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DESIGN-WARE SYNTHESIS

Summary. There are presented conceptual models of the information and knowledge structuralization proposed on the background of the operation aiding as well as activities of the designed process. It is lead out the structural and functional organization i.e. design-wares and principles of creating software of the means. There is paid attention to their meaning for creating utility resources used for computer aiding and new generation computer aided design (CAD) systems.

1. Basic concepts

From the first applications of computers for the design aiding, development of the systems created for these aids are observed. New generations of systems are appeared. They integrate (include) functions of proceding solutions enriching them of news tasks.

The synthesis of computer aided design (CAD) systems is visible against a background of analysis of the range of the design process functions.

The characteristic feature of structures of detailed design aiding systems is modelling of designer activities realized under the resulted from giving the answer for the general question: How should one operate to design (dimension) an object built a priori?

Enlargements of computer aiding to the stages previous to detailed design, so thus to phases of initial and conceptual design, the aiding needs are realized under the general question: How can one archieve the pointed out aim, i.e. design the object satysfying a specified need?

Computer aiding requires the representation of different behaviours of the designer and totality of the designed operation, experienced and creative activities.

Taking into consideration the creative behaviours in the aided design is not a simple matter. It is helpful when we are refering to investigations as to:

- computer structure and organozation of the memory for the definition of the range of the knowledge representation used by thinking-decision processes,
- computer modelling of thinking-decision processing in the human mind, for representation of certain fragments of the operation composed for the user (designer) behaviour, for effeciency of the computer aiding and using the user-computer relation in computer aiding systems.

There are appeared problems of design-wares synthesis for creating new va riants of computer aided design systems, fulfiling qualitatively-new user requirements. To main factors conditioned creation of new generation CAD systems we can reckon as follows:

- taking into consideration elements of advisory,
- enlarging the knowledge range used in aided design processes.

It leads to:

- including to consideration under aiding, not only aiding the routine activities of the user, but also aiding of some elements composed for the creative behaviours of the designer,
- including to consideration of effeciency of the aiding process, and mainly participation of the designer in the organization medelling of structurally-functional aiding-wares and modelling of them using in particular CAD systems.

2. Design-ware structural and functional organization

In analysis and proposing of the new solutions, functional and structural approach is used.

The structural approach lies in the identification of of stru-ctures perforrning data storing and data processing and their significance of the activity of a man - a computer relations. In the fun-ctional approach it is shown of connections appearing in suitable processes, at the renaucement of the seperation of particular components showing the way of data prosessing.

The union of two approaches permits to characterize the evolution and integration of design aided information systems and the role of computer aided design-ware synthesis.

In the tab. 1 there is presented the structural and functional modelling of the computer aided design processes.

The models of computer aiding processes we may analize against the background of the data and processing modelling for computer aiding (tab. 2). We may notice the principles of the software synthesis for data storing and data processing for computer resources for design. Aditionally we may notice the design-ware integration for CAD system creation (tab. 3).

In the case of the detailed of systems created according to rules of the evident inside logic the conceptual models of the design-wares results from the computer aiding integration of calculation, the informational service (data bases) the documentation (graphics) with the function aiding of taking a decision (choise in the design), as well as the knowledge representation supporting the activity of CAD systems itself. In software there is realized manipulation (management) of parameters in the valuation of data (data schemas). There is checked fulfilment of requirement and restrictions.

All steps of the system operation, including decision, are evidently enclose in the system software structures. In software there is realized manipulation (management) of parameters in the valuation of data (data schemas). There is checked fulfilment of the requirement and restrictions.

In the case of other phases of the design process macrostructure, i.e. in the initial and conceptual design, the computer aiding-wares based on rules being the determinism negation or otherwise the algorithmic approach, and lies in the computer representation of information structures accesible afterwards operationally accerding to needs of the informational service and heuristically simulated and constructive behaviours of the designer in the design process.

In the case of initial design aiding, factors and main elements allowing to modelling of the activities of the designer include: configurations and object structures (data schemas) choice, management of configurations and object structures. It leads to creation of different kind of computer catalogs and can determine the departure of creation of computer design-ware, used next for crea-

Tab. 1. Computer aided design processes modelling and range of knowledge utilize

DESIGN PHASE	The role of the aiding and the range of knowledge utilize	Contents of the computer representation of the design knowledge and the design operations
CONCEPTUAL	* Elaborating the object conception * The choice algorithms of the functional characteristics $O^P = <\ldots>$	Models of the design knowledge (C) Operations Heuristically simulated operations in the conceptual design
INITIAL	* Elaborating (selection) of the object structure - data (schemas of data) characterizing the structure * The valuation algorithms of the object structures $O^P = <S^P, \ldots>$	Model of the object domain with representation of the acces strategy of the useful information in the design (I) Operations in the initial design $S_1^P \longrightarrow S_2^P \longrightarrow \cdots \longrightarrow S^P$
DETAIL	* Detailing valuations of data (schemas of data) * The valuation algorithms of the data (schemas of data) $S^P = <S^P, W^P>$	Model of the CAD system (D) Operations in the detailed design $W_1^P \leftarrow W_2^P \leftarrow \cdots \leftarrow W^P$

tion of the data bases in detailed design systems and for creating different variants of systems of the design informing.

In the case of the conceptual design, factors and main elements of the aiding model include: factographic data, management of factographic information according to heuristically simulated activities (behaviours) of the designer. Factographic data bases i.e. syntetically processed informations, repleacing different documental informations will be cases of aiding-wares built on those bases.

3. Design-wares as utility resources of CAD systems

The seperation and the creation of different variuos utility of the computer design-ware, resources useful for the design aiding, results from possible aproaches to the object domain representation (fig. 1). Utility resources performs a role in the creation of mo-dels of the computer aiding of the designed

Tab. 2. The computer resources modelling for computer aiding

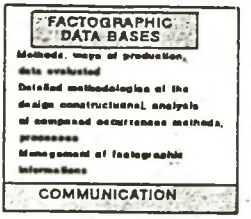
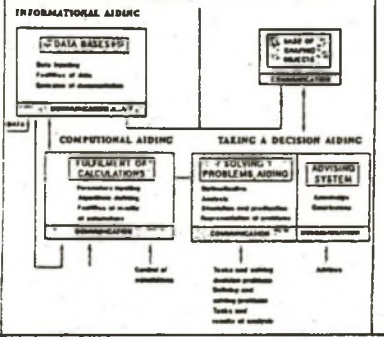
DESIGN PHASE	Principle of software synthesis	Computer resources for design and resources operation for computer aiding
CONCEPTUAL	DETERMINISM NEGATION, ALGORITHMIC APPROACH. Representation of designing knowledge and information useful in the design and facilities in compliance to needs of creative behaviours and aiding activities	(C) - Factographic information: synthetically proccesied informations replacing bibliographic sources - Management of factographic informations -
INITIAL		(I) - Information structures representing configurations and objects - Management of configurations and structures of objects -
DETAIL	EVIDENT INSIDE LOGIC. Software fixing steps of the system activity	(D) - Program structures associated with parametric (data schemas of data) structures - Management of parameters and programs -

process.

Analysis of design-wares role is interesting in the computer aided design. The meaning of computer representation of variuos the designed information and knowledge is visible (fig. 2).

The design-wares union with activities of progressive detailing of the information about the designed object is also visible in particular phases of the macrostructure model of the designed process. The meaning of the knowledge range presented in design-wares components is visible for realization of the computer

Tab. 3. The structural and functional organization of the design-wares for computer aiding

DESIGN PHASE	Structural and functional organization	Resources for computer aiding	Design-ware integration for CAD system creation
CONCEPTUAL		Factographic data bases (FDB) for aiding the elaboration of the object conception	(FDB)
INITIAL		Computer catalogs (CC) and informing the designer about spaces of technical solutions for the aiding the choice of structures of the designing object. Base of graphic objects (visualization)	(CC)
DETAIL		Data bases and algorithms for aiding the valuation of parameters (data, schemas of data). Base of objects graphic for the visualization the result of the design	(DB,PB) (C) (I) (D) Problem oriented CAD systems built usually with a dominant role of data bases

aided design, modelled as multilevel process of taking a decision.

It can be also noticed mutual design-wares interconnections and computer aided-wares intergration factors resulted from the knowledge structuralization aiding design process phases

4. Concluding remarks and certain references

We depend no experiences of earlier invetigations and realization achievments. The following publications are concerned with this subjects, they include the detailed bibliography:

REFERENCES

[1] KIERZKOWSKI Z., 1980, Modele i synateza oprogramowania systemów komputerowego wspomagania projektowania (Models and synthesis of CAD system software), Wydawnictwo Politechniki Poznańskiej, seria: Rozprawy, Nr 122, 1980, 1-127.

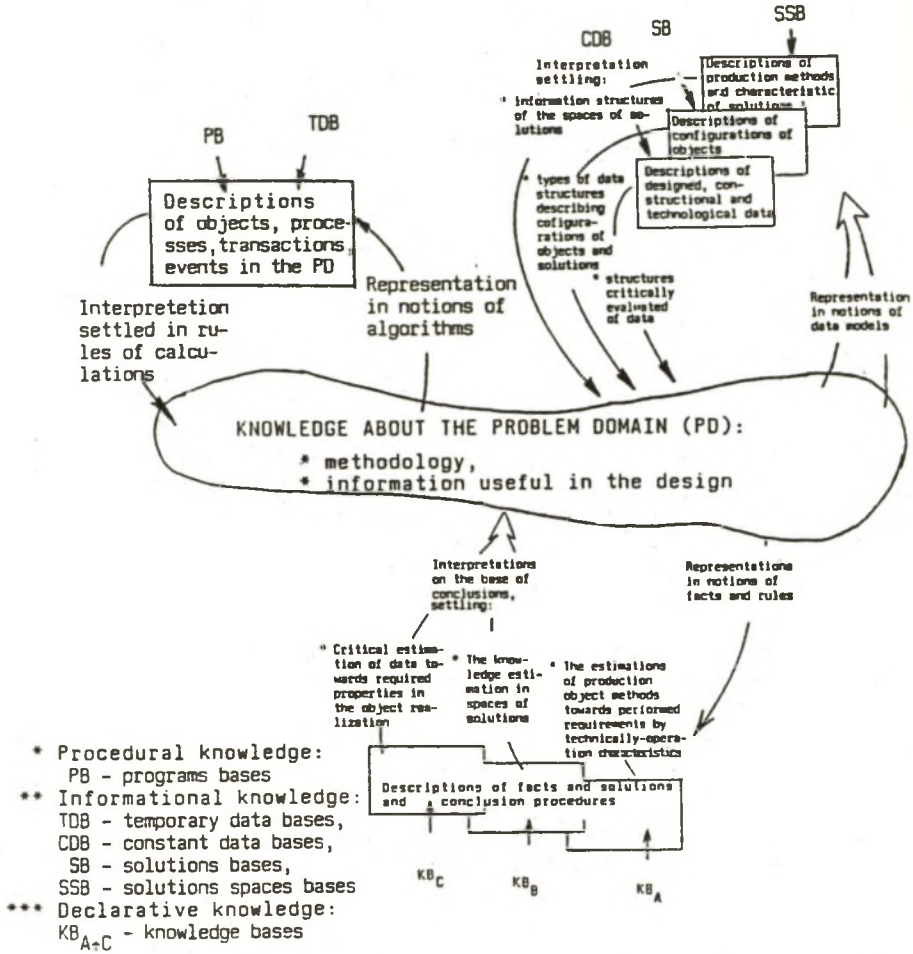


Fig. 1. Representation of design knowledge methods for the creation of computer design-wares

[2] KIERZKOWSKI Z., 1983, Podstawy teorii zintegrowanych systemów komputerowo wspomaganego projektowania (Integrated CAD systems theory foundation), Prace Instytutu Mechaniki i Podstaw Konstrukcji Maszyn, Wydawnictwo Politechniki Śląskiej, Zeszyt 89, 1-12.

[3] KIERZKOWSKI Z., 1986, Sztuczna inteligencja i komputerowo wspomagane projektowanie (Artificial inteligence and computer aided design), [In] Problemy komputeryzacji projektowania urządzeń elektroenergetycznych (Computerization problems of the design of power systems - ed. J. Bujko), Prace Naukowe Instytutu Elektroenergetyki Politechniki Wrocławskiej, No 68, 70-84.

[4] KIERZKOWSKI Z., 1988, Computer aided design and computer graphics - Status and development trends, [In] 3rd International School: Microcomputer 88 - Computer Graphics: Design-Practice-Education, Prace Naukowe Instytutu Cybernetyki Technicznej Politechniki Wrocławskiej, Nr 79, 89-94.

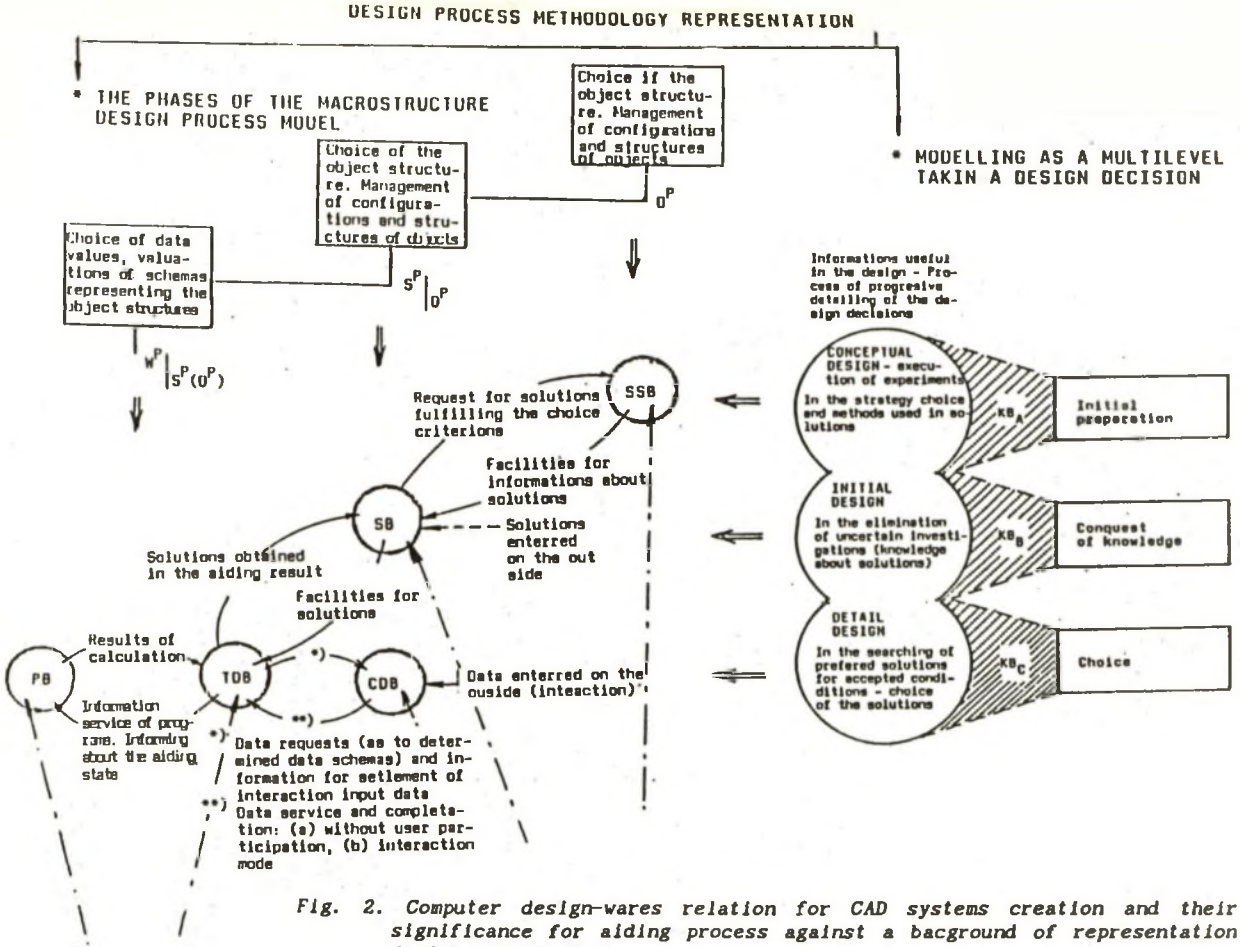


Fig. 2. Computer design-wares relation for CAD systems creation and their significance for aiding process against a bacground of representation design methodology

[5] KIERZKOWSKI Z., 1990, Computer aided design - An attempt at global approach, [In] Proc. 2nd International Conference on Information Systems Developers Workbench, Gdańsk 474-494.

[6] KIERZKOWSKI Z., 1991, The evolution and integration of computer aided design systems, [In] Proc. International Conference on Engineering Design - ICED 91, Zürich, Heurista, vol. II, 861-866.

From consideration of this paper there are resulted the conceptual models of the computer aiding-wares which have the meaning for enlargements of computer aiding for design.

Those considerations complete an attempt of the global formulation of computer aided design foundations.

Computer aiding-wares synthesis leads to the organization of structural and functional information and designed knowledge as to needs of the informational and calculation service, routine and creative activities of the designer appearing in the design process.

The meaning of the synthesis and integration of the design-wares is visible in creation of the problem-orinted (particular) CAD systems.

Considerations can be the output point for creation of new generation CAD systems, formulating the detailed problems for software synthesis of CAD systems. They have the meaning for the practice efeciency of usign computers.

SYNTHESE VON CAD MITTELN

Zusammenfassung

Man stellte die konzeptionellen Modelle von der Strukturalisierung der Informationen und Projektierungswissen dar. Diese Modellen wurden auf dem Boden der Unterstützung von Operationen, die in den Projektierungsprozessen auftraten, gebaut. Man leitete die structurell-funktionelle Organisation von den Computerunterstützungsmitteln (design-ware) sowie die Bildungsregeln von Soft-ware für diese Mitteln, die als benutzte Bestände dienen, ab. Man unterzeichnete ihre Bedeutung für die Bildung der neuen Generationen von CAD-Systeme.

SYNTEZA ŚRODKÓW KOMPUTEROWEGO WSPOMAGANIA PROJEKTOWANIA

Streszczenie

Przedstawia się modele konceptualne strukturalizacji informacji i wiedzy projektowej, budowane na tle wspomagania operacji i działań składających się na proces projektowania. Wywodzi się organizację strukturalno-funkcjonalną tzw. środków wspomagania komputerowego (design-ware), a także zasady tworzenia oprogramowania tych środków, jako zasobów użytkowych wspomagania komputerowego. Zwraca się uwagę na ich znaczenie dla tworzenia nowych generacji systemów komputerowego wspomagania projektowania (KWP).

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