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Ms. Latrech  
Contract Officer  
Contract Section  
General Services Division  
Department of Administration  
UNIDO, P.O. Box 300  
A1400 Vienna, Austria.

Dear Ms. Latrech

SUB: FINAL REPORT  
- UNIDO PROJECT NO. DP/PAK/84/012  
- CONTRACT NO. 94/040

With reference to clause 4(b) to the contract no. 94/040 relating to above project, we enclose 5 copies of Final Report.

This report consist the extent of the work carried during the six weeks of Computer Vision's consultancy services.

Please do not hesitate to ask for any further information or clarification you might require in this connection.

With Best Regards

Your's Sincerely

HAFIZ-UR-REHMAN  
Technical Specialist

Consignee:

Recieved on behalf of PMTF

QAZI MOHAMMAD ASLAM  
Deputy General Manager (Tech.)  
Pakistan-Machine-Tool Factory  
KARACHI-75030  
Mr. Qazi M. Aslam  
DGM (Training & Project)
FINAL REPORT

CONTRACT NO. 94/040

UNIDO PROJECT NO. DP/PAK/84/012
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<td>8</td>
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</table>
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2- List of Software                  Appendix B

3- Problems Facing by PMTF Engineers Appendix C

4- Consultancy Schedule              Appendix D

5- List of Participant               Appendix E

6- Consultancy Report for CADDS5     Appendix F

7- Consultancy Report for Personal Designer Appendix G

8- Consultancy Report for Personal Machinist Appendix H
INTRODUCTION

1- This has reference to UNIDO Contract No. 94/040 in regard to Project No. DP/PAK/84/012, for provision of consultancy services by Computer Vision Corporation relating to the Computer Vision Software Operation, Integration, and Application of the software installed under Contract No. 92/210.

2- The present report has been prepared to meet the requirement as specified in clause 4(b) of the aforesaid contract. It summarises all tasks and activities performed by consultants from Computer Vision Singapore in conjunction with Selling Business Systems (SBS).

3- A number of live problems facing by PMTF engineers in the utilization of the supplied Hardware (see Appendix 'A') and Software (see Appendix 'B') has been sent to Chartered System Network Ptd Ltd, Singapore to the expert via fax which are enclosed herewith as Appendix 'C'.

4- To solve the problem as mentioned in Appendix 'C', three experts were visit to PMTF as per decided consultancy program see Appendix 'D' for the name, duration and field of consultancy services.

5- List of PMTF personnel who participate in the consultancy program from Tool Design, Product Design & CNC Shop is enclosed as Appendix 'E'.
CONSULTANCY

6- During the Six weeks of consultancy by three experts the problem as mention in Appendix 'C' has been solved and practised by PMTF engineers.

The summary of consultancy with recomendation of experts along with the solution of the live problem are as:

See Appendix 'F' for CADDS5 & System Administration consultancy
See Appendix 'G' for Personal Designer & 3D Surfacing consultancy
See Appendix 'H' for Personal Machinist & Post Processor consultancy
GENERAL OBSERVATIONS:

7. On conclusion of the consultancy assignment, we feel satisfied that most of the practical problem faced by PMTF team of engineers have been solved by the experts.

After a long period utilization of the available software, the PMTF engineers are now in a position of having some new or upgrade release of software as also mentioned by the experts in their reports.

CONCLUSION

8. In our opinion the consultancy services was given in good condition with the entire satisfaction of PMTF's Engineers/Participants.

Finally, we would like to thanks all concerned of PMTF and UNIDO of taking their interest in successful implementation of this consultancy services.
## Appendix A

### LIST OF HARDWARE

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<td>Memory : 16 Mbyte Exp (IPX)</td>
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<tr>
<td>DISK : CD-ROM Optical Disk Drive 644 Mbytes</td>
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<td>Calcomp 1025 Pen Plotter</td>
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<td>Tektronix Phaser II PXE Color screen Printer</td>
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</tr>
<tr>
<td>UPS 3.0 KVA POM</td>
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</tr>
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<td>21&quot; Daewoo Server with 1GByte HDD</td>
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<td>21&quot; Daewoo 486 Workstation (CNC Shop)</td>
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# Appendix B

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Appendix - C

Problems Facing

by

PMTF Engineers
REQUIREMENTS AND OBSERVATIONS OF TOOL DESIGN
IN CADD S 5 (SOLID MODELLING)

DATA BASE

For the storage of standard part dimensions a data base is required which can be read into CADD S 5. So as to relate with model parameters.

PROGRAMMING LANGUAGE "C"

"C" will help to manipulate the equations defined in CADD S 5 and link them to the values read from the data base.

SPATIAL SURFACE

How are spatial surfaces generated using the command in CADD S 5 by picking the points as well as spline curves. Detailed solved example required.

CIRCLE

Circle which is tangent to two or more circles. The command is not available in CADD S 5.

ASSEMBLY MODULE

Module required for creating jig and fixture assemblies in CADD S 5.

COMPRESSION SPRING

Detail on development of compression spring & Helix curve.

FEATURES

Features is not functioning now previously it was operational.

CHANGE OF PARAMETERS

Number of multiple entities modelled through array or rotate copy does not change through change of parameter "n" (number of).

Please see attached sheets annex 1 & 2.
Solid model of standard part in CADDS 5 with defined variables and equations, so that manual input of given dimensions regenerates the resized model.

If all the standard data for various sizes is fed into a data base software which is linked with CADDS 5 and "C" programming language. Then standard or custom data, according to the choice of user can be read into CADDS 5 data base, hence regenerate the solid model.

Thus with the entry of just one code number such as example 3110 210, a resized model will be generated, instead of the current method of manual entry.

If possible, then addition of graphic entities, that is selected planar views of the standard part solid model in the data base will highly facilitate its use.
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| 20   | 174 | | 204|
| 25   | 176 | | 234|
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| 35   | | 296 |
| 40   | 179 | (208) | 237| 324|
| 45   | | (291)| 297| 355|
| 50   | (181) | 210 | (239) | 297| 355|
| 55   | | 241 |
| 60   | 183 | (212) | 241 | (299) | 328| 386|
| 65   | | 241 |
WORK PLAN FOR THE EXPERT OF "PERSONAL DESIGNER"

The "Personal Designer" software has been utilized mostly in Tool Design Department for the drafting of various drawings of dies, molds, fixtures, range Dies, equipments etc. This software has been found very useful for preparing "templates" drawings of similar shapes. In an mode of manufacturing, the geometry and dimensions of the templates drawings are very helpful in tool manufacturing.

Following are the practical problem for which we need the solution.

(1) **3D SURFACING:**

Making an impression die block of a pressure die cast part, its detailing (Sectioning by split command and dimensioning) and tool path generation for CNC machine.

(2) Sectioning (Spliting) of a Cadd5 drawing in PD5 environment.

(3) Making libraries of standard parts.

(4) Use of icon menu to generate repeative work e.g. assembly making.

(5) Use and importance of various icon (not so far used) e.g. SEMA, REMA etc.

(6) How to use "HIDE" command.

(7) PD5 interface with CMM.

(8) User programming language (UPL).

(i) Data base format

(ii) Executing data base file for UPL program.

(iii) Advance user commands.

(9) Arrow head size to be modified.

(10) Size of dashed line not working.

(11) Transfer of file from FD5 to Design view/Page maker.

(12) Macros keys/Functions to be explained.

(13) Up-dating of post processors of: (i) Mandelli (ii) Galaxy (iii) Ab 7340.

(14) Problems in application of milling commands for machining center.
WORK PLAN FOR THE EXPERT OF "PERSONAL DESIGNER/PERSOAL MACHINIST"

PMTF CNC Machine Shop is using "Personal Machinist" mostly for their Turning Centres and has generated/manufactured a number of components. There has been some difficulty in successfully utilizing "Personal Machinist" for our Turning Centres and Machining Centre (Mandelli) due to the reasons mentioned below and need to be sorted out by the visit of Expert from Computer-Link.

1. For Turning Centres:
   i) Updating of Post Processor for:
      a) Galaxy  
      b) Ab 7340
      Some of the parameters are required to be changed/modified according to the requirements.
   ii) The files (nc2) created after post processing are found to be lengthy as compared to our manual programmes which of course require large memory of machine control.
   iii) The nc2 files show errors and not created for more than six tool paths generated for one component.

2. For Machining Centre:
   i) Updating of Post Processor for Mandelli machine.
   ii) We are facing following problems in the generation of nc2 files.
       a) Post processor does not convert axes according to the axes of machine.
       b) In a component if we require to machine for example five faces in one setting then the axis should be shifted with respect to each face whereas it is not the case with available Post Processor and each time the origin for each surface machining is taken from the origin of the drawing.

3. Expert should assist PMTF engineers in writing of Post Processor for any CNC machine and its practical application during his stay.

Gazi Muhammad Qtan
By General Manager (Eng.)
## Appendix D

### Consultancy Schedule

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name of Consultant</th>
<th>Duration</th>
<th>Field of Consultancy</th>
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<tbody>
<tr>
<td>1</td>
<td>Mr. K.S. TAM</td>
<td>15th JAN to 30th JAN 1995</td>
<td>CADD5 &amp; System Administrator</td>
</tr>
<tr>
<td>2</td>
<td>Mr. B.H. THONG</td>
<td>18th March to 31st March 1995</td>
<td>Personal Designer &amp; 3D Surfacing</td>
</tr>
<tr>
<td>3</td>
<td>Mr. M.S. TONG</td>
<td>20th May to 1st June 1995</td>
<td>Personal Machinist &amp; Post Processor</td>
</tr>
</tbody>
</table>
Appendix E

List of Participants

1- CADDS 5 & System Administration:

Mr. Aftab Iqbal          Tool Design
Mr. Maaz-ul-Masaid Siddiqui Tool Design
Mr. Maqsood Ahmed Khan    Tool Design
Mr. Mohammad Moiz Alvi    Product Design
Mr. Shaukat Ali          Product Design

2- Personal Designer & 3D Surfacing

Mr. Aftab Iqbal          Tool Design
Mr. Asim Fazal Chohan    Tool Design
Mr. Maaz-ul-Masaid       Tool Design
Mr. Maqsood Ahmed Khan   Tool Design
Mr. Mohammad Moiz Alvi   Product Design
Mr. Shoukat Ali Khwaja   Product Design
Mr. Kamal uddin Sheikh   Product Design
Mr. Mushtaq Ahmed Javed  Product Design
Mr. Nusrat Ali           Product Design

3- Personal Machinist & Post Processor

Mr. Aftab Iqbal          Tool Design
Mr. Maaz-ul-Masaid       Tool Design
Mr. Maqsood Ahmed Khan   Tool Design
Mr. Manzoor Hussain      CNC Shop
Appendix - F

CADD5

&

System Administration Consultancy

Mr. K.S. TAM

15th JAN to 30th JAN 1995
There are two SUN workstation in PMTF located in Product Design and Tool Design departments. Nature of work in both departments differ slightly. Team of five Engineers who were initially trained are committed to work on these stations. They are

1. Aftab Iqbal            Tool Design
2. Maaz-ul-Masaid Siddiqui Tool Design
3. Maqsood Ahmed Khan     Tool Design
4. Mohammad Moiz Alvi     Product Design
5. Shaukat Ali            Product Design

This consultancy from Computer Vision was built in the program contract with the view that the above engineers will sharpen and fine-tune their skill with reference to specific problems to their work and faced during usage of CV Software. For this purpose it was understood that PMTF engineers will send their specific problems to the expected consultant who will come prepared with answers and solutions. In this regard we sent our specific problems to CV Singapore to the expert via fax which is enclosed herewith as Annex 'A'.

The live problems mentioned in the fax were discussed/ worked out with CV consultant Mr. Tam in PMTF during his two weeks consultancy period and the solutions found and practiced. These are summarized by PMTF engineers and referred in Annex 'B'.

Besides the above the PMTF engineers also discussed following practical problems.

1. Printing and Plotting of Cadds5 drawing and text files directly from Sun Work Station through PCs Workseats. The available system were very helpful in achieving the said goal except the need of "Postscript" option on laser printer which is not available and is required for taking the printout of Cadds5 drawings.
2. Unix to DOS and DOS to Unix conversion of text files.
interfacing Sun Workstation with Coordinate Measuring Machine (CMM), discussed with the view of oncoming consultancy from the manufacturer of CMM machine.

4 Customization of Cadds5.

5 Capturing screen for Demonstration / Printout.

6 Use of 'Tag'.

The detailed solutions of all the above mentioned problems were found during the consultancy of Mr. Tam are included in the Annex 'B'. The contents of Annex 'B' has been prepared by PMTF team of engineers after rechecking each practically.

For reference we are enclosing herewith some figures showing the solution of our practical problems.

1. Fig 1: This is made in Cadds5 with the help of 'C' language program and "data base" which are enclosed as Annex 'E' to 'G' of Annex 'B'.

2. Fig 2: Showing the printout of Cadds5 drawing through laser printer via Word perfect. Since this is the available software wherein CGM files of Cadds5 can be converted to laser printer format. This was mentioned by the expert Mr. TAM. Alternatively the other way to obtain printout on laser printer was through "Postscript" card, which would have been another investment in terms of money.
REQUIREMENTS AND OBSERVATIONS OF TOOL DESIGN
IN CADD S 5 (SOLID MODELLING)

DATA BASE

For the storage of standard part dimensions a data base is required which can be read into CADD S 5. So as to relate with model parameters.

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"C" will help to manipulate the equations defined in CADD S 5 and link them to the values read from the data base.

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How are spatial surfaces generated using the command in CADD S 5 by picking the points as well as spline curves. Detailed solved example required.

CIRCLE

Circle which is tangent to two or more circles. The command is not available in CADD S 5.

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Module required for creating jig and fixture assemblies in CADD S 5.

COMPRESSION SPRING

Detail on development of compression spring & Helix curve.

FEATURES

Features is not functioning now previously it was operational.

CHANGE OF PARAMETERS

Number of multiple entities modelled through array or rotate copy does not change through change of parameter " n " (number of).

Please see attached sheets annex 1 & 2.
Annex 1

Solid model of standard part in CADDS 5 with defined variables and equations, so that manual input of given dimensions regenerates the resized model.

If all the standard data for various sizes is fed into a database software which is linked with CADDS 5 and "C" programming language. Then standard or custom data, according to the choice of user can be read into CADDS 5 data base, hence regenerate the solid model.

Thus with the entry of just one code number such as example 3110 210, a resized model will be generated, instead of the current method of manual entry.

If possible, then addition of graphic entities, that is selected planar views of the standard part solid model in the data base will highly facilitate its use.
ANNEX Z

![Diagram of a mechanical component with dimensions labeled.

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<td>20</td>
<td>176</td>
</tr>
<tr>
<td>25</td>
<td>204</td>
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<td>30</td>
<td>234</td>
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<tr>
<td>35</td>
<td>(177)</td>
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<tr>
<td>40</td>
<td>(208)</td>
</tr>
<tr>
<td>45</td>
<td>293</td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>(181)</td>
</tr>
<tr>
<td>60</td>
<td>(212)</td>
</tr>
<tr>
<td>65</td>
<td>(289)</td>
</tr>
</tbody>
</table>

*Note: The table values and dimensions are approximate and may require specific units and tolerances for precision.*
Figure - 1

TOP view

ISO view

6 SIDES
s 17 CIRCUM.

FRONT view

RIGHT view

E
Figure - 2

This drawing was made on Sun Workstation and laser printer was used through CGM File conversion option available in WP.
CONTENTS

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- Summary of the useful commands and important concepts 5 - 6
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- Review of the Consultancy Project at PMTF 8
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INTRODUCTION

1- This has reference to UNIDO Contract No. 94/040 in regard to Project No. DP/PAK/84/012, for provision of consultancy services by Computer Vision Corporation relating to the Computer Vision Software Operation, Integration, and Application of the software installed under Contract No. 92/210.

2- The present report is in compliance with clause 4(a) of the aforesaid contract and cover the work performed by CV consultant in connection with the two week consultancy of CADDS5 CVWare Parametric Design software.

3- The Consultancy was given by K.S. Tam CV, Singapore. In this consultancy, consultant taught the engineers in both Tool Design Department and Design Office Department of PMTF about the concepts of useful UNIX Commands, CADDS5 Explicit & Parametric Commands and some C Program Development techniques for interfacing CADDS5 Parametric environment with UNIX.

4- The system used in PMTF is:
   2 x SUN SPARC IPX machine with 32M RAM
   SUNOS 4.1.3
   CADDS5 Rel 2 Rev 2.1.1
Summary of the useful commands and important concepts

5- UNIX

* General review on different versions of UNIX system, e.g., AT&T systems and BSD 4.2 systems.

* Important setup files for running UNIX C-shell (/bin/csh). This is the shell which CADDS5 is running on.
  
  `.login': execute when the user login in to the system.
  `.logout': execute when the user login out to the system.
  `.cshrc': execute when a new C-shell is invoked.

* use id command to identify the user.
  
e.g.,
  `UNIX_prompt > id

* change permission mode by using chmod command
  
e.g.,
  `UNIX_prompt > chmod 777 file1
  The above command will give no protection to the file file1.

* change ownership by using chown command
  
e.g.,
  `UNIX_prompt > chown pmifsusr file1
  The above command will change the ownership of the file1 to pmifsusr.

* use finger command to check how many users are logged in to the system
  
e.g.,
  `UNIX prompt > finger
set the history record by using the variable history
  e.g.,
  UNIX_prompt> set history = 50
The above command in UNIX means to record the most current 50 commands

how to use UNIX on-line help
  e.g.,
  UNIX_prompt> man ls
  The above command will show the on-line help for the UNIX command ls.

some special characters in UNIX C-shell
  ! : execute the previous command again
  $ : the symbol for the last argument of the previous command
  & : submit a job as a background process
  ^ : command argument substitution.
  e.g.,
  UNIX_prompt> ^123^abc
  The above command will substitute the argument 123 in the previous command by abc.

C program development in UNIX environment
  e.g.,
  UNIX_prompt> cc -o test.exe test.c -lm
  The above command compiles the source file test.c and links with the mathematics library to an executable file called test.exe.

debugger in UNIX environment
  e.g.,
  UNIX_prompt> dbxtool test.exe
  The above command invokes the debugger to debug an executable file called test.exe. In order to use the debugger, the C source file(s) must be compiled with -g option.
  e.g.,
  UNIX_prompt> cc -o test.exe -g test.c -lm
6. CADDSS

(6.1) General:

- different curves/surfaces used in CAD modelling systems have been explained. Common types are listed as follows:
  (a) Bezier curves/surfaces
  (b) B-Spline curves/surfaces
  (c) NURBS curves/surfaces

- How to start and stop the feature database server?
  Suppose there is a data base called db2,

  **start** data base server with the command:
  UNIX_prompt> ldmserv db2 start

  **stop** data base server with the command:
  UNIX_prompt> ldmserv db2 stop

  These two commands can be placed in .login and .logout file respectively so that the starting and stopping processes will be executed automatically.

  CADDSS users may use the following commands to stop the feature database server by checking whether it is being activated or not. The following commands are highly recommended for PMTF to use.

  UNIX_prompt> if ("ps -ax | grep LDMSERV | cut -c48-50") == "db2") then
  UNIX_prompt>    ldmserv db2 stop
  UNIX_prompt> endif

- how to create demonstration screen images

  capture the whole screen image:
  UNIX_prompt> screendump -x0 -y0 -X1151 -Y899 filename

  redisplay the whole screen image:
  UNIX_prompt> screenload -x0 -y0 -X1151 -Y899 filename

  In the above commands, *filename* is name of the file to store SUN raster format data. The values after the arguments -x -y -X -Y specify the monitor resolution.
The raster file can then be converted from 8-bit deep to 1-bit deep. This is useful for creating monochrome image

e.g.,
UNIX_prompt> rasfilter8to1 8bitfile 1bitfile

* Plot drawing to a plotter through Novell Network
A shell script (called cgmplot) modified by me has been given to PMTF to plot CGM (Computer Graphics Metafile) files to the HP DraftPro Plus/HP DraftPro DXL plotters which accept HP-GL/2 and HP-GL languages respectively. The script is in /usr2 directory so that all the users can access to it.

CGM files can be created by using the CADDSS command put cgm.

e.g.,
Command:Put Cgm Name cg_filename Scaleto A4

The above command will create a A4 size CGM file called cg_filename which can then be used to generate HP-GL/2 or HP-GL files.

e.g.,
UNIX_prompt> /usr2/cgmplot -Pgl2a1 -oxoffset -oyoffset cg_filename

Where

- gl2a1 is one of the printer names in file /etc/printcap,
- xoffset is the x-coordinate offset,
- yoffset is the y-coordinate offset.

The above command is to convert CGM file cg_filename to HP-GL/2 file (A1 size) by using the script cgmplot. The HP plot file is stored in directory /usr/tmp. The HP-GL/2 file can then be sent to the plotter from the SUN workstation directly (please refer to next section) OR transfer it to the Novell network PCs first and then uses the Novell "nprint" command to send it to the network printer.

e.g.,
DOS_prompt> nprint hp_filename/q=LASER

The above command will print the file hp_filename to the network printer called LASER.

* send files to HP plotters and HP Laserjet 4 printers from SUN workstations directly.

File /etc/printcap has been modified to connect all printers and plotters.
e.g.,
UNIX_prompt> lpr -Phpa4 filename

The above command will send the file filename to printer hpa4. Users may look at the file /etc/printcap to find out the settings of hpa4.

Users may use the following command to display the queue of printer jobs of printer hpa4.
UNIX_prompt> lpq -Phpa4

Users may use the following command to remove a job from print queue.
UNIX_prompt> lprm -Phpa4 job 11
The above command removes a print job number 11 for printer hpa4 from the print queue.

6.2- Explicit:

* General view on CADDSS command structure and punctuation
The command structure is as follows:

[Verb] [Noun] [Modifier] : system prompt
e.g.,
INSert LINe HOR : MODEL loc
INSert CIRcle RADius 1.5 : MODEL loc
INSert ARC DIAMeter 3 : MODEL loc

Because CADDSS punctuation is standardized, punctuation marks retain the same meaning throughout all commands. The following table lists the various command punctuation:

<table>
<thead>
<tr>
<th>Punctuation</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>blank</td>
<td>Used optionally between keywords.</td>
</tr>
<tr>
<td>.</td>
<td>Used between explicit coordinates, items in a list, and groups of numbers.</td>
</tr>
<tr>
<td>:</td>
<td>Used between clauses, as in switching modes from identification to digitizing on location.</td>
</tr>
<tr>
<td></td>
<td>Used to enter coordinate input, or reenter the same command without re-issuing the verb-noun combination</td>
</tr>
</tbody>
</table>
When used to re-issue the command, the colon terminates the input, executes the command and then reenters the same command for new coordinate input, thus preserving all modifier selections from the previous command specification. Used to terminate the current command input and execute the command.

* Zooming Techniques
The following commands are useful for fitting the model image on the computer screen.

```
#01# zoom view all:
#01# zoom view win:
#01# set view:
```

* create assembly in explicit mode with different orientation.

```
#01# insert part [partname] figplane ["front"] : model loc
#01# insert part [partname] AX [angle about x-axis] AY [angle about y-axis] AZ [angle about z-axis] : model loc
```

* show the drawing in CADDs drawing window

```
#01# zoom draw ALLDRAW
```

The above command will update the CADDs drawing window.

6.3-Parametric:

* how to create a parametric helix
The procedures are as follows:

(1) Create a new parametric part and drawing

(2) Change to the view Cplane to ISO.

(3) Insert a vertical construction line with a given length, say 30.

(4) Insert nine six-sided construction polygons along the construction line. Each polygon is circumscribed within an imaginary circle whose diameter will control the diameter of the helix.

```
Command Insert Polygon Sides 6 Circumscribed 2.0
Unconstruction Along 7Nooffset [-0.085,0.069,0.155,TOPview]
```
(5) Insert an Nspline (Non-Uniform Rational B-spline) by selecting a side of each polygon in succession, rotating clockwise from top to bottom, to determine how many control/through points will be used to define the Nspline.

(6) If desired, change the height of the helix to regenerate the model.

* Use of tagname
The entities in CADDS5 parametric environment can be associated with a unique tagname. Users can then refer to the entities by using the tagname instead of digitizing.

e.g.,
Command: Insert Line Pair utag abc
Command: Delete Entity tagname abc

The above commands insert a line with the tagname abc and then delete it by referring to its tagname abc.

* customizer in CADDS5
The customizer can be activated by pressing the menu as

UTILITY => CUSTOMIZER

The techniques to create a user-defined interface were taught. The icon editor was also illustrated. It is an object-based graphics utility. By combining lines, arcs, circles and rectangles, users can create icons for use in the user interface menus.

Customizer Action Example 1:

/* comments */
Insert Line Free < END >

Customizer Action Example 2:

/* comments */
Read Commandfile Name = USR2.PMTF,USR.PARTS.PMTF1
/* comments */ < END >
C program interface with CADD5 parametric environment

7. Create a complex parametric curve with a given equation in CADD5 without CVMAC.

Suppose there is a CAM profile with the following equation:

\[
x = r \cdot \cos(\alpha)
\]

\[
y = r \cdot \sin(\alpha)
\]

\[
z = 0
\]

\[ r = a \cdot (R_1 - R_2)/A + R_2 \]

where

- \((x, y, z)\) are the coordinates of the CAM profile,
- \(R_1, R_2\) and \(A\) are constants,
- \(r\) and \(a\) are parameters to define the planar curve.

In this case, \((r, a)\) are the polar coordinates.

The following program will create a CADD5 command file to draw the parametric curve with 51 data points on it. The command file can then be executed in CADD5 parametric environment. Here is the program listing:

```c
#include <stdio.h>
#include <math.h>
#define pi 3.141592654

void main()
{
    double theta;
    double A, R_1, R_2, r, x, y, z = 0;
    FILE *stream;
    char filename[100];

    printf("Please input the filename to store the data : ");
    scanf("%s", filename);
    stream = fopen(filename, "w");
    printf("Please input A (in degree) : ");
    scanf("%lf", &A);
    A = A * pi / 180;
    printf("Please input R_1 : ");
    scanf("%lf", &R_1);
    printf("Please input R_2 : ");
    scanf("%lf", &R_2);

    fprintf(stream, "Insert Nspline");
```
for (n=0; n<=50; n++) {
    theta = A*n*50;
    R = theta*(R1-R2)/A + R2;
    r = R*cos(theta);
    y = R*sin(theta);
    printf(stream, "Loc [%.2f,%.2f,%.2f]",x,y,z);
}

printf(stream, "Go \n");
fclose (stream);

* numerical method

Newton's method was taught to find a root of a complicated equation which may appear during a CAM or gear design.

Suppose the equation is given in the form \( f(x) = 0 \), then a better approximation of the solution is given by:

\[
x(n+1) = x(n) - \frac{f(xn)}{f'(xn)}
\]

where \( x(n) \) is the current approximation and \( x(n+1) \) is the solution of the next iteration. This equation can be applied successively until the difference between \( x(n+1) \) and \( x(n) \) is small enough which means the required accuracy has been achieved.

* create an involute profile for gear design

The involute profile equation is given by:

\[
\text{inv}(x) = \tan(x) - x
\]

We need to solve for \( x \) when \( \text{inv}(x) \) is given, say a constant \( c \). In this case, we need to rewrite the equation in the following form:

\[
f(x) = \tan(x) - x - c = 0
\]

Then we can apply equation (1) to solve for \( x \). Equation (1) will become

\[
x(n+1) = x(n) - \frac{((\tan(x(n)) - x(n) - c)/(\sec^2(x(n)) - 1))}{0}
\]

A sample C program was provided to PMTF staffs as a reference. Please refer to section (A1) for compilation of C programs in UNIX. Here is the program listing.
```c
#include <math.h>
#include <stdio.h>

#define eps 1e-6
#define MAX_ITER 1000

double fcn();
void fcn1();

void main()
{
  double xn;
  fcn1(&xn);
  printf("The answer is %12lf\n", xn);
} /*end main*/

void fcn1(xn)
  double *xn;
{
  double xn,c;
  int count=0;

  printf("please input the number c : ");
  scanf("%lf", &c);

  printf("please input the initial guess (xn) : ");
  scanf("%lf", &xn);

do {
  *xn = xn - fcn(xn,c);
  if (fabs(*xn-xn) < eps) break;
  xn=*xn;
  printf(" ");
  count++;
  if (count > MAX_ITER) {
    printf("Cannot find solution\n");
    break;
  }
} while (1);
} /*end fcn1*/

double fcn(x,c)
  double x,c;
{
  double tmp,
```
\[
\text{tmp} = 1.0/(\cos(x) \times \cos(x));
\]
\[
\text{return } ((\tan(x) - x - c) \div (\text{tmp} - 1));
\]

Review of the consultancy project at PMTF

8- Some useful and common UNIX commands were shown.

- Feature base problems of their existing systems were solved.
- HP laser printers and plotters were connected to SUN workstations successfully. Commands were also given to PMTF’s staffs to control the UNIX printing utilities.
- The procedures to use Customizer in CADDS5 were demonstrated.
- Some useful techniques for using CADDS5 explicit and parametric environment were taught.
- C program development in UNIX were explained in details.
- Interfacing C programs with CADDS5 parametric environment were clearly shown.
- The procedures for preparing good quality documents and screen demonstration shows were taught.

- Detailed investigation was taken to their CNC workshop. PMTF has several 2-axis CNC lathes and one 4-axis Mandelli milling machine with pallet changer. The machine can select either as a vertical or horizontal machine. However, there is no RS232 serial interface in the machine controller. Therefore, operators need to input the NC programs manually.
- Detailed studies were carried out to their metrology laboratory. Some suggestions were given to explain how to connect the CMM machine (Model number is Digital Electronic Automation Diamond IOTA 2203) to the existing ethernet network.

comments on the technical skills of the engineers at PMTF

9- The engineers at PMFT have good experience in product design and tool making but they lack of enough computer knowledge to computerize their jobs systematically. Therefore, they need more CAD/CAM training and practices. However, there are a few engineers who can pick up the knowledge very fast.

10- The engineers should not rely only on training. Instead, they should try to learn the concepts and commands by reading more manuals and experimenting with CADDS5 software.
Recommendation

11- CAM software packages should be installed so that manufacturing data can be generated directly after design stage. In order to have a practical and successful CAD/CAM environment, they need complete CADDS5 options for Drafting, Explicit & Parametric environment, CVNC and CVMAC.

12- Their hardware systems also need updating. A practical solution is to upgrade the slow IPX machines to fast SPARC 20 machines. CADDS 5 should also be upgraded to Rel 5. The present version is Rel 2 Rev 2.1.1.

13- The 4-axis Manuelli NC machine need to add an DNC option so that NC programs can send from the PCs to the machine directly.

Conclusion

14- In our opinion the consultancy services was given in good condition with the entire satisfaction of PMTF's Engineers/Participants.
Appendix - G

Personal Designer

&

3D Surfacing

Consultancy

Mr. B.H. THONG | 18th March to 31st March 1995
CONTENTS

TITLE

PARAGRAPHS

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- Conclusion .......................... 26
INTRODUCTION

1. This has reference to UNIDO Contract No. 94/040 in regard to Project No. DP/PAK/84/012, for provision of consultancy services by Computer Vision Corporation relating to the Computer Vision Software Operation, Integration, and Application of the software installed under Contract No. 92/210.

2. This is a summary of the two (2) weeks consultancy provided by Mr. B. H. THONG commenced from 18th March 1995 until 31st March 1995 at PMTF in Karachi.

3. Before his arrival, there were a number of problems sent to Chartered System Network Ptd Ltd, Singapore to the expert via fax which is enclosed herewith as Annex 'A'. During the two weeks, most of the questions faxed were dealt with both theoretically and practically except the PD5-CMM interface. Participants were not able to get a hand-on on the PD5-CMM interfacing practically as CMM machine were not available.

4. However, the structure of PD5-CMM data format has been conveyed to personnel of PMTF. Once the problems in the CMM has been solved, personnel of PMTF will be able to interface PD5 and CMM practically.
LIST OF PARTICIPANTS

5- The following is a list of participants from both Tool Design and Product Design Department of PMTF,

Mr AFTAB IQBAL ...................... Tool Design
Mr ASIM FAZAL CHOHAN
Mr MAAZ-UL-MASAID
Mr MAQSOOD AHMED KHAN

Mr MOHAMMED MOIZ ALVI ............. Product Design
Mr SHOUKAT ALI KHOWAJA
Mr KAMAL UDDIN SHEIKH
Mr MUSTAQ AHMED JAVED
Mr NUSRAT ALI

SOFTWARES & RELEASE

6- The following is a list of MS-DOS based softwares by Computervision available in the PMTF both in Tool Design and Product Design Department,

- Personal Designer Rev 5
- Personal Microdraft Rev 5
- Personal DXF Rev 5
- Personal Data Extract Rev 5
- Designview Rel 2
SUMMARY OF THE CONSULTANCY

7. CHANGING ARROWHEAD SIZES:

The arrowhead sizes for Dimension and "Insert Arrow" commands can be selected either from PdS 'config' file (externally) or from "SELECT" option of "DIM" (internally). The Arrowhead size of a dimension can be changed by CHANGE " option of "DIM", whereas the Arrowhead size obtained by "Insert Arrow" can be changed by "SCALE".

8. LINE TYPE (LINE FONTS):

The sizes of line fonts depend upon the selection of either 'SOFT' or 'HARD' fonts. For printing purpose it is advisable to select the "SOFT" font. The sizes of "SOFT" font type can be changed by changing the sizes as defined in PDS "config" file.

9. HIDDEN LINE REMOVAL (HRL):

There are two ways to get a 3-D view with hidden lines removed.

A) By using "QHIDE" command (Internally i.e. by remaining inside PdS environment.)

B) By using "HIDE" option (Externally i.e. from outside PdS environment.)

A) "QHIDE"

i) Make the surfaces.

ii) Click "QHIDE", "MESHONLY" and other available options (if required).

iii) System will prompt "Enter". Select the surfaces to appear on screen, leaving other surfaces and press "Enter".

iv) The full view will again appear on screen with "REPA" command i.e. by using "Qhide" we can temporarily remove the hidden lines.

B) "HIDE"

i) Make the surfaces.

ii) Make a shade file by clicking "PUT SHADE", the system will ask for the "SHI" file name.

iii) Type any name other than names for which "DRW" file already exists.

This is required because "Hide" option creates a "DRW" file with the given name.

iv) Exit to Do
v) \texttt{C:\PD5> HIDE SHI filename <CR>}
vi) A file with .DRW extension will be created that can be viewed in PD5 with hidden lines removed.

Note: By using "HIDE" option, the hidden lines are permanently removed.

10. **SHADING OF PD5 SURFACES:**

i) Make the surfaces.
ii) Click "PUT SHADE" from '3D'. Type the shading file name and press <CR>.
   A file with the specified name and SHI extension will be created e.g. Test.shi.
iii) Exit to Dos.
iv) \texttt{C:\PD5> Shade <CR>}
v) A Screen window will appear showing "Personal Designer Shaded Picture"

- Type the shaded file name (e.g. Test)
- Type the output shaded picture file name or simply press <CR> to take the same name as SHI file.
- Select S or F (usually 'S')
- Type screen pixel horizontally (1024) and vertically (768) and press F10.
- Type other parameters if required and press F10.
- Press <CR> to appear the shaded image on screen.

11. **DISPLAYING SHADE FILE ON SCREEN:**

   The shade file (with the extension of SHP) can be displayed on screen as

   \texttt{C:\PD5> display filename.shp <CR>}

   Press <CR> to make the shaded file to disappear and type 'cls' to get the prompt back to screen.

12. **SLIDES OF SHADED FILES:**

   To display the shaded files on screen to appear one by one, a file starting with '@' and with extension 'EXT' is required to be created as:

   i) \texttt{C:\PD5> Edit @filename.ext <CR>}

   \begin{verbatim}
   0 0   xyz.shp
   cls
   0 0   abc.shp
   cls
   0 0   test.shp
   \end{verbatim}

   Note: Here 0 0 indicates the position of the screen for the shaded file.
   ii) Save and exit to DOS.
13. **DISPLAYING PD5 SCREEN IMAGES:**

i) Open the PD5 drawing file

ii) `>>save screen (press spacebar) filename <CR>`

iii) A file with the specified name will be formed that can be displayed as

   `C: \PD5 > Display filename<CR>`

iv) Press `<CR>` and type `cls`.

v) We can make the slides of the screen images for demonstration purpose as mentioned earlier under the topic "slides of shade files".

14. **USE OF MVIEW.SGX FILE:**

   If we are not using "MVIEW" for 3D surfacing and surfaces are formed by using only one view and if it is required to put the other views on screen then we can use "MVIEW.SGX" file as

   `>>Execute (press spacebar) mview <CR>`

   The four views will appear on the screen. Copy of Mview.sgx file is enclosed as Annex 'A'.

15. **USE OF SIMA (Save Image) and RIMA (Restore Image):**

   SIMA and RIMA are useful options for a user to access quickly at a particular portion of drawing specially when the drawing is very large and complicated. The steps are as follows:

i) Zoom the required portion of the drawing to appear fully on the screen.

ii) Click "SAVE" from "IMAGE" the system will prompt as

   "Save Image (I type the image No )"

   The saved image can be displayed on the screen as
iv) The SIMA and RIMA options can be used as a modifier from "GDATA" to access quickly at the required positions of drawing.

16. USE OF MACRO:

We can replace the function of any PDS icon in which the name of icon remains same but function is replaced with defined option. For example we can replace the function of 'CPL' with 'UNDO' on PDS screen in which CPL appears on screen but it will do UNDO operation. The procedure is as follows:

i) >> Type 'Edit menu' and press spacebar. The system will ask for “Pick menu box to change.”
ii) Click the menu box to change e.g. 'CPL' box.
iii) Press 'C' for command. The system will show old cmd and ask for entering new cmd.
iv) Type the new cmd e.g. UNDO #13#

17. DEFINING MACRO BY PD_MAC.DEF FILE:

In PDS a pd_mac.def file is available to define macros for permanent use. The undefined macros' options are available in the file starting with two dashes (--), the dashes indicate that it is a comment. The procedure for defining macros is as follows:

i) C:\pd5>edit pd_mac.def <CR>

The macro "#0##36" "#10#--Alt J--> ^J

iii) Remove the two dashes shown at the start.

iv) Type the command in " " in place of "#10" (other fields should remain as it is) for example "#13#INS LINE:" The line will now appear as

Macro "#0##36" "#13#INS LINE:"--Alt J--> ^J

v) Save the file and exit to DOS.

vi) Compile the file as

C\PD5> bldf pd_mac <CR>

Now whenever we will press Alt+J in PDS environment, we will get the command "INS LINE:"

Note: The "INS LINE:" command is available on first screen of pd5 menu and the other line options are available on next screen by clicking line option provided on first screen. We can make a macro so that by pressing the defined keys we get the command as well next screen as

Macro "#0##36" "#M-14 M+2# #13#INS LINE:" - Alt J - - ^J
18. INSERTING DIMENSIONS IN ISO VIEW:

We can insert the dimension in ISO view (view #7) according to the sides (CPL). The procedure is as under:

i) Click 'SELECT' from 'DIM' and then click "VIS ALL VIEWS".
ii) Save the setting by clicking "END SETTINGS".
iii) Select view #7 and required 'CPL'.
iv) Insert the horizontal or vertical dimension from "INSERT" options of "DIM".

Notice that the dimension line is inserted always from the selected depth. To insert the dimension at the required location we have to select the depth from the origin. The procedure is as under:

i) Click "Z DEPTH" from '3-D' and type the value of new depth or dig by using modifier as:
   >>SEL DEPTH <::' system will show 'end'
   Click the point where the depth is required to be shifted.
ii) Now, the dimension will be inserted at new position (depth).

19. DATA FILE FOR PDS:

We can make our own data files to execute in PDS environment. The Data files are made in the editor and contains x,y,z coordinates. At the beginning of the file we have to specify the entity type e.g., 1 or 5 where 1 is the entity type for lines and 5 is entity type for the points. The procedure is as under:

i) C:\PDS> edit filename.dat <CR>

1
35 35 0
70 35 0

ii) >> ins df (press spacebar) name filename <CR>

20. PRINTING OF PDS DRAWINGS THROUGH "PRINTGL":

The available printers are listed under 'PLOT' menu on menu screen in PDS environment. If any one of the listed printers is available then we can take the printout directly to the printer provided the driver is installed. If we have a printer other than defined in PDS
i.e. IBM - Star or HP Paintjet then we can take the printout of PDS drawings externally.
through "PRINTGL". For this first of all we have to convert the PD5 drawing format into 
ASCII codes. The procedure is as under:

i) Open drawing in PD5
ii) >> PLOT DEV HPDP SIZE A ZALL FILE filename <CR>
    A file with the given name will be created.
iii) C:\PD5 >ren filename filename.plt <CR>
v) Select the plot file and press <CR>
    The cursor will go to the list of files, Press <CR>. The system 
    will show the list available 'plt' files.
vi) Select the file and press <CR>.
vii) Press <CR> again to go to selection mode.
viii) Select the 'plot page', 'origin / rotate', 'window / margins' etc 
     according to requirement.
ix) Select "destination" and press <CR>.
    Cursor will move to the available options. Select the proper 
    destination e.g., "continuous flow LPT: -- 1" (For IBM or Laser 
    Printer) and press <CR>.
x) The cursor will move to the selection mode. Select "output format" 
    and press <CR>.
xi) The cursor will move to available option. Select the proper printer e.g. 
    "IBM 92 pass" and press <CR>.
xii) The selected parameters can be saved for permanent use by selecting 
    "save configs" and pressing <CR>.
xiii) Select "Run Printgl". Printing will start.

NOTE:

i) We can take the printout from any printer, whether the printer is 
    directly connected to PC or through network.
ii) To take the printout on printer when directly connected to PC we 
    do not have to connect with server.
iii) To take the printout on printer when connected to server we have to 
    select the proper "queue". eg.,

    Ppollter for plotter
    Plaser for laser printer
    Lprinter for IBM printer etc.

These printers must be define in the "pconsole" and a batch file is to be 
required to made.

iv) The IBM printer is connected to the cpu by inserting the cable on the 
    security keys, whereas laser printer is connected to the port available 
    on Server.

v) The printgl document file is available which can be read by 
    c:\pd5:type printgl doc |more <CR>
21. USE OF TABLET (DIGITIZER) ON PD5:

The Summagraphics Tablet is available to use in PD5 or Windows as an alternative input device for mouse.
To use tablet in Windows we have to type as:
C:\ tablet . CR

To use tablet in PD5, the procedure is as under:

i) Mount the tablet cord to COM1 in place of mouse or at COM2
ii) C:\PD5 > config <CR>
iii) Select "Install / Re-install ComputerVision Supported
     Hardware Devices" and press <CR>
iv) Select "Digitize Mouse" and press <CR>
v) Insert PD5 driver disk in drive A. and press <CR>
vi) Select the appropriate device e.g. "Summa Sketch tablet" and press<CR>
vii) Notice that the tablet device is installed.
     To use mouse repeat the above procedure and this time select
     "Microsoft Serial Mouse"

viii) While using tablet we have to edit some of the parameters as
     - Digitizer Comport Number ------- 1 or 2 according
       to connection.
     - Number of buttons on stylus -------- 2
     - Digitizer input wait loop counter ------ 4000
     - Parity -------- 1

ix) Save data and Escape to C: \PD5 >

22. USE OF MOUSE OR TABLET WITHOUT DRIVER DISK:

We can use Mouse or Tablet as an input device without editing Pd5"config" file and driver disk. The driver disk will be required once just to copy two files to C:\PD5 directory i.e., Summa.def and msoftmse.def.

The procedure is as under:

i) Insert the driver disk (disk #3) into driver A
ii) Check the directory list and change directory to " def " as
    A : \ cd def < CR >
iii) A : \ DEF > copy summa.def C:\PD5 < CR >
    A \ DEF > copy msoftmse.def C:\PD5 < CR >
iv) A \ DEF > C : < CR >
v) C \PD5 > edit summa.def < CR

Change the parameters according to required settings e.g
Digitizer no of button on stylus (2 for two button
comport to use (2 for com2 and 1 for com1)
odd parity (1 to enable tablet)

vi) Save the file and exit to C:\Pd5

vii) Compile the file as
     C:\Pd5 > bldf summa < CR >
     No Error should be detected and a file summa.dif will be
     created in C:\Pd5

viii) Similarly we can edit and compile msoftmse.def file if required

ix) C:\Pd5 > copy input dif mmouse.dif < CR >

x) To use Tablet copy Summa.dif as input.dif as
     C:\Pd5 > copy Summa dif input.dif < CR >

xi) To use Mouse copy mmouse.dif as input.dif as
     C:\Pd5 > copy mmouse.dif input.dif < CR >

NOTE: -
     Once the steps (i) to (ix) has been carried out in any PC then we do not
     need to repeat these steps every time. We just have to use either step
     (x) or (xi) according to the requirement.

23. SHADING PRINTOUT OF PD5 DRAWING:

     Once the shading file (.shp) has been created with shade option of PD5
     drawings, we can take the printout of this file by the method described
     below. Note that any file with .shp extension can be printed by this
     method.

     i) Link the PC with the server and set the queue as C:\plaser <CR>
        This will not be required if the printer is directly connected to PC
        via serial

     ii) C:\Pd5 > shprint A screen menu will appear

     iii) Type the shp file name in response to "Display file"

     iv) Select the printer and press <CR> in response to "Printer"

     v) Select the resolution and press <CR> in response to
        "Printer resolutions"
        (Higher resolution gives good result but small size printout)

     vi) Select the paper size e.g. A4 in response to "Paper Size"

     vii) Select methods e.g. Floyd unidirectional in response to
         "Printing Method"

     viii) Select the orientation e.g. Portrait in response to"Image Orientation"

     ix) Select the Position of printout to be appear on paper e.g., Centre
         in response to "Image location"

     x) Select the adjustments of light e.g. 10% in response to
        "Light Compensation". Higher value gives brighter appearance of
        printout and vice versa

     xi) Select the Intensity of background shade e.g. white in response to
         "Background Shade"

     xii) Select the option e.g. compression in response to "Options"

     xiii) Select the output port e.g. LP11 in response to "Output to"
RECOMMENDATION

After spending two weeks in PMTF, based on their present facilities and requirements, following advise were given by expert to PMTF engineers.

24. The servers in Product Design and Tool Design Deptt have softwares Personal Microdraft and UPL. The primary task of server is to communicate among PCs as well as workstation, it should generally not be treated as a PC for designing purposes, since such use will restrict other users from other stations to gain access to the server for printing or plotting.

25. It was recommended to engineers of PMTF to make use of PDS more other than CADDS5 for 3D designing as there is no CAM package available in CADDS5, but available in PDS. Also shaded figures generated from PDS can be printout thru HP Laser printer.

CONCLUSION

26. Both the Tools Design & Product Design engineers are well versed in their scope of operation in use of Personal Designer software. There are a number of UPL programs in PMTF which both the departments are using in their daily calculations and design especially for gears and dies.
WORK PLAN FOR THE EXPERT OF "PERSONAL DESIGNER"

The "Personal Designer" software has been utilized mostly in Tool Design Department for the drafting of various drawings of Jigs & Fixtures, Cutting tool & Gauges, Dies, Equipments etc. This software has been found very helpful in making templates drawings of intricate shapes e.g. casting dies of various parts. The accurate geometry and dimensions of the templates' drawings are very helpful in tool manufacturing.

Following are the practical problem for which we need the solution.

(1) 3D-SURFACING:

Making an impression die block of a pressure die cast part, its detailing (Sectioning by split command and dimensioning ) and tool path generation for CNC machine.

(2) Sectioning (Splitting) of a Cads5 drawing in PD5 environment.

(3) Making libraries of standard parts.

(4) Use of icon menu to generate repeatative work e.g., assembly making.

(5) Use and importance of various icon (not so far used )e.g.,SEMA,REMA etc.

(6) How to use "HIDE" command.

(7) PD5 interface with CMM.

(8) User programming language (UPL).

   (i) Data base format.
   (ii) Executing data base file for UPL program.
   (iii) Advance user commands.

(9) Arrow head size to be modified.

(10) Size of dashed line not working.

(11) Transfer of file from PD5 to Design view/Page maker.

(12) Macros keys/Functions to be explained.

(13) Up-dating of post processors of: (i) Mandelli (ii) Galaxy (iii) Ab 7340.

(14) Problems in application of milling commands for machining center.
Appendix -  H

Personal Machinist

&

Post Processor Consultancy

Mr. M.S. TONG  20th May to 1st June 1995
CONTENTS

TITLE

PARAGRAPHS

- Introduction 1 - 4
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INTRODUCTION

1. This has reference to UNIDO Contract No. 94/040 in regard to Project No. DPP/PAK.84/012, for provision of consultancy services by Computer Vision Corporation relating to the Computer Vision Software Operation, Integration, and Application of the software installed under Contract No. 92/210.

2. This is a summary of the two (2) weeks consultancy provided by Mr. M.S. TONG commenced from 20th May 1995 until 1st June 1995 at PMTF in Karachi.

3. Before his arrival, there were a number of problems sent to Chartered System Network Ptd Ltd, Singapore to the expert via fax which is enclosed herewith as Annex 'A'. During the two weeks, most of the questions faxed were dealt with both theoretically and practically.

4. The Standard Post Generator in Personal Machinist basically for normal 2-Axis & 3-Axis machining. Due to the different of various machine tools manufacturer and configuration, additional customization is require.
LIST OF PARTICIPANTS

5. The following is a list of participant from both Tool Design and CNC Shop of PMTF.

Mr. AFTAB IQBAL .................................................................................. Tool Design
Mr. MAAZ-UL-MASAID
Mr. MAQSOOD AHMED KHAN

Mr. MANZOOR HUSSAIN ........................................... CNC Shop

SOFTWARES & RELEASE

6. DOS-Platform of Personal Designer / Personal Machinist Rev. 5 from COMPUTERVISION, Bedford, USA.
7. **PROBLEM RELATED TO TURNING CENTRES:**

The problem related to points (i) and (ii) of Annex 'A' were further elaborated as:

a) The tool path creates small radii on each corner. These radii appear in the NC2 file and thus make the file lengthy and also difficult for editing on the machine.

b) Repetition of blocks after circular interpolation in NC2 files.

c) Each command occupies separate block while in manual programming we can combine some command in one block.

The problem of formation of lengthy NC2 file due to the reasons mentioned above has been partially solved by solving somewhat the problem as mentioned at point 'c' only by editing the post processor file of Galaxy (Not for AB7340). The sample of NC2 files created by using original and edited post processor file are enclosed as Annex 'B' and 'C'.

d) A long line having very small taper angle becomes straight after Trimming or Intersectioning.

This problem is related with the accuracy of the software and may not be found in upgrade versions.

The problem listed at point (iii) of Annex 'A' has been solved by editing the post processor file.

8. **PROBLEM RELATED TO MACHINING CENTRE:**

The problem mentioned at point (ii) of Annex 'A' has been solved only for machine cycles (M Cycles) by creating a separate post processor file. The sample of NC2 files created by using original and edited post processor file are enclosed as Annex 'D' and 'E'.

To solve the problem listed at point (ii)b Annex 'A' we have to do the following:

i) Rotate the drawing according to the required CPL.

ii) Edit NC2 file manually by entering Angle of table and Origin of each face.

Besides the above some other problems have also been discussed e.g., While using 'Gen Seq' command we were getting duplication of NC2 files with one empty file. This problem has been solved by adding "Job Name" in the "Insert Tool Path" command as a parameter.

Regarding the 3D Machining Commands, the command sequences and required parameters for Rough and Finish machining of Internal and External surfaces of 3D models are enclosed as Annex 'F'.

RECOMMENDATION

The present facilities and equipment in CNC Shop consider well established for production job but hardly amenable to quantification in cost terms due to the CNC machine which actually run-out of accuracy are needed to recondition for minimizing the collision of machining part.

10. Manual inputing NC program instead of DNC (Distributed Numerically Control) from computer cause time and mistake

11. Definition of Mould & Die making is basically more on paper and traditional matter without go through the computer aids manufacturing (CAM) due to the absence of suitable CNC Milling machine with feature such as DNC.

CONCLUSION

12. Good team work of Tool/Product Designer and CNC programmer, final output is still depend on the type of machine available.
Work Plan for the Expert of "Personal Designer/Personal Machinist"

PMTF CNC Machine Shop is using "Personal Machinist" mostly for their Turning Centres and has generated/manufactured a number of components. There has been some difficulty in successfully utilizing "Personal Machinist" for our Turning Centres and Machining Centre (Mandelli) due to the reasons mentioned below and need to be sorted out during the visit of expert from Computerision:

1. For Turning Centres:
   i) Updating of Post Processor for:
      a) Galaxy    b) Ab 7340
      Some of the parameters are required to be changed/modified according to the requirements.
   ii) The files (nc2) created after post processing are found to be lengthy as compared to our manual programmes which of course require large memory of machine control.
   iii) The nc2 files show errors and not created for more than six tool paths generated for one component.

2. For Machining Centre:
   i) Updating of Post Processor for Mandelli machine.
   ii) We are facing following problems in the generation of nc2 files:
      a) Post processor does not convert axes according to the axes of machine.
      b) In a component if we require to machine for example five faces in one setting then the axis should be shifted with respect to each face whereas it is not the case with available Post Processor and each time the origin for each surface machining is taken from the origin of the drawing.

3. Expert should assist PMTF engineers in writing of Post Processor for any CNC machine and its practical application during his stay.

Qazi Muhammad Aslam
By General Manager (Engr)
ANNEX 'B'

(Original Post Processor Galaxy)

N5GG28
N10T101M06
15G96S180M3 (SSL, 1500)
N20GZ5 .0X120 .0
N25MO8
N3OM03
N35GZ1.154X68 .0
N40G1X58.306F0.3
N45Z-63 .7
N50X62 .0
N55GZ2.6
N65G1X54 .011
N70Z-62.035
N75G2Z-63.7X58 .0I2 .494F1 .035
N80G1X58 .306
N85G1Z1.154
N90G1X47.719
N95Z-14.425
N10GZ-18.35X52 .252
N10G3Z-19.0X52 .6I-1 .126K-0.65
N11G1Z-61.0
N11G2Z-62.035X53 .013I2 .7K0 .0
N12G1Z1.154
N12G1X42 .426
N13GZ-13.7
N13G45 .381
N14G3Z-14.35X47 .633I0 .0K-1 .3
N14G1Z-14.425X47 .719
N15G1Z1.154
N15G1X37 .132
N16GZ-1.728
N16G2Z-2.081X37 .838
N17G3Z-3.0X38 .6I-0 .919K-0.919
N17G1Z-12.0
N18G2Z-13.7X42 .0I1 .7K0 .0
N18G1X42 .426
N19G1Z1.154
N19G1X31.838
N20GZ0 .919
N20GZ-1.728X37 .132
N21G0X68 .0
N21GZ1.154
N22G0Z.0X120 .0
N22G5G53X (SSL, 100)
N23G1T202M06
N235G58G96S200M3 (SSL, 1800)
N24G1Z5 .0X120 .0
N24GM08
N250Z2 .0X66 .0
N255X20 .0
N260G1Z0 .8F0 .25
N265X30 .0
N27G3Z0 .566X31 .131I0 .0K-0.8
N27G1Z-2.434X37 .131
N28G3Z-3.0X37 .6I-0 .566K-0.566
N28G1Z-12 .0
N29GZ2Z14.2X42 .0I2 .2K0 .0
N29G1X45 .181
N30G3Z14.6X46 .767I0 .0K-0.6
N31G1Z-18.6X51 .386
N3I0G1Z-19.0X51 .6I-0 .693K 0. 4
N315G1Z 61 .0
N32G2Z64.2X58 .0I3 .2K0 .0
N32G1Z64 .
N33GZ64 .
N34GZ64 .
N35GZ64 .
N36GZ64 .
N37GZ64 .
ANNEX 'C'

(Edited Post Processor Galaxy)

T101M06
GG28G96S180M8M3 (SSL, 1500)
GZ5.0X120.0
Z1.154X68.0
G1X58.306F.3
Z-63.7
X62.0
GX63.6
Z1.154 G1X53.327
Z-62.035
G2Z-62.7X68...454F100
GZ1.154
G1X47.71°
Z-14.425
Z-18.35X52.252
G3Z-19.0X52.61-1.126K-0.65
G1Z-61.0
G2Z-62.03SX53.013I2.7K0.0
G1Z1.154
G1X42.426
Z-13.7
X45.361
G3Z-14.35X47.633I0.0K-1.3
G1Z-14.425X47.719
G2Z1.154
G1X37.132
Z-1.728
Z-2.081X37.836
G3Z-3.0X38.6I-0.919K-0.919
G1Z-12.0
G2Z-13.7X42.011.7K0.0
G1X42.426
G2Z1.154
G1X31.838
Z0.919
Z-1.728X37.132
GX68.0
Z1.154
Z5.0X120.0
GG53X (SSL, 100)
T202M06
G58G028G96S200M8M3 (SSL, 1800)
G55.0X120.0
Z2.0X66.0
X20.0
G1Z0.87.3
X30.0
G3Z0.566X31.131I0.0K-0.8
G1Z-2.434X37.131
G3Z-3.0X37.6I-0.566K-0.566
G1Z-12.0
G2Z-14.2X42.012.2K0.0
G1X45.381
G3Z-14.6X46.76I0.0K-0.8
G1Z-18.6X51.385
G3Z-19.0X51.61-0.693K-0.4
G1Z-61.0
G2Z-64.2X58.012.2Y0.0
G1Z-64.2
X62.0
GZ 65.0
X66.0
Z2.0
Z6.0X66.0
ANNEX 'E'
(Edited Post Processor Mandelli)

N10B-9002XG10B
N20X10.0Y0.0
N30G00B-9002BG10B
N40G00X400Y300Z30002XYZB
N50T1M06
N60G00X10.0Y0.0Z300.0S1000M03
'70X0.2M08
N80G86<PP=0.0><QP=0.0><RP=10.0><EL=-320.0><RA=10.0>F300.0
'90X0.0Y0.0
N100G00X10.0Y84.805
N110G00X400Y300Z30002XYZB
N120T2M06
N130G00X10.0Y84.805Z300.0S900M03
N140X84.805Y52.992M08
N150G86<PP=84.805><QP=52.992><RP=10.0><EL=-50.0><RR=10.0><A=10.0>F250.0
N160X84.805Y52.992
N170G00X7.0Y34.805
N180G00X400Y300Z30002XYZB
N190T3M06
N200G00X7.0Y34.805Z300.0S800M03
N210X34.805Y152.992M08
N220G86<PP=34.805><QP=152.992><PP=7.0><EL=-99.0><RR=7.0><A=7.0>F200.0
N230X34.805Y152.992
N240G00X-260.0Y0.0
N250G00X400Y300Z30001XYZB
N260T4M06
N270G00X-260.0Y0.0Z100.0S900M03
N280G86<PP=-260.0><QP=0.0><RP=-60.0><EL=-139.0><RR=-60.0><A=-60.0>F250.0
N290G00X400Y300Z300
N300M30
INS TOOL BORDEROFF MAT CONS MAXZ TO ZIG
STEP 18 AUTOZON CHT 0.5 STOCK FLATM
TOOLD 20 SPE 1200B Fee 200 JOBN PO20E

Constant Offset 3D Roughing
INS TOOL STRCONT ZROUGH MAXZ 10 ZK: 3EP
18 AUTOZON CHT .5 STOCK 1 FLATM TOOL 20 SPF
1200 FEE 200 JOBN PP20E

Z-Axis 3D Roughing

Range Point

Containment String
Zig-zag 3D Finishing

Contains String

INS TOOL STRCONT ZIG STEP 3
AUTOZON CHT 0.5 FLATM TOOLD 20
SPE 2000 FEE 200 JOHN VOLCE
Containment String

INS TOOL STRCONT ZIG STEP 3
AUTOZON CHT 0.5 FLATM HOCLD 20
SPE 2000 FEE 200 JOBN PI 20E

Zprofile 3D Finishing
INS TOOL BORDERON ZIG STEP 3 AUG 00
CHT 0.5 BALLM TOOLD 20 SPE 120
FEE 200 JOBN PP20B

Zig-zag 3D Finishing with BorderOn
Zig-zag 3D Finishing with BorderOff
**STEPS:**

1. Insert tool path by "Z Profile" as described on page 4/7 taking step value according to the required depth for 2D pocket milling.

2. Insert a point as a starting point of tool.

3. Generate tool path for each step for 2D pocket milling keeping the same job name as INS POCKET START IN FLATM TOOLD 20 SPEED 1500 FEED 250 MAGPOS 1 JOBN SAMPLE