MEP Technical Report 8617

TITLES AND ABSTRACTS OF TECHNICAL NOTES ON RESEARCH IN COMPUTER-AIDED DESIGN FOR 1986

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1. MEP Technical Note 8601
   User Manual for the Prolog-CADAM system
   Alan H. Bond and Basuki Soetarman

   Prolog-CADAM is an integrated intelligent CAD system, which has been designed and implemented by combining VM/PROLOG and CADAM on an IBM 4341 mainframe. The resulting system allows the user to interact through one screen to
   (i) work graphically in the conventional CADAM system
   (ii) write application programs in Prolog, or a mixture of Prolog and Fortran
   (iii) interact with his application program, setting Prolog goals and monitoring results in Prolog
   (iv) produce modified drawings in Prolog and display them in CADAM

   Also available is an intelligent CAD modelling package, which was designed and implemented in collaboration with S. Zia Ahmed and Dong H. Kim. This is a mixture of Prolog and Fortran, and which provides facilities for reading in 2D drawings and automatically constructing a 3D CAD model. The model provides a Prolog and Fortran interface, with a set of functions and predicates for accessing information contained in the model. The model provides 3d wireframe, surfaces and volumes and manufacturing features.

2. MEP Technical Report 8602
   Intelligent databases for computer-aided design
   Alan H. Bond and Basuki Soetarman
   June 1986
   A Discussion Document. There are many motivations for intelligent databases, which allow a rich query language and automatic transformation, updating and verification of data. There are also many important issues in designing a database suitable for storing CAD data. We propose an intelligent database specifically designed for CAD data, to work with a CAD/CAM system.

3. MEP Technical Report 8603
   Introduction to Prolog and its use for programming expert systems
   Alan H. Bond

4. MEP Technical Report 8604
   Notes on using IBM VM/PROLOG
   Alan H. Bond and Basuki Soetarman
   June 1986

   This document briefly introduces the main features of IBM's official product VM/PROLOG. It assumes the reader already knows the standard version of Prolog, as described in Clocksin and Mellish's book, for example, or the original Dec-10 Prolog. We also assume the reader will have access to the IBM VM/PROLOG reference manual for details as needed.

   We explain the main differences in syntax, the additional features and generalisations introduced in VM/PROLOG, how to run VM/PROLOG programs under CMS, and how to interface VM/PROLOG programs to assembly code and Fortran programs.

5. MEP Technical Report 8605
   The automatic interpretation of sheet metal drawings
   Alan H. Bond, S. Ziauddin Ahmed, Rony Sawdayi, Ahmadreza Rofougaran and Dong Hun Kim
   June 1986

   A set of methods for automatically interpreting drawings of sheet metal parts is described. Starting with three two-dimensional views, a three dimensional model is found automatically. Its faces (which must be planar or circularly cylindrical) are found, amd also a set of describing features. Finally, the flat pattern is also generated. The methods were implemented using the CADAM system.

6. MEP Technical Report 8606
   Integrating Prolog and Cadam to produce an intelligent CAD system
   Alan H. Bond and Basuki Soetarman
   November 1986 We discuss the system issues in integrating an artificial intelligence system like Prolog with a computer-aided-design system like CADAM. These are totally different types of system, and both are interactive. We describe different schemes for their integration, and experience with implementation and use of two of them.

7. MEP Technical Report 8609
   Commented code for Design Checker
   Alan H. Bond
   June 1986

8. MEP Technical Report 8610
   Commented code for Faces and features
   Dong Hun Kim
   June 1986

9. MEP Technical Report 8611
   Commented code for Flat pattern generation
   Syed Ziauddin Ahmed
   June 1986

10. MEP Technical Report 8613
    Introduction to Prolog
    Alan H. Bond
    June 1986

11. MEP Technical Report 8614
    Commented code for 2d to 3d transformation
    Rony Sawdayi and Ahmadreza Rofougaran
    June 1986

12. MEP Technical Report 8615
    Sheet Metal Flat Pattern Generation from 2D drawings and from 3D CAD models

Alan H. Bond and S. Zia Ahmed
June 1986 I) Strictly 2-D approach

A more or less dedicated algorithm had been developed earlier and the code based on that writted (though not fully tested and debugged). The goal is to produce the flat pattern, given 3 views of the part as (x,y), (y,z) and (z,x) coordinate contours (provoded by GRAD).

It must be noted that the "unbending problem" is actually composed of two fundamental parts:

1) Recognizing the 3 D geometry. 2) "Unbending" the geometry.

A strictly 2-D approach was adopted, however it is found (after much work) that this approach is quite limited in its scope (of types of parts handled). The limitations are:

1) Simple bends of 90 degrees only. 2) No overlapping allowed. 3) No holes or cutouts.

Three examples of the types of parts that can be handled are given in the examples 1 - 3 (shown on the following pages).

It seems that this approach is not effective as even this limited "unbending" requires over 2000 lines of code. A much better approach seems to be one in which the two sub-problems are dealt with separately, i.e. 1) building the 3-D model 2) unbending the model. Henceforth this approach is adopted with these considerations.

1) The previous work done by Lin, Rau and currently carried on by Rony and Reza can be used to produce the 3-D wireframe model of the sheet metal part from 3, 2-D views. Examples of sheet metal parts need to be tested using the codes developed.

2) Given the 3-D wireframe model, the unbending is fairly easy and the general method (applicable to all bends) is outlined in MEP TN05.

13. MEP Technical Report 8617
Titles and abstracts of technical notes on research in computer-aided design for 1986
Alan H. Bond
December 1986

14. MEP Technical Report 8618
Areafill algorithms
Alan H. Bond and Dong Hun Kim
September 1986 Description of Code

15. MEP Technical Report 8620
A Knowledge Based System Approach To Factory Simulation
Basuki Soetarman
February 1987

16. MEP Technical Report 8621
Introduction to UCLA research into intelligent computer aided design
Alan H. Bond

December 1986
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Current projects:

(a) THE PROLOG-CADAM INTERFACE
(b) THE PROLOG-CADAM MODEL
(c) DRAFTING - VALID 3D INTERPRETATIONS FROM 2D DRAWINGS
(d) AUTOMATIC DIMENSIONING AND TOLERANCING
(e) SEMANTIC MODELLING - DESCRIBING MANUFACTURING FEATURES
(f) DESIGN CHECKING USING PROLOG RULES
(g) PARTITIONING INTO SUBASSEMBLIES
(h) CAD/CAM DATABASE
(i) OUTLINE PRODUCTION PLANNING AND COST ESTIMATION
(j) PERFORMANCE ANALYSIS OF PROLOG-CADAM