THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

Proceedings of the IREAPS Technical Symposium

Paper No. 16: Computervision Interface to Batch Electric Boat Piping Programs

U.S. DEPARTMENT OF THE NAVY CARDEROCK DIVISION, NAVAL SURFACE WARFARE CENTER
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COMPUTERVISION INTERFACE TO BATCH ELECTRIC BOAT PIPING PROGRAMS

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Senior Software Engineer
General Dynamics/Electric Boat Division
Groton, Connecticut

Mr. McKee is currently responsible for development of interfaces to and from the Electric Boat Division piping design analysis and assembly programs to computervision. He has developed an interface between computervision and AUTOKON.

Mr. McKee holds a BS degree from Hofstra University Hempstead, New York.

Robert Sciullo
Manager Material
General Dynamics/Electric Boat Division
Groton, Connecticut

Mr. Sciullo's functions include computer system development and control and computer generation of pipe details which provided a logical conversion from batch to graphic terminals. Additional responsibilities are in the areas of material identification and sourcing; drawing control and issues; and contract definition and budgets. Data systems interface provides for involvement in virtually all aspects of engineering products and the interfaces with shipyard construction activities.

Mr. Sciullo attended Thames Valley State Technical College and Carnegie Institute of Technology.

ABSTRACT

The design and implementation of the computervision interface to the batch electric boat piping design analysis and assembly programs will be described. This interface will allow three-dimensional piping models produced on computervision to be processed by the Electric Boat Piping programs on the UNIVAC. The end result of this processing, would be assembly details which are delivered to the pipe shop for assembly.
Background

COMPUTERIZED PROGRAMS FOR PIPING SYSTEM EVOLUTION

1. Provided pipe bending data for length, bend angles, roll angles, and distance between bends.

2. Added fitting, valve, and hanger locations to both bent and straight pipe by match marking and creating pipe details.

3. Combined details into assemblies.

4. Generated isometric and orthographic drawings.

5. Added welding identification and data.

6. Extracted and added material information.

7. Expanded to include work authorizations, trade work instructions, feed relationships, test boundaries, and serialization.

8. Generated tapes for data transfer to work authorization files and reports for manufacturing and installation.
LIST OF MATERIALS

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FABRICATION
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F7 (AT POINT 2) ATTACHED TO P-PL-196-I OF DETAIL 2 AT JOINT IDENT. NO. 048-01-038
ATTACH F1 TO P-PL-196-2

NOTE: INCLUDES
CONTROLLED AND
NON-CONTROLLED JOINTS
STATE OF THE ART ALLOWS A CHANGE IN SKILL LEVEL AND REDUCTION IN WALL TIME.
Isometric of Modeled Pipeline Routed with Bends
Approach

- MUST BE TECHNICALLY EQUAL TO EXISTING PRODUCTS.
- MUST BE COST-EFFECTIVE WITH REAL BENEFITS (MANHOURS AND WALL TIME).

ESTABLISH PLAN AND MILESTONES

1. Training on CADDS 3

2. Execution on CADDS 3

3. Mods/workarounds CADDS 3

4. Training on CADDS 4

5. Execution on CADDS 4

6. Mods/workarounds CADDS 4

7. CADDS 4 \(\rightarrow\) IN / UNIVAC \(\rightarrow\) OUT

8. Committee programming/data flow
Approach (Cont'd)

- **PROGRAMMING - IN-HOUSE OR CV?**
  - CV

- **DATA FLOW**
  1. CV → IBM → UNIVAC
  2. UNIVAC → CV
  3. UNIVAC → IBM → CV

- **TEST AND ACCEPTANCE**
  1. Equal products
  2. Time trial – Machine
  3. Time trial – Human

**X vs 5**
Creating A Pipe Detail With Bend and Match Mark Data

COMPARISON OF BATCH TO COMPUTERVERSION

Step 1

BATCH (8 hrs, 1 day)
Obtain Cartesian coordinates from mockup, layout, shipcheck, etc.

COMPUTERVERSION (8 hrs, 1 day)
Obtain Cartesian coordinates from mockup, layout, shipcheck, etc.
Step 2

BATCH (20 hrs, 2-1/2 days)
Fill out source paper for key punch.

COMPUTERVISION (12 hrs, 1-1/2 days)
Model piping system.

Step 3

BATCH (3 hrs, 1-1/2 days)
Run PIPER program until error-free. Run DRUID program for isometric or orthographic plots.

COMPUTERVISION (2 hrs, 1 day)
CV data base interfaced to DRUID for isometric or orthographic plots.

Step 4

BATCH (2 hrs, 1 day)
MMAP Interface program - pipe details

COMPUTERVISION (2 hrs, 1 day)
MMAP Interface program - pipe details

Totals

BATCH - 36 hrs, 7 days

COMPUTERVISION - 24 hrs, 4-1/2 days
LIST OF MATERIALS

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FABRICATION

ATTACH F7 AT POINT 2 AT JOINT IDENT. NO. 048-01-032
ATTACH F1 TO P-PL-195-2
PAINT WITH EPOXY COATING SYSTEM
Isometric of Modeled Pipeline Routed with Bends

Isometric of Piping Network Showing Fittings

Plan View of Piping Network
Cutaway Isometric Showing Combination of Piping and Structural Systems
Labeled Isometric Showing Pipe Penetrating Structure
Results

- PROMISING
- CAN GENERATE PRODUCTS
- MARRY EXISTING TECHNOLOGY WITH NEW TECHNOLOGY
- MODS/WORKAROUNDS ARE ESSENTIAL
- USERS AND PROGRAMMERS MUST WORK AS A TEAM
- SIDE BENEFITS
Capture & Control Data

- Graphics Programs
- Material
- Configuration Control

PART DEFINITION AND MATERIAL TO SHIP'S COORDINATES BY DRAWING ID AND APPLICABILITY

CLASS DRAWINGS

SDI

Package Work

IN ACCORDANCE WITH SHIPYARD WORK AUTHORIZATIONS AND SCHEDULES

COMPOSITE ASSEMBLY

LIST OF

PIPING DETAIL

LIST OF MATERIAL

STRUCTURAL DETAIL
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