

Fermilab Library



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SDC-90-00082

SDC
SOLENOIDAL DETECTOR NOTES

CAD/CAE NEUTRAL FILE DEFINITION, PRELIMINARY

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		WBS Code 8.3.1 S	SSC Det # 90-00082	CD # N/A
Author Shuman	Department Mechanical Engineering		Date 9/17/90	
Program Solenoidal Detector Collaboration				
Title CAD/CAE Neutral File Definition, Preliminary				

Introduction and Goals

In order to perform system integration tasks, the SDC Integration Group (SDCI) needs to be able to import and export both 2-D and 3-D CAD drawings to/from the many collaborators involved with subsystem design. SDCI's immediate task is to create true solid models of the SDC detector and use them for the management of subsystem volumes. These resultant volumes will next be transmitted to collaborators in some fashion so that designs may be created which fit within the as-defined detector. Ideally, this would be an unambiguous 3-D solid or surface model, however, collaborators without 3-D systems would need to receive 2-D drawings. The next step is then to receive CAD files, again preferably 3-D solid-models, from subsystem designers and verify that subsystems do not extend past their defined geometry envelopes. It is anticipated that modifications to defined boundaries will occur from all parties and that CAD, especially 3-D modeling will facilitate quick resolutions of conflicts. SDCI may also carry some of the interface design process, designing, with subsystem group input, some of the mechanical supports, fluid and electrical pipes and ductwork, using solid-modeling.

Another goal is the creation of a central CAD database, a library of neutral files, both 2-D and 3-D, which any collaborator will be able to read up to a certain level, depending on capability. A communication level concept is introduced here, defining various levels of neutral communication. This is described more fully in ~~section 2.1.~~ *below*

This note is simply a first attempt at defining some integration goals for SDC CAD activities and should not infringe on any procedures developed between specific collaborators. I expect many changes to be suggested and made in the course of this effort, so please feel free to contact me at any time.

Neutral format(s)

More than one format is possible. The IGES standard is broad enough to accommodate most geometry entities that CAD systems use. It is the only neutral format to my knowledge, allowing 3-D entities. Further, IGES version 4.0 is the only format allowing b-rep solid model transfer (trimmed surfaces). It may not be the best neutral format for 2-D drawings, but it is suggested that we start by using it until a better choice becomes obvious (such as DXF, from AutoCAD). A subset, (or several subsets) of IGES entities will need to be defined which will allow adequate communication capability between collaborators. Various levels of communication will tentatively be defined in order to accommodate the various capabilities of CAD systems involved. Two sets of procedures will be worked out for each level, one system dependent, the other generic, which will cover drawing or model preparation, command sequences for both creating and reading the IGES files, accompanying documentation, etc. The generic procedure will be developed to both minimize the amount of system-to-system dependent procedures and to insure that any IGES file of a certain communication level can be read by any other system with the same communication level capability.

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following information about their CAD capability. Please send to: Derek Shuman, M.S. 90-2148, LBL, Berkeley, CA 94720, or by E-mail to LBL::DEREK or by fax to (415) 486-6668. My phone is 486-4662. An example of LBL's response to this survey is enclosed. Please add any other information you feel is important.

description of work; subsystems involved

types of hardware

types of software, including version #

software capabilities

e-mail address

node name

node address

ftp login (userid)

ftp password

ftp procedure

mail address

IGES software

IGES entities supported

IGES mapping capability

input

output

DXF capability

System neutral capability (e.g. pro/e neutral, or hp's MI format)

Other neutral formats (stereo lithography, rendering, CAM, F.E. etc.)

Specific system to system translators (shareable?)

Procedures and known problems and limitations (e.g. 12 mile long drawings, part smashing, scale factors, etc.)

Formulation of IGES subsets for each communication level.

This will be done using the results of the above survey, tempered with actual results from test (and actual) files from each collaborator.

Formation of a globally accessible neutral CAD file depository, network accessible

A directory scheme will be set up, perhaps with some type of subdirectory scheme which will accommodate the files together with their log files and any other assorted information. This should tie in with SSCL's effort to develop an SDC database and unified drawing number system.

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VAX based computer

At the system prompt type: ftp me41.lbl.gov <return>. At the me41.lbl.gov> prompt type: user ftp <return>. At the password prompt type: ftp <return>. (you may have to wait several seconds and ignore the "password please" prompt). When the ftp prompt comes back, proceed as with the unix based procedure above.

IGES software and versions supported

Pro/engineer supports some IGES version 4.0 entities; ME10 supports IGES version 3.0

IGES entities supported

3-D solid model input to pro/Engineer from b-rep solid modelers (IGES 4.0)

- 100 circular arc
- 108 plane
- 110 line
- 112 parametric spline curve
- 114 parametric spline surface
- 118 ruled surface
- 120 surface of revolution
- 122 tabulated cylinder
- 124 transformation matrix
- 126 b-spline curve
- 128 b-spline surface

3-D input to pro/Engineer from other 3-D systems (wireframe, surface model, etc)

- 100 circular arc
- 110 line
- 112 parametric spline curve
- 124 transformation matrix
- 126 b-spline curve

IGES input requirements and input/output mapping capability, 3-D

Various systems have the capability to modify the iges files they either read or write. These options allow tailoring of output to fit the specific input requirements of other systems and give flexibility in interpreting files from other systems.

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Specific system to system translators (shareable?)

HP ME10 to DXF translator is available. Perhaps one could use it on LBL's machine. This needs further study. If many collaborators have AutoCAD, and others can accept DXF it might make sense to use DXF as a neutral format for all 2-D drawings. Also needs further research.

Procedures and known limitations

ME10

Single scale factor (ME10)

Problems have occurred when more than one ME10 part is present on a drawing. If they have different ME10 scale factors this information could be lost, with resulting parts being mismatched for size. This problem is not yet well understood however.

pro/Engineer