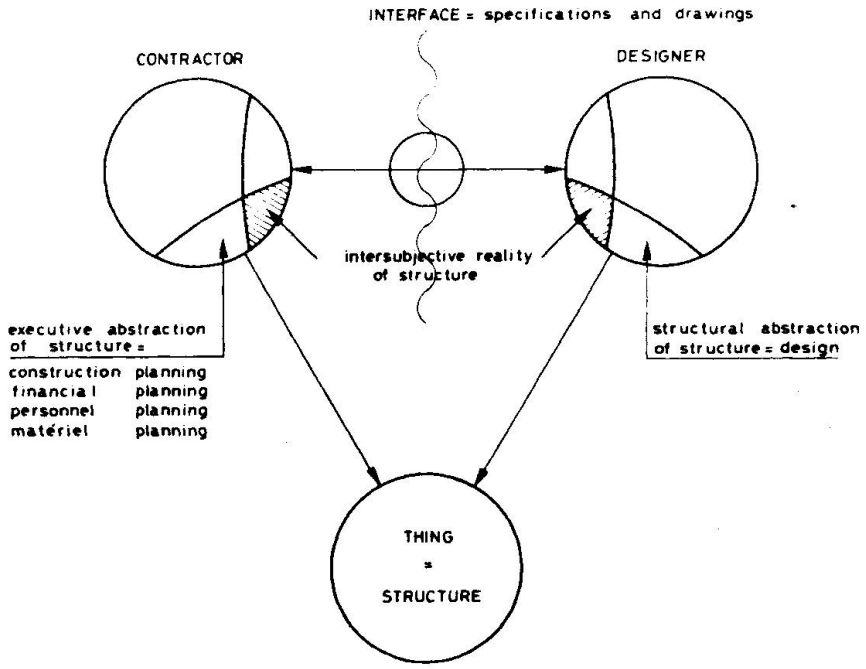

Fig. 5 Designer - contractor relation

How does the program developer fit into the picture? (Fig.6)

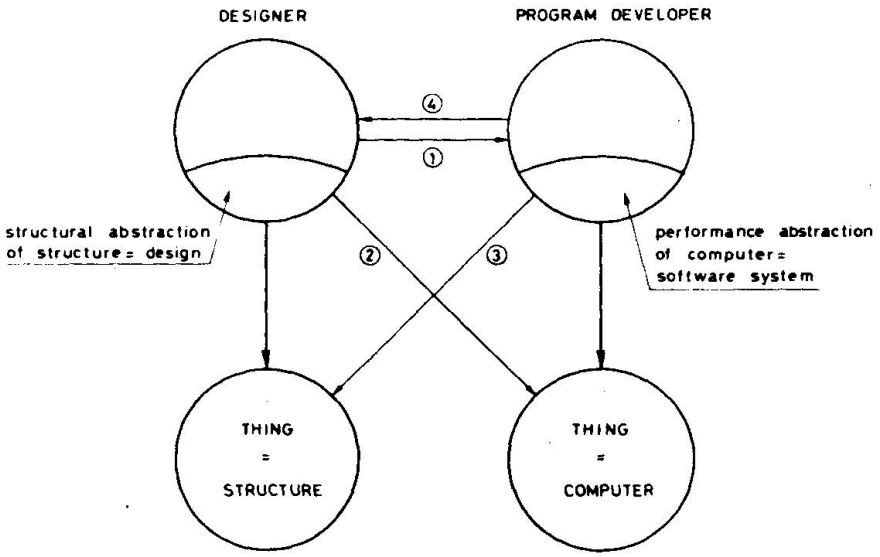

Fig. 6 Designer - program developer relation

Designer and program developer have different things on which their attention is focussed and there is no a priori relation between them.
How is the relation initiated?
As there are two men and two things a number of possibilities arise
1. The designer becomes interested in the program developer
2. The designer becomes interested in the computer
3. The program developer becomes interested in the structure
4. The program developer becomes interested in the designer.

Possibility 1 may sometimes occur. The designer becomes fascinated by the work of the program developer, but in general the result will be possibility 2.(Fig.7) The designer becomes fascinated by the possibilities of the computer. With a computer he can do things better and faster. As we all know from our professional environment, such designers tend to become program developers. If they do the job professionally they become the best ones! Because they speak the language of the designer.

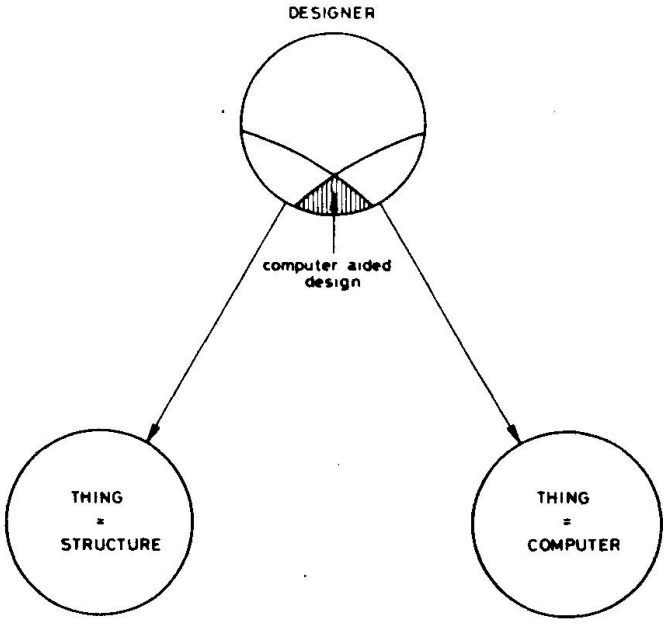

Fig 7 Designer with two affections

Possibility 3 is not impossible but it is not likely to occur. Just as designers in general do not tend to become contractors. The reverse more often occurs. Careers tend to develop from concrete to abstract environments. And computer applications are much more abstract than structures, even more than designs.

Possibility 4 is also of interest. The program developer who sees a market for his program developments in the designer. Make a general program and try to sell the use to the designer. Unless the program developer succeeds in entering the intersubjective world of the designers, his product will never be a winner. Each designer will have met the attempts, as many program developers will have met the disappointment of having an excellent but unused program.

Recommendations

1. Make a group of designers and program developers.
   Because the program developer and designer are involved in contractors' planning activities as well, the contractor should be member of the group too.

2. Make communication between designer and program developer as simple as possible. In other words bring the communication to the level where the two intersubjective worlds meet again.

3. Make education and training such that the intersubjective world of designers is directed towards the use of programs, in other words towards the program developers, instead of teaching future designers to make programs and directing them towards the computer.

PART III

Attempts in the Netherlands

1. In 1968 the CIAD Association was founded. An independent, non-profit organization. Members are contracting firms, consulting engineering firms, government bodies, together covering nearly the entire civil engineering sphere in the Netherlands. Service bureaux and industries are represented as well.

   The Association started with the aim to make programs on a combined basis. After ten years nearly all activities are concentrated in project teams, where computer programs are no longer made but where a range of activities are being performed on problems related to computer use, such as parameter studies on pile-drive analysis programs and verification with full-scale testing; standardization of traffic measurements to be used in different programs; which computer programs are to be used for certain soil-mechanical problems, etc. Contractors meet in a team to unify their salary programs, etc. It is hardly possible to find out what the backgrounds of the members in those teams are.
   A new intersubjective world of relations has grown and is still growing.

   The main goal of the Association today is "To optimize computer use in engineering technics". The optimalization is found in speaking the same language, maybe not always using the same words, but at least not arguing about what way leads to the ideal.

2. As a result of efforts within the CIAD organization and with financial support from the government a new Association has been established based on the use of one integrated program system (Genesys).
   Main goals are standardization of program structures, standardization of user manuals and lay-out of input data and output results, in general of program documentation, and hardware independency of the subprograms.
   Especially the standardization aspect is of great importance because it lowers the required level of communication between designer and program developer, i.e. his product. In the Association the users and potential users of the program system and its subprograms are joined together. They raise their standards and express their wishes regarding new developments, etc.

   Alongside the Association a Foundation has been created to make the system available to users in a service bureau manner and to carry out the work resulting from the Association. After some years' start-up the Foundation

will work for the users in the Association and will find its financial continuity from the users, while the users form the Board of the Foundation (Fig.8). The users (designers, program developers and contractors) will thus have created their own interface. It is the result of 10 years' collaboration within CIAD.

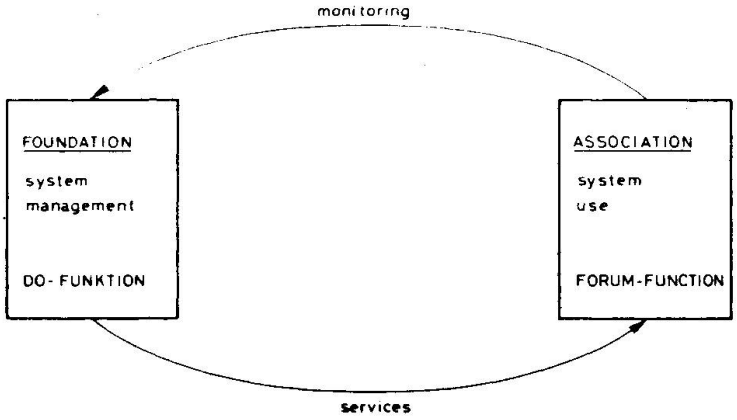

Fig. 8 Organizatorial scheme of co-operation between designers (users) and program developers on basis of an integrated program system

3. Over the past few years CIAD has directed its attention towards education as well. There is a dialogue growing between the Association on one hand and technological universities and technical colleges on the other hand. Once more it becomes clear how difficult it is to bring two intersubjective realities together!

CLOSING REMARK

From the foregoing it may be clear that to attempt to define a general interface between design and computing is fruitless. Each designer and program developer will define his own interface. Through continuous discussions and cooperation these individual interfaces will be unified and at last match, at least a little. This colloquium is one attempt.

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