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INTRODUCTORY CONCERNING THE USE OF THE COMPUTER IN THE FOUNDRIES

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Abstarct: *Within an informatics based society, data traffic globalisation gives a multinodal system that covers the whole industrial activity, including the foundry type economic agents.*

Computer stands for the basic part of a data administration system; metallurgist engineers must become efficient users of the computer informatic system and relearn to design and manage technological processes with these dedicated applications.

The present paperwork introduces elementary notions that one must keep in mind when implementing computer based techniques in metallurgical engineering and, particularly, for foundry type economic agents.

1. DATA. DEFINITIONS. CLASSIFICATIONS

Computers appeared around 1950, revolutionizing the calculation technique, but began to be involved, one way or another, in all the fields of activity: science, technique, economics. Together with informatics development and communication techniques globalisation**,** all technologies became involved in data generation, collection, transmission, elaboration and dissemination.

Nowadays, the technological innovation in communication becomes more and more rapid, and dependant on the society demand. The best example is the family of technologies characterized by [C4 / I2], meaning: [Command, Control, Communications, Computer / Data, Intellect].

The software/hardware quality speed of change is amazingly huge; miniatural huge storages compete with flexibility given by the wireless technique. These new achievements allow data exchange through connection between different networks; once a connecting profile was created, a location must be sellected and all will occur automatically.

Data are based on information that acquired meaning, purpose or utility through processing. Since data are communication's main subject, it must reach the following features:

1. Consistency (comprehensive enough to provide as many data as possible);
2. Relevance (so that it can provide the missing data, when taking a decision);
3. Accuracy (its content must reflect the phenomenon's real state);
4. Opportunity (it must be provided in time);
5. Accessibility (it must be clear, easy to understand).

The social activities development, whose goal is data transmission, memorising or treatement, generated an unprecedented diversification of data's nature, simultaneously with an exponential increase of its volume. Therefore, it imposed a data classification, after its form, as well as its nature and the basis it uses.

Data classification after form:

1. The data analogical form consists of physical phenomena representation, fixed images, sounds and moving images, as they are being perceived by the technical recording devices, with no need of conversion or codification before their transmission or memorising on technical data supports. Examples of data analogical representation: • recording messages or other sound data on a magnetic tape using analogical audio equipment (taperecorder), as well as sound catching devices (microphone); • recording documents's images or filming activities, operations, processes by using analogical devices for sound and image, videorecorder type and appropriate camera;

2. The data digital form cand be acquired either starting from the real phenomenon, or from its analogical side, both cases releasing a numerical codification, a quantitative evaluation, a phenomenon quantification subject to representation. On technical support, data are seen as a binary values succession (0 and 1), ordered after a rule system (code), and therefore, once introduced in the calculation, it is directly transmmitted and memorised.

Data classification after nature:

1. information: numerical, alphabetical, alphanumerical;

2. texts organized as documents, text pages, paragrahs, sentences, words and characters, designed to be processed with appropriate text edit and writing, grammar and semantic word control, edited text form making and page setting;

3. graphical documents that can contain graphical representations, drawings, technical designs etc and can be visualised by displaying them on the computer's monitor, their printing from the printer or drawing device (plotter) etc.;

4. audio sequences generated by human voice, real phenomena, musical instruments or voice and sound electronic synthesizer.

5. animated or movie video sequences, most of the times accompanied by sound data: voice or sound;

Data classification after the technical support used:

1. data on technical support: - magnetic support (magnetic tape, magnetic disk, flexible disk, magnetic card); - optical reading support (optic disk whose data are read optically with lasser devices);

2. data on graphic support: - opaque support made of paper (such as classic documents, computer devices documents acquired from printer, documents made with plotter drawing table); - transparent support (made of photographic blister, film blister, microfilm).

The usage of automatic data processing technique pursuites immediate and perspective goals in order to optimize the communication process.

In professional publications, technical documentaries, science communication sessions etc one can find any kind of data for decision taking.

Apparently, winthin an Internet network documentation, there appears a state of ″suffocation″ due to data abundance. The key to overpass this situation is relatively simple: know what you look for and why, or, in other words, do not passively stock any data that come either from simple bibliographic research, or from doing the respective work in extenso.

The data amount that floods the universe is apparently uncontrollable; most users cannot defend themselves from the informational „bombardment" and turn it into an accessible flux. In order to support these users, there are informatic instruments that facilitate data communication and control process.

Of course, the question is where to stock these data. Many organizations chose an internal data base that can be enriched by anyone. One cand stand the risk of becoming too eager to documentate, which makes stocked data over abundance change into its opposite, not being usable any longer.

The data management encounters one main problem - to finding the solution for the documents in use, because using the paper holder, at all the stages a documents passes through, becomes a more and more difficult and expensive activity.

2. DATA MANAGEMENT

Data management requires the following functions:

1. data taking over in the system (from the national or international communication networks, public or private; from the local data network; by manually introducing data and texts or recording conversation, image and sound with appropriate equipment). Data taken/introduced in the system are being immediately processed or memorised for further processing;

2. data memorising and refinding (internal memorising for data in course of processing; external memorising for reccurent data checking; electronic archives, for „historical" or rarely consulted data);

3. data processing (creation and loading of data base, that require a set of procedures through which data structure and mode of organization on technical holder, as well as data base effective loading are generated; data base actualisation, that requires elimination of useless data, introduction of new ones, modification of the existing ones to make them match reality; data effective treatment, that requires performance of most various operations that concern either form, when processing texts, or documents and images, or content when processing data);

4. data consultation in real time is being operated with some programmes that allow selection and transmission of the required data towards an exit peripheral device (monitor, printer, network communication equipment etc). Data stocking capacity and access speed are the main criteria in appreciating a system's performances. Through memorising, data can be processed or used by local consultation or sollicitors' communication through the communcicattions networks. Consultation of data base does not affect its content. Putting into form the required data at exit requires different operations depending on the nature of the data required. For example, when processing data, some operations take place to get reports and complex situations that will be transfered to the exit devices in order to print or post them on the monitor, local or distance communication, through data networks;

5. printing or publishing (to professionally make the two functions perform, it is necessary to found, within an organization, some specialized compartments in electronic journalism which have minicomputers or medium/big computers with appropriate software and bases that facilitate the hoarding of big amounts of documents. Managers convinced hemselves that it's not only what the product looks like that influences customers, but also the quality of their presentation);

6. system's control and command (leading and regulation of the whole system's functionning; optimal allocation of the system's resources concerning the equipment; internal memory and programme base management; taking over processes control, data processing and exit etc.).

The latest PC usage is undoubtely, multimedia. PCs equipped with CD-ROMs combine graphics with sound and give the user a glimpse of what will bear the digital future – informatic superhighway - a mix of graphics, sound and video.

În this context, due to multimedia systems' appearance and spreading that optimally combine telecommunications, calculation technique and audiovisual, data processing gets new dimensions, either qualitative and quantitative. Qualitatively, numerical data electronic processing enriched itself with new forms: texts, documents, graphics, voice, sound and video image.

Quantitatively, through the modern communications systems, data central weight point moved from computer specialists to computer product users.

3. OPPORTUNITIES IN COMPUTER'S USAGE

The informational system. Computers are everywhere, likely connected to each other and thus, forming computer networks. All this because we more and more realize that the PC facilitates our work. But one must emphasize that a computer is, in fact, a „machine" that processes a series of *data* that we supply to it. Data are the key element in this entire chain. In fact, practice introduces, among other things, two concepts connected to it, namely the *informational and informatics* systems.

The informational system stands for a set of elements involved in the activity collection, transmission and processing etc. The role of the informational system is to transmit data between different elements. For example, within an economical unity, the role of the informational system is to ensure necessary data for the leading persons to take different economical or other type decisions. Within an informational system there is : spread data, data caring documents, staff, communication means, data processing systems, etc. Among the possibile activities performed within this system, we can enumerate: data acquirement from the base system; completing the documents and transfering them between different compartments; data centralization, etc.

Within the informational system, most of the activities can be performed with the calculation technique. Basic data can be processed and then, the result can be further transfered, towards another compartment for processing. The transfer can be performed electronically, through a computer network or a modem.

THE informatic system. The set of elements involved in this entire process of data processing and transmission electronically form an *informatic system*. Within an informatic system, there can be: computers, data transmission systems, other hardware components, a software, processed data, the staff that exploits the calculation technique, theories that support the processing algorithms, etc.

Therefore, we can say that the informational system is included in the informatic system, the latest being an essential component of the first one.

The informatic system cover the most various fields; according to expertise, they are:

1. Specialized systems, designed to solve a certain type of issue from a certain field;
2. General usage systems, which help solving a large range of problems from several fields;
3. Local systems, programmes necessary to process data when data are on one calculation system;
4. Network systems, the system works within a computer network, in which case, data and programmes can be distributed to several workstations that are part of that network.

Lately, we insist more and more on the network systems variant, the advantages being obvious : very quick data transfer between stations, minimal costs, etc.

Depending on data localization and the processing place, there are different informatic systems:

1. With centralized data, data are on one calculation system only;

2. With distributed data, data are distributed on several computers within the network;

3. With centralized processing, data processing is being done on one workstation only, regardless of the number of stations that host data to process;

4. With distributed processing, several computers process data come from one or more computers of the network.

After the domain where they perform, systems can be classified into:

1. Data base systems, specialized in huge data amounts management;

2. Scientific processing systems, specialized in certain scientific domains;

3. Technological processes leading systems, machine management systems, instruments, computer tools.

After the hierarchical level of informatical systems in the society's organizatorical structure, there are:

1. Informatic systems for activities management within economic units;

2. Organisation system with group structure;

3. Territorial informatic systems;

4. Branch, subbrench and national economic systems;

5. General use systems.

A computer mainly stocks data in data bases/data banks and uses programmes (achievable activities) at the operator's commands, using data stocked on its own system or exchanging them with the networks it is connected to. From this perspective, computer can be taken as an unlimited size „list" data storing place, with instantaneous accessibility; this general feature makes it usable mainly for the so called monitoring operation.

Monitoring stands for the main subject of the informatical compartment of any economical agent and its results allow the coordination of the whole respective unity, for example that of an integrated foundry and stands for the base of a global computer systems's building, that includes achievable programmes and instantaneously accessible data bases for:

1. technological department/chief metallurgist;
2. mecanic compartment/technological equipments;
3. power sector;
4. human resources office/working staff;
5. financial-countable sectors, marketing, suppliers contact;
6. administrative structure;
7. management staff/instantaneous communication with and in between sections and sectors , leaders, replacement of daily operative meetings and conferences for reports collecting, statistics of tasks and achievements or transmission of decisions to different departments/sections/communities;
8. informatic system administration, connection to mass-media and web promotion of products and economic agent.

After the activity it monitorizes and executes at operator's demand, that performs a certain application, data management systems can help:

- Production management;
- Commercial activity;
- Countable bookkeeping;
- Materials and goods bookkeeping;
- Staff and wages bookkeeping;
- Fixed means bookkeeping.

The monitoring strategic goal is to achieve the techno-technological processes optimization state, to get high efficiency and frame into the total quality regime, respectively attestation and certification after norm series ISO 9000.

Individual monitoring totals into a territorial structure, that stands for the base of the informing source for the department administrative decision, at ministerial and republican level.

4. DATA BASES MANAGEMENT SYSTEMS (SGBD)

An „applicaţion" (an achievable programme) is a programme system designed to perform a well determined set of operaţions on data bases; the application consists of:

1. the very programmes (main programme, coordinator, menu programmes, screens, interrogations, indexes, actualisations, reports);
2. data bases.

Application's performance takes place at two levels:

- *Interpretative* – when a programme called „interpreter" takes each enunciation of application, translates it into an internal code and performs error analysis, executes it, then passes to the next enunciation;
- *Compilative* – when the whole application is being translated by the compilator programme into an intermediate code, memorised on the disk, called object code, submitted to suplementary processing by the connection editor in order to get the final achievable form of the application. The performing is done under the operation system's control.

Achievement of a data base implies: analysis of the system for which data bases are being built; designing the base structure; loading data into database; data base exploitment maintenance.

Effective achievement of an application implies: assign task; task analysis; application design; application coding; modulus testing; implementation of application; application maintenance.

1. *Assign task;* task is assigned by the application beneficiary, in accordance with the activities that are about to be modeled.

2. *Task analysis;* this operation implies identification of data types, connections between them, necessary operations for their management. Task analysis ends with the assignment of four „data multitudes", whose rigour and exactitude influence the veracity of application's results: description of input data; description of data stored in the database; list of performed processings on data; description of reports data.

3. *Application design.* At this stage, we achieve data and programmes structure design. Designing programme structure implies detailing the modulus necessary to application achievement: modulus for folders creation, data implementation, processing and result abstraction, error correction etc. These modulus are controled and coordinated by the main programme, that has the following structure: main programme; global picture declaration; global variables initialization; environment state saving (general iniţialization).

4. *Application coding;* if at the precedent level called „initial designing of application" the detailing level has a „pseudocode" type, at this stage application is written in a specialized language, respecting the rule imposed by that one.

5. *Modulus testing.* At this stage, modulus are being checked, possible errors are detected and corrected, extreme cases analysis is being performed, tests are being designed.

6. *Application's implementation.* We build the final form of application by gradual integration of tested functional modulus.

7. *Application maintenance.* We must remove the errors pointed out by the user during the warranty period, modernise and upgrade the application.

Database users can be:

- *Non specialist users* (conversational) that are offered a form of communication with database, close to current speech;
- *Specialist users* who know the structure of database;
- *Database administrator* is a special user, who defines database exploitation's objectives, shares users access rights, elaborates database design conception, is in charge of all the activities and operations refering to database, helps defining users' demands etc.

Databases languages. Within *„Databases Management Systems" (SGBD)*, data declaration and and manipulation functions are being done with different languages:

a) *Data defining languages (LDD).* LDD functions are: performs entities and their attributes definition by names, memorising form, length; specifies the connections between data and access strategies to them; assigns confidential different criteria; defines used data automatic validation criteria;

b) Languages for data manipulation (LMD). Operations performed on databases require a specialized language, where commands are expressed in sentences that describe actions upon the base. A command has the following structure: 1. - *operation*, that can be an arithmetical or logical calculation, editation, extraction, opening-closing, manipulation (introduction, add, delete etc.); 2. – *selection criteria* (for, while, where etc.); 3. *–access mode* (secvential, indexed etc.); 4. *–edit form;*

c) *Data control languages (LCD).* A database control implies: assuring data confidentiality and integrity; data saving in case of damage; getting performance; solving competition problems;

d) *Universal languages.* An universal language is rarely used to manage a database.

The interface between user and SGBD is achieved in two ways:

- Using a calling mechanism inserted in the application programme. This mechanism can be a CALL or another key word. A system that allows this type of mechanism is called a *SGBD wih a host language;*
- Using a special command, used independently. În this case, the managing syistem is called *autonomous SGBD*. Still, there is a special interface, which is capable to interprete the commands of the sollicitation language.

In order to achieve an efficient *informatic system* , we must keep in mind some basic rules, deduced from practice:

1. *Global modular approach.* When projecting a system, we musk pay attention to its connection to the external world, the communication possibilities with similar systems, compatibility to systems of different nature, the possibility of including the system into a more complex one, or the possibility of including other systems.

2. *The economical efficiency criterium.* The main criterium that stands for the basis of achieving a system is the economic one. In other words, when designing, we must keep in mind the fact that the report between the direct or indirect result or results got through implementation and usage of the economical system and the total amount of performance costs should be as big as possible, the system should, therefore, be profitable.

3. *Orientation towards users.* When achieving the system, we must pay atttention to users' requirements and preferences. În this sense, one must have a previous conversation with the users and, taking into account their suggestions and preferences, one must start the so called designing process.

4. *Assurance of data introduction exclusiveness.* In most of the cases, a series of data must be used in several places within the informatic system. when designing the system, data must be

introduced only once, and the system must automatically distribute data to all the other places they are needed at.

5. *Training the beneficiary when achieving the system.* This principle also derives from orientation towards user. One must talk to the user before starting the designing process, in order to initially remove a series of shortcomings .They must talk about the means of introducing data and adapting the application to users' necessities, data calculation and processing modes.

6. *The general solution, independent of the actual configuration of the computer working system* if possible, the designed system must not depend on the beneficiary's actual tehnical endowment, but one must pay attention to possible new acquisitions in the calculation technique, a possible change of the informatic system.

7. *Further development possibility.* We must keep in mind the possibility to improve the system according to future requirements of the beneficiary firm. The informatic systems give significant issues at their own performance. According to the approaching mode, costs can be smaller or bigger, results can be better or worse. As time passed, two types of strategies have been outlined:

- Ascendent („bottom-up" from bottom to top, from small to big);
- Descenden („top-down" from top to bottom, from big to small.

8. *The ascendent strategy.* According to this strategy, the solution to a certain problem starts with the solution to detail, minor ones. Solutions stand for an unit that solve a more complex problem. We must perform this way till we get to the top, to reach the global problem's solution. The drawback of this method consists of the necessity of knowing in detail the domain of the problem to be solved before getting to the so called solution.

9. *The descendent strategy.* It is opposed to the ascendent one, approaching the problem from general to particular, from top to bottom. The problem is approached globally, trying to decompose it into smaller problems and getting to solve the subproblems thus resulted. Solving the subproblems is done through the same method, namely by decomposing them into other subproblems, and so on till we get to problems whose solution is popular. This strategy has the advantage that it offers, at any time, a general image of the issue to be solved.

To achieve an informatic system, a lot of persons, materials, time etc are involved, and finally leads to high costs. It's because of this issue that the design problem approaching mode is extremely important. În time, a few designing standard methodologies appeared. The main stages in achieving an informatic system are the following:

- The existing system analysis – we study the existing informatic system and establish its shortcomings and the requirements that will be overpassed by the future informatic system. At this stage we establish the rentability of using the informatic system;
- The informatic system designing – we conceive the system, its elements, their structure and means of performing it. Due to its complexity, this stage is being decomposed into two substages, too: 1. – The general designing – we establish the general architecture, the means of decomposing into its components, systems' inputs and exits. It ends with a general scheme of the system where all these elements are included; 2. – The datailed designing – each element described in the previous stage is described in detail;
- Prorams drawing up – we write the system's programme in a previously selected language;
- Sytem's implementation – once the system was achieved, we get to its implementation;
- Exploitation and maintenance of the system – this is the final stage of the project, where we get to its exploitation. In parallel, we need a series of operations for its maintenance.

5. USINGE THE COMPUTER FOR DESIGN AND RESEARCH-DEVELOPMENT TYPICAL USAGE DOMAINS

The development of the calculation technique marked the most various domains, so that nowadays it became unconceivable that a designer should work without a computer, which leads not only to a substanțial time saving as far as the so called technologies elaboration is concerned, but also to a clearer vision of the decision concerning the optimal variant, adopted within the process that it is about to elaborate or analyse.

Within the general context of optimizing the functioning of the industrial systems, the computer is used to: 1. – the so called designing; 2. – achievement of some data bases; 3. – shaping the technological processe; 4. – leading the processes towards working places; 5. – achievement of Expert Systems = SE.

6. THE TECHNOLOGICAL DEVELOPMENT

The goal in designing and research-development methods and devices is shaped by the necessity of product improvement, reduction of fabrication specific costs, reduction of technological assimilation time, increase of productivity.

The first stage of the fabrication – *conception/designing,* must anticipate the technic-technological evoluțion frame and be at a time level with < + *2-4 units* >, in an *execution* report.

Accordingly, the usage of computer and some programmes is implemented and < *authenticated* > during the designing process; implicitely, designing was the first <step> even in the case of number command units, and the peforming processor was subsequently implemented.

At international level, there have already been established a series of principles of the fundamental discipline, the theoretical base, including already known terms elements.

Our country confrunts itself with the same dilemma as in other domains (longlasting development –ecology, globalization, natural resources limitation, energetical alternatives etc.): < *taking the same stepsi, including the failures already known* > or < *selection of the essential points and framing at optimal levels only* >; chosing the variant is conditionned by the difference of the total costs. In this regard, we may think about the < *mechanization-automatization* > stages or integration by < *robotization* >.

We must give a series of explanations as far as terminology is concerned.

The designing working technique, in connection to computer's usage, through the appliance of some apprpopriate programmes and equipments, is defined as *CAD = Computer Aided Design.* The concatenation of the designing programmes with data processing systems, in the engineering science, is generically called *CAE = Computer Aided Engineering.* The integration of an enterprise into a complex and complete system of data monitoring, processing and administration is called *CIM = Computer Integrated Manufacturing.*

The *CAD* applications, with the designing assistance programmes systems are the most famous and are mainly made up of the scheme domains from Figure 1, as it follows:

1. a communication domain organizes data input and output to and from the designing department;
2. a method domain contains the working modulus corresponding to shaping, informing and calculation;
3. a data administration and management field, namely an integrating system of the data bank organizes all the data transfers and stockings between the method algorithms and communication domain on the one hand, and the data banks networks or specialized or standard individual folders, on the other hand;
4. the designing data base containts all the stocked geometrical and nongeometrical data, which are necessary both to the designing methods and to the communication between the projecting operator and the CAD system.

A fundamental characteristic of the CAD systems is made up of the *RID concept = Geometrical Objects Internal Representation.* This system is built on a *real object;* through the abstract process, one can get a *mental virtual object,* from which one can get an *informational object,* through formalization and multiple filtrations in fundamental specific languages. By a series of transformations and transposings based on the binary code, one can constitute an *internal model* in the computer's memory = *RIM* (see. Fig. 2).

In Figure 3, we give the very simple scheme of the tridimensional representation means essence of *objects – technical bench-marks* and of biunivocal transformations from an informational model (with discrete sizes, quantizable in volumes, surfaces, contours and/or points) to an *internal model of the computer, RIM type.*

An object representation can be achieved through a volume, surface or line model (the so called *the edges models or the wire models*).

The volume model (spatial) can be recomposed in a way oriented towards *bodies* or *surfaces*. For calculations and analytical integrations one needs the internal generation of a *tridimensional body*, therefore, the construction of a spatial model oriented towards bodies. Having a surface model, one is able to sufficiently describe volumes for constant thickness pieces only (e.g. tin pieces) or for rotation symmetry pieces.

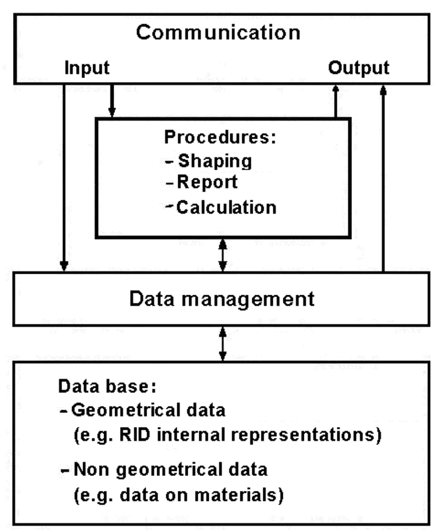

Fig. 1 *General structure of the CAD programme systems*

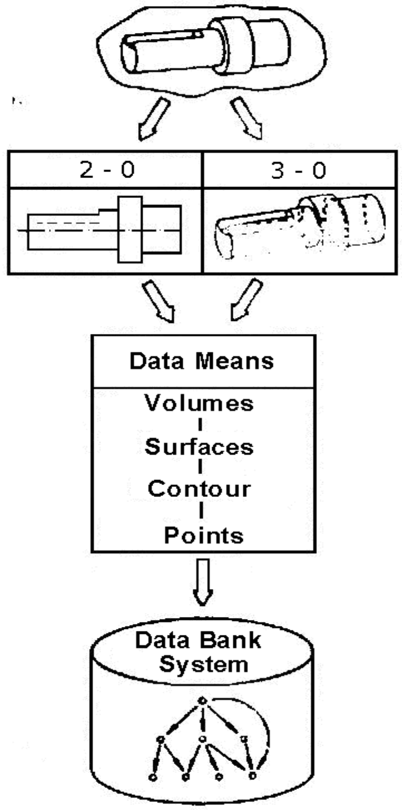

Fig. 2 *Abstractization models of technic objects*

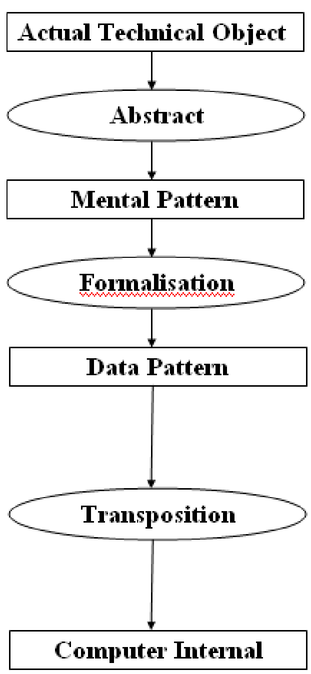

Fig. 3 *RIM principle general scheme of geometrical objects internal representation performing, in the computer's memory*

Plane and rotation symetru pieces can be clearly described only by the bidimensional representations = < *D Models*>, surfaces or lines. These models are appropriate not only for the internal representation of *views* and *sections*; for the normal-classic drawings execution, this patterns is sufficient (v. fig. 4).

From < *2D Views* >, hand designed, scanned and introduced into the computer, through reconstruction automatic techniques – < *3D Models* > are automatically generated.

The macros technique is based on the usage of the already existant geometrical models, namely stocked for simple pieces, classic sets, fundamental structures; from case to case, these *patterns* = *standard solutions* are submitted to adaptations, adjusting, redimensioning. It is very productive to import from the data bases *stocked-archived representations* = *finished* elements, pieces and standardized-tipified solutions by usual devices and cars organs.

În the CAD field, a package of programmes can contain a large series of individual programmes and programme systems:

1. *Configuration programmes*, that can integrally perform a geometrical representation, calculation and preprocessing of the designing data, in an interractive form; in a special way, there must be possible a shaping of the tridimensional geometry of the computer's internal model, on the basis of which rapid, accurate and exact regrant of classic projections of the usual technicalal drawing should be possible.

2. *Programmes specialized in data organization* (the fundamental principles of solving standardized pieces, materials, cost data, rate-setting times values, data connected to specific consummation); such data banks systems are easy to use with searching dialogue interractive facility programmes;

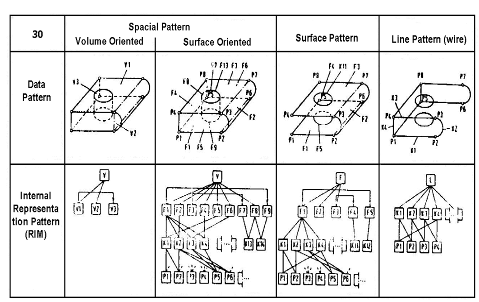

Fig. 4 *Types of models for 3D objects, within the informațional field*

3. *Specialized-dedicated calculation programmes* (resistance, thermic, checking, interpretation, optimization, simulation, graphic representation or those to prove dependance of a

certain size on a certain parameter, such as time, temperature, etc.);

4. *Drawing performing programmes* (generally, the systems for the bidimensional representations are sufficient);

5. *Synthesis programmes* (performing the documentation for the tipodimensional series designs, modular or adaptation constructions; these systems are mainly based on the combination of some modulus or blocks as banchmarks or sets, achieved under variation or modification of some parameters from the initial base).

To assist the creative designing activity we need, first of all, geometry shaping programmes, simulation and data processing on the basis of some confirmed solutions, because, with their help, we can quickly acquire the variation possibilities and designing measures effects, as well as the properties and capacities of the popular solutions and the technique stage.

When we work with the CAD systems, we get help from the numerous auxiliar functions, such as the so called exploded representations, perspectives, transparences, transformations of the representations from D to 3D, detail augmentation, scale modifications, body rotations and translations etc. Thus, these work methods work either as rationalizing means or creativity stimulation.

Alongside with the pure drawing representations, the concatenation of the calculation stages with the geometrical effects communication is very importanț to designs and designer's conception activity optimization; in this regard we must mention only the Finished Element Method = *FEM*, a subject we'll talk about later.

7. CONDUCTING THE TECHNOLOGICAL PROCESSES

The actual research concerning the usage of the artificial intelligence to support industrial development, through the systems based on expert cognition of certain top technologies domains, will result in a rapid generalization of the newest methods at each country's scale, allowing to eliminate the dependance of the productive units based on advanced tehcnologies, on the existence and availability of some very high professionalism staff.

At the level achieved by the most competent units of scientific and technological research, without needing the respective scientists' psysical participation to the problems effective solution, expert cognition availability stands for the central objective of the artificial intelligence applications, known in the world computer's field as Expert Systems = SEs.

În the most general acceptation, SEs stand for a complex informatic programme that emulates a human expert reasoning upon a process or it is even capable to act, with the specific informatic-cybernetic means, just like this one.

In principle, SE have been developped under the following form:

1. *specialized SEs*, that deal with a specific issue;
2. *domain independent SEs.*

The latest informatized option in the technologically leading processes field – independent SEs have the advantage that they can solve any kind of problem and can work alone, if given enough *input data*; this system can learn alone from its own performing experience, it selfcorrects, it selfprogrammes, evoluates. It has a training session during which it can learn to take decisions based on experience; after it practiced long enough, we can allow it to take real decisions, using *reasoning* (the *expert* specific function). While learning, the system gets more rapidly to *the desired (real)exit (conclusion).*

It is possible that, at a first performing, the system should take a wrong decision; the user communicates to the system that the decision was wrong, so that the second time – the SE system should reach the real conclusion. If the SE still does not give the right solution, the user fournishes it and the SE will emit, after a series of integration and selfreprogramming sessions, correct *reasonings (judgements).*

Using the *process computers* facilitates control, fixing and leading actions. The leading *activity,* conceived as the *optimal leading***,** can be achieved by: 1. – mycrocomputer automatic system solution; 2. – like a SE.

În the first case, using the leading system aims at the optimal leading of a techological process whose parameters (metallic material, product, load, equipment) are preestablished (with tabels, off-line simulation, number methods etc.), the effect of different disturbances being corrected during the technological process by the automatic system with a microprocessor. In each particular case, we aim to apply a certain programme or sets of programmes.

8. CONCLUSION

The fundamental criteria that lie at the basis of SE development are:

- *Necessity* (satisfy industrial or technological requirement);
- *Capacity* (development according to industrial capacity to cover with resources requirements determined on the basis of the necessity criterium);
- *Flexibility* (elimination of factors that prevent industry from quick adaptation to requirements and resources unpredictable modifications, determining the transition parameters from one state to another);

• *Maintenance* (the necessity to maintain the industrial production level correlative to scientific and technicalal development).

In the SE case, we get an upper stage of computer leading, with the microcomputer.

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