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POSSIBILITIES OF MicroCADDs IN PRODUCTION PLANNING

Summary. Production planning means the whole production process of the given product, that is an overall planning which contains main and auxiliary processes. Its main tasks are: planning of the technological processes, planning of the auxiliary processes and the production system.
The paper represents the levels and tasks of the computer aided process planning of the part production. Taking into consideration planning methological bases, mixing of semi-generative and artificial intelligence methods is perspective. It is important to realize integrated working/operation for which the application of standardized product model satisfied requirements of technological planning in terms of CAD systems.

The production planning means the planning of whole production process - i.e. entirety of main and auxiliary processes - of the given product. So that the production plan contains the plan of every activity of the whole production process - i.e. the plan of the manufacturing operation, technical inspection and qualification, transportation, storaging, packaging, setup of machines and equipments, energy supply, etc.

The complexity of the production planning activities makes the necessity of the application of computer methods evident. In spite of this fact the software supply is smaller in this field than, e.g. in the field of CAD systems helping the work of design engineers. Although the development and research of computer methods of technological process planning - as the port of production planning - providing its basic function go back to the past of several decades, and it has produced a number of encouraging results applied in industries.

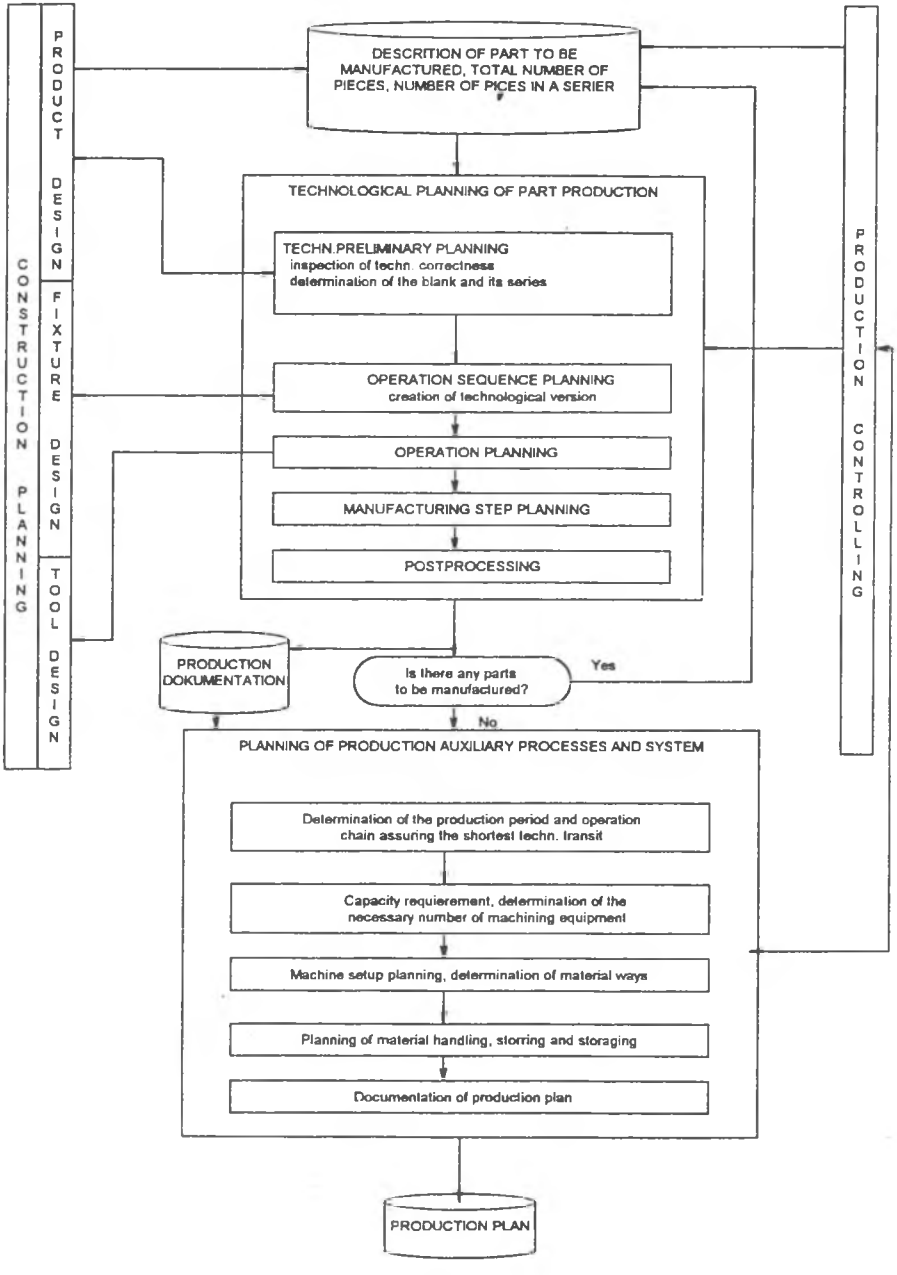
CONSTRUCTION PLANNING
PRODUCT DESIGN
FIXTURE DESIGN
TOOL DESIGN
DESCRITION OF PART TO BE MANUFACTURED, TOTAL NUMBER OF PIECES, NUMBER OF PICES IN A SERIER
TECHNOLOGICAL PLANNING OF PART PRODUCTION
TECHN.PRELIMINARY PLANNING
inspection of techn. correctness
determination of the blank and its series
OPERATION SEQUENCE PLANNING
creation of technological version
OPERATION PLANNING
MANUFACTURING STEP PLANNING
POSTPROCESSING
PRODUCTION DOKUMENTATION
Is there any parts to be manufactured?
Yes
No
PRODUCTION CONTROLLING
PLANNING OF PRODUCTION AUXILIARY PROCESSES AND SYSTEM
Determination of the production period and operation chain assuring the shortest techn. transit
Capacity requierement, determination of the necessary number of machining equipment
Machine setup planning, determination of material ways
Planning of material handling, storring and storaging
Documentation of production plan
PRODUCTION PLAN

Figure 1.

The paper emphasises the problems of part production - more exactly, the cut part production - from the wide area of machine industrial production planning containing several technological branches.

The Figure 1. shows the scheme of part production planning. According to this, two basic problems are to be solved:

the planning of - technological process and
- production auxiliary processes and system.

We think that the semi-generative process /1/ synthetizing from elementary standard technological processes coordinated to typified surface groups is perspective among the well-known planning methodical bases, in the field of the computer aided technological process planning. In creation of operation sequence the computer realization of this method, the choise of machining equipment, the creation of operations are quite difficult, and they give proper solution mainly with the interactive contribution of technologists. The cause of this is the fact, that in this phase of planning the creative and intuitive knowledge of the technologist has a significant role. The application of Artificial Intelligence (AI) methods means the future. The realization of experiments of this direction has been encumbered by the fact, that the available AI software development environment did not ensure too comfortable tools for solving technological process planning tasks. It results a slight stop in the field of research and development initation, but the up-to-date tools help to avoid the initial unsuccess, so it is expedient to increase the development of this direction.

The efficiency of application of computer aided production planning is influenced by the condition, that in what extent its integration /2/ with other systems of technical preparation realizes, mainly with product and tool designing as well as production controlling systems.

In case of integrated production mode, e.g. the ready and raw piece description meaning the basic datas of technological planning can be received from the construction planning, so that it is not necessary to convey this information again to the technological planning, with any manual ways (input language, interactive grafical or text data input). The description of the parts is a quite difficult task. The disproportion between the quantities of needed information and results data is particularly conspicuous, if - because of any reasons - the technological planning is expected to solve grandiose planning or operation sequence planning tasks. This problem does not arise abviously, if the part description can be directly taken over from the construction planning.

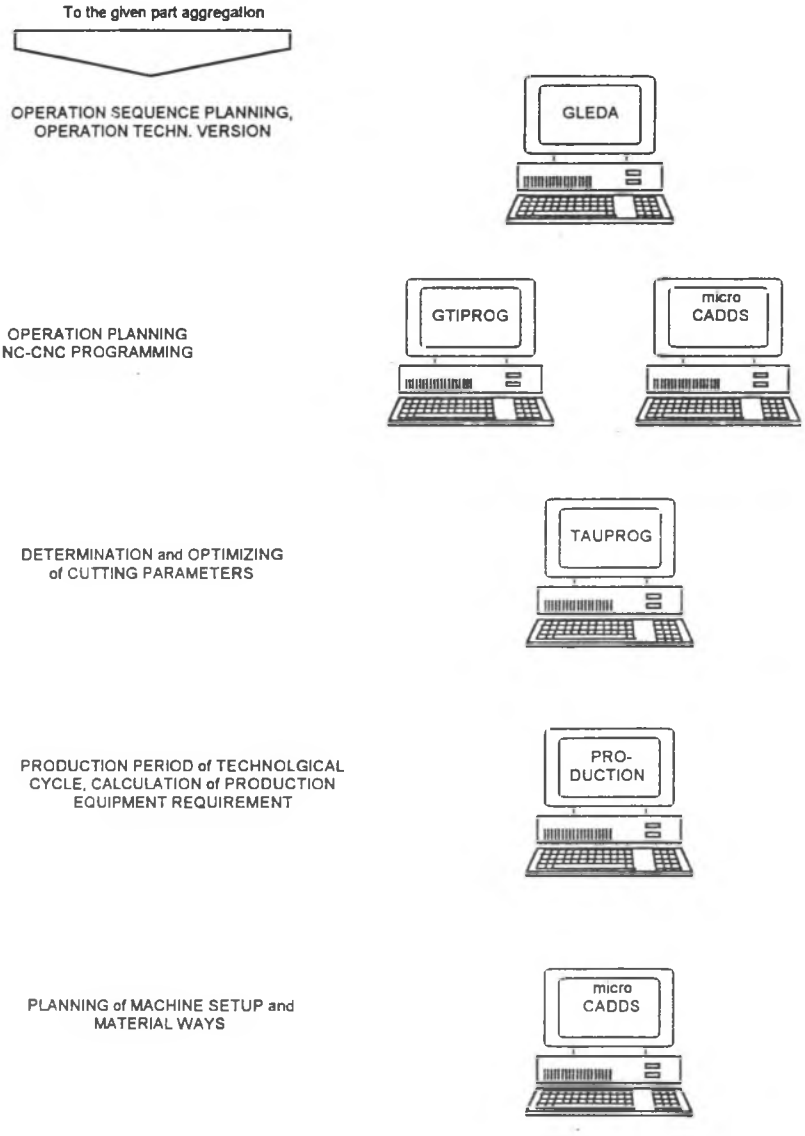

Figure 2.
Computer aided planning of part production
Elements of system applied in education

Taking over the part description seems to be obviously, but it carries numerous problems. The main difficulty is that the current CAD systems mean only the geometrical model of the part - if we speak about part model (description) -, and they do not regard the description of accuracy requirements as the important part of the model. Another problem is that during the planning although the constructist thinks in surface groups (bores, grooves, steps, pads,...) creating functional (constructional-technological) integrity, these do not appear in explicit form in CAD part model, but they are falling apart to geometrical „primitives„ (line, circle, plane, different surfaces, cylinder, cube, prism and conoid). From the aggregation of „primitives„ technological systems must recognize surface groups creating a 2Hintegrity, which can be solved sometimes only with the contribution of the technologist.

The connection of technological process planning systems to any CAD systems becomes simple, if the CAD systems use standardized part model satisfying the above mentioned requirements. The standardizing works in ISO and the development of the STEP product model are perspective.

The connection with the production controlling system is duplex; partly the production controlling provides the boundary conditions of technological planning (equipments and devices taking into consideration, optimum criteria, etc.), partly the technological planning provides information for solving production controlling tasks. The realization of this relationship does not mean difficultly.

The Figure 2. shows a system evolved for teaching of computer aided planning of part production at the Department of Production Engineering, University of Miskolc. The GLEDA technological process planning /4/, the GTIPROG operation planning and NC programming /5/ and the TAUPROG technological data determining /6/ moduls are the results of national R&D and are made in the Industrial Technological Institute with the cooperation between TU of Budapest and University of Miskolc.

Inserting to the above mentioned system we performed experiments on the Personal Machinist CAD/CAM system as a part of the Prime Computervision microCADDS system. This system can be excellently applied for solving NC programming tasks and planning of machine setup (Figure 3.). To realise other tasks in production planning the microCADDS system is not applicable.

It is an attractive idea to realise the description of raw and ready pieces constituting the main part of base data of production planning in the microCADDS system and so the production planning (e.g. the GLEDA system) processes the geometrical model created by this way. For this, a software developer environtment is available in the microCADDS.

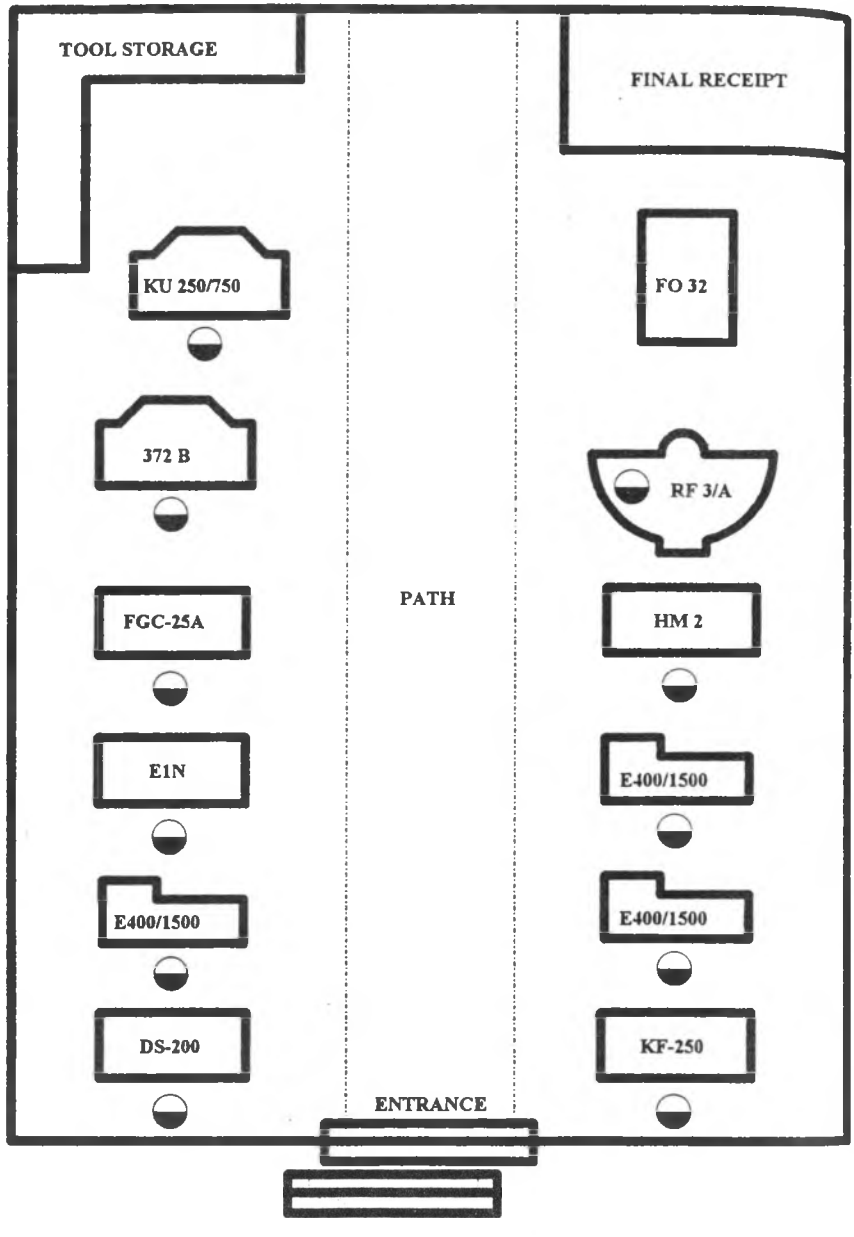
TOOL STORAGE
FINAL RECEIPT
KU 250/750
FO 32
372 B
RF 3/A
PATH
FGC-25A
HM 2
E1N
E400/1500
E400/1500
E400/1500
DS-200
KF-250
ENTRANCE

Figure 3.

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