REPORT DOCUMENTATION PAGE

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1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
		FINAL/01 FEB 93 TO 31 JAN 95

4. TITLE AND SUBTITLE
EFFICIENT ALGORITHMS AND DATA STRUCTURES IN GEOMETRIC DESIGN

6. AUTHOR(S)

5. FUNDING NUMBERS

2304/DS
F49620-93-1-0138

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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8. PERFORMING ORGANIZATION REPORT NUMBER

AFOSR-TR- 95 - 0311

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
AFOSR/NM
110 DUNCAN AVE, SUTE B115
BOLLING AFB DC 20332-0001

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

F49620-93-1-0138

11. SUPPLEMENTARY NOTES

DTIC
ELECTED
JUN 21 1995
F

12a. DISTRIBUTION/AVAILABILITY STATEMENT

APPROVED FOR PUBLIC RELEASE: DISTRIBUTION IS UNLIMITED

13. ABSTRACT (Maximum 200 words)

An efficient and uniform approach for the automatic reconstruction of surfaces of CAD models, and scolar field defined on them, from an unorganized collection of scanned point data has been developed.

19950616 089

DTIC QUALITY INSPECTED 8

14. SUBJECT TERMS			15. NUMBER OF PAGES
			16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	SAR(SAME AS REPORT)

Final Technical Report   F49620-93-1-0138
(1 Jan 95 - 31 March 95)

Project Title: Efficient Algorithms and Data Structures in Geometric Design
PI Name (Last, First, MI): __Bajaj, Chandrajit, L.__
Institution: __Purdue University ___

1. Developed an efficient and uniform approach for the automatic
reconstruction of surfaces of CAD (computer aided design) models and
scalar fields defined on them, from an unorganized collection of
scanned point data. Example applications in the manufacturing domain
are the rapid computer model reconstruction of any existing physical
part from some three dimensional (3D) points scan of the part's
surface. Color, texture or some scalar material property of the
physical part, defines natural scalar fields over the surface of the
CAD model. Manufacturers who wish to use existing computer aided
design and manufacturing software (CAD/CAM) need to have computer
models of these parts. Using these algorithms, existing parts and
prototypes can be automatically reconstructed into computer models
from 3D scans.

This work resulted in the publication below:

''Automatic Reconstruction of Surfaces and Scalar Fields from 3D
Scans'',
(with F. Bernardini, G. Xu),
Proc. of 1995 ACM Symposium on Graphics, SIGGRAPH 95, Los Angeles, California,
Computer Graphics, 29, 2, (1995).

2. Developed an algorithm using ''blossoming'' for a sparse and smooth connection
between B\'{e}zier or Bspline curves.
Often in interactive font design, free-form sketching and input path
specification for graphics animation, one is faced with the problem of
connecting two B\'{e}zier or B-spline polynomial
curves with a piecewise
transition polynomial curve achieving prescribed continuity at the two
end points.
Furthermore one desires the transition polynomial curve
to have the fewest number of pieces (sparse).
This issue is addressed by first identifying degrees of
freedom needed to achieve the
conditions for smoothness and sparseness.

This work resulted in the publication below:

''Sparse Smooth Connection between B\'{e}zier/Bspline Curves'',
(with G. Xu)
Graphics Gems V,
edited by A. Paeth, Academic Press, New York, (1995).

HONORS/AWARDS RECEIVED DURING ABOVE CONTRACT/GRANT PERIOD

1. Elected Program Committe Member of the Eurographics workshop on
Implicit Surfaces, Implicit'95, France, 1995.

2. Elected Program Committe Member of
workshop on Algorithms and Data Structures, WADS'95, 1995.