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MS WINDOWS BASED TOOLS FOR P-CAD DESIGNERS

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The paper presents the results of joint work with CERN CN/CE group in the field of developing and implementation of software for Printed Circuit Board (PCB) designers who use the P-CAD suite of programs for board layout. The set of tools on the base of the friendly multi-documented Windows graphic user interface was developed. These tools are the useful extension of standard P-CAD utilities.

Now the people during a work with P-CAD have an access to many libraries of the standard components created by the different companies, laboratories and designers. There are a lot of recommendations for P-CAD component design, but many designers do not follow these rules in their work. As a result the part of P-CAD libraries and components have non-standard representation. In order to avoid this situation the special rule-based program for graphic normalization (**PC-NORM**) was developed. The main goal of it is to give the simple and quick way for the viewing and the correction P-CAD components graphic representation in accordance with pre-defined customized rules.

The PC-NORM works with compacted libraries of P-CAD components and alone components. It browses the contents of P-CAD component, marks all wrong (from rules point of view) elements of component, presents them and allows to edit these elements. It can change automatically the following attributes in P-CAD component files:

- line width;
- text size, justification, rotation and placement;

• origin point placement.

The PC-NORM is not the P-CAD graphical editors (like PC-CAPS or PC-CARDS) because it can change only graphic element attributes, but it can not delete or add new graphic elements to component graphic representation.

In addition to automatic normalization, the PC-NORM supports interactive normalization as well, so it is possible to change accessible attributes of graphic primitives by hand. All normalized components can be saved as a compacted P-CAD library.

The **PC-BANK** package was developed to ease electronic component selection for PCB designers. The PC-BANK creates database of electronic components contained the set of components' attributes that are absent in the initial P-CAD files and full-scale graphic image of the component. The existence of the centralized component database allows to have the one common source of the electronic components for the P-CAD design. The components in the PC-BANK database are tested by the expert, so it allows to except the using of non-standard or incorrect components by the designer. In the current implementation the PC-BANK database uses Oracle 7 database management system.

The sources of the data for the PC-BANK database are the existing P-CAD libraries and the separate components. All accessible data are extracted from them, using the standard P-CAD utilities, and then they are loaded into the database (Fig.1). The special graphic format is used to store information about graphic representation of P-CAD components. All components in the PC-BANK database are separated into groups named Family (twelve in the current version). A Family has its own specific set of attributes. The attributes of the loaded component can be changed in the interative mode.

To receive the information about P-CAD components from PC-BANK database, the user has to specify the database request (query). The request contains some search attributes that are specific for every family. For example, it can be based on functional characteristics of components (like the resistance for Resistors & Potentiometers Family or the capacity for Capacitors Family), or it can use some alphanumeric pattern for search by name.

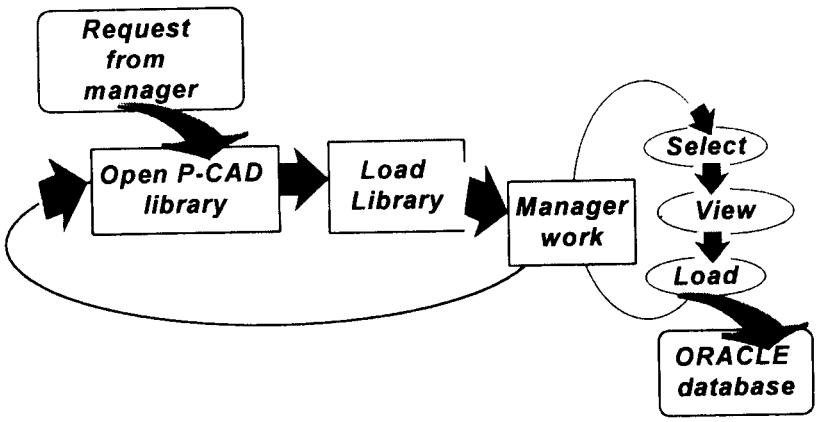

Fig.1. The cycle of Manager work

P-CAD programs use only DOS facilities to view graphic shape of component, that is rather obsolete and does not give the possibility to other applications receive P-CAD component's graphics. The special application **TURBO VIEWER** had been developing as a part of the PC-BANK and it is used for graphical representation of P-CAD components for the user. The Turbo Viewer shows standard P-CAD graphical layers and special PC-BANK layers as well. The PC-BANK layers are used to show an information about the component from PC-BANK database.

The Turbo Viewer allows to perform the following functions:

- to show any combination of P-CAD layers;
- to obtain the hard copy of the graphic image of the chosen component using a printer;
- possibility to change the scale of any part of viewing image;
- possibility to change some characteristics of viewing image: background color, color of any P-CAD layers, scale of grid, grid size and color;
- to put component's image into Clipboard.

The PC-BANK helps to the user in seeking of P-CAD components and saving them, as standard P-CAD files, to the user project directory. Save function is used to extract chosen component from the original P-CAD libraries, to add values of component's attributes to new PC-BANK layers and to copy component into project directory (Fig.2). All components for definite PCB design with additional data from PC-BANK database can be collected in one place and can be easily used for future design.

The PC-BANK **ADMINISTRATOR UTILITY** was developed to help in PC-BANK database maintenance independently from the maintaining Oracle database at whole. Some actions that can be fulfilled with the help of this tool are the following:

- creation of the backup file for the current PC-BANK database and loaded P-CAD files;
- restoring PC-BANK database and P-CAD files from the backup file;
- clearing the contents of PC-BANK database;
- deleting from PC-BANK database specific P-CAD library;
- deleting from PC-BANK database specific PC-BANK Family;
- change Oracle password for the PC-BANK administrator.

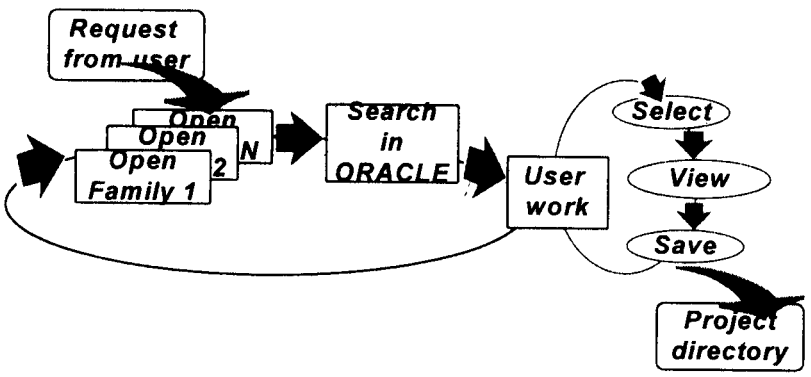

Fig.2. The cycle of User work

The **PC-LIST** program was developed to prepare a list of components used in schematics or in PCB design under P-CAD. The working cycle of PC-LIST consists of two stages. At the first stage the PC-LIST extracts information from the P-CAD files, produces the report files and passes them to EXCEL. At the second stage it is possible to use EXCEL features for editing, printing, zooming and others. It is most useful for schematics or PCB designs with components that were chosen and saved using PC-BANK. At this case the data from additional PC-BANK layers will be inserted into report.

System requirements:

- Operating System: MS Windows 3.1/3.11 or MS Windows 95;
- Disk storage: at least 4 megabytes of available disk space;
- Monitor: VGA or SVGA graphic adapter and compatible monitor;
- Software: PCLIB, PDIFOUT, PDIFIN utilities for P-CAD 7 or later;
  Oracle 7 - for PC-BANK
  EXCEL 5.0 - for PC-LIST

The first network versions of PC-BANK and PC-NORM were installed at CERN on December 1994 for beta-test evaluation. The operational versions were installed at CERN PC Networks on November 1995. At PNPI the current version of PC-BANK is installed at IT department local network. After the developing of PNPI local network PC-BANK will be accessible to other departments. The main results of these works were presented at EDAC-ETC EUROASIC 94 – the 1994 European Design and Test Conference 23.2.-3.3. 1994, Paris.

There are a few main directions for future development:

- current versions of these tools deal with P-CAD software, that use PDIF (P-CAD Database Interchange Format) for component description, therefore PC-BANK and PC-NORM should be upgraded for supporting modern EDIF (Electronic Design Interchange Format) format;
- to develop mechanism, that allows use other DBMSs for creation PC-BANK database;
- the possibility of using of current PC-BANK implementation is limited by the size of Local Area Network and accessibility of the Oracle server. The new version of PC-BANK can be integrated into Internet, as WWW application.

PREPARATION OF PURE HD-GAS FOR $dd\mu$-CATALYSIS INVESTIGATION

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In 1994 at PSI (Switzerland) was started a new investigstion of $dd\mu$-catalysis in D_2 and HD-mixtures with greatly increased precision [1]. One of the main goal of this experiment is the study of the temperature dependence resonant and non-resonant $dd\mu$-formation rates for HD-molecules, so far no detailed known. Because of the formation rate on HD-molecules ten times less than ones on D_2-molecules, one should reduce as much as possible the amount of D_2 in the gas mixture. Specially for this purpose at PNPI was designed and constructed new system for HD-gas preparation.