Center for Mapping
Ohio State University

Mr. Lowell Starr
Technical Advisor for International Marketing
Intergraph Corporation

INTERGRAPH CORPORATION

IN COOPERATION WITH

THE OHIO STATE UNIVERSITY
CENTER FOR MAPPING

CENTER FOR THE COMMERCIAL DEVELOPMENT OF SPACE

1990-91 PROJECTS

P.I.	DEPT.	PRODUCT NAME	FUNDING
BOYER	ELECTRICAL ENGINEERING	FEATURE EXTRACTION & DETERMINATION OF DIGITAL ELEVATION MODELS FROM AERIAL & SATELLITE IMAGERY	$ 70,000
GOAD	GEODETIC SCIENCE	REAL-TIME GPS SYSTEM FOR EARTH MOVING EQUIPMENT APPLICATIONS	$ 75,000
BARNES	GEODETIC SCIENCE	DEVELOPMENT OF A GIS CAPABILITY TO SUPPORT "ONE-CALL" UTILITIES PROTECTION SERVICES	$ 49,500

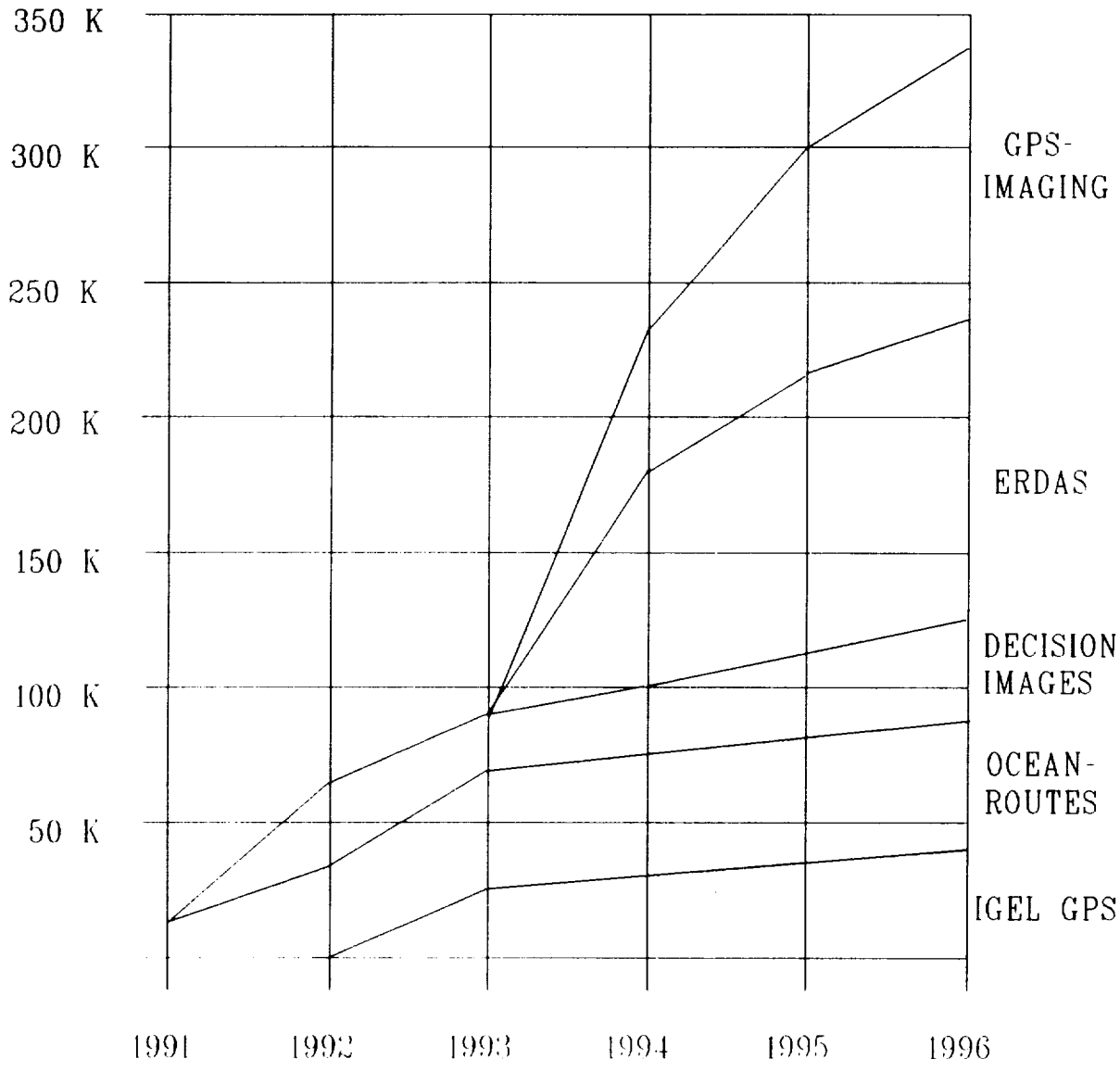
P.I.	DEPT.	PROJECT NAME	FUNDING
MCCORD	CIVIL ENGINEERING	IMPROVED OCEAN ROUTING USING REMOTE SENSING	$ 75,000
VON FRESE	GEOLOGY & MINERALOGY	INTEGRATING SATELLITE, AIRBORNE, AND SURFACE GEOPHYSICS FOR GLOBAL HYDROCARBON EXPLORATION	$ 49,500
NOVAK	GEODETIC SCIENCE	AUTOMATIC DERIVATION OF DIGITAL ELEVATION MODELS AND SIMULTANEOUS RECTIFICATION USING DIGITAL AERIAL PHOTOGRAPHY AND SPOT IMAGERY	$ 93,698
PRIDE	GEOLOGY & MINERALOGY	INTEGRATING THEMATIC MAPPER AND HIGH-RESOLUTION SURFACE DATA TO HIGHLIGHT GOLD MINERALIZATION IN NORTHERN NEVADA	ON-GOING NO NEW FUNDS AWARDED
SCHENK	GEODETIC SCIENCE	FEATURE EXTRACTION & DETERMINATION OF DIGITAL ELEVATION MODELS FROM AERIAL & SATELLITE IMAGERY	$ 86,000

P.I.	DEPT.	PROJECT NAME	FUNDING
TOMLIN	NATURAL RESOURCES	A MAPBOX/SYSTEM 9 INTERFACE	$ 108,000
BOSSLER, GOAD, AND NOVAK	CENTER FOR MAPPING AND GEODETIC SCIENCE	COMMERCIAL APPLICATION OF A GPS SYSTEM FOR TRANSPORTATION PLANNING	$ 140,000
MERRY	CIVIL ENGINEERING	STUDY OF EOS COMMERCIALIZATION POTENTIAL	$ 40,000
WU	CIVIL ENGINEERING	LANDSLIDE HAZARD FROM SNOW-MELT	$ 35,000
ANDERSON, BOSSLER, BOYER, SCHENK	CENTER FOR MAPPING/EE/ GSS	SPACE CAM	$ 250,000

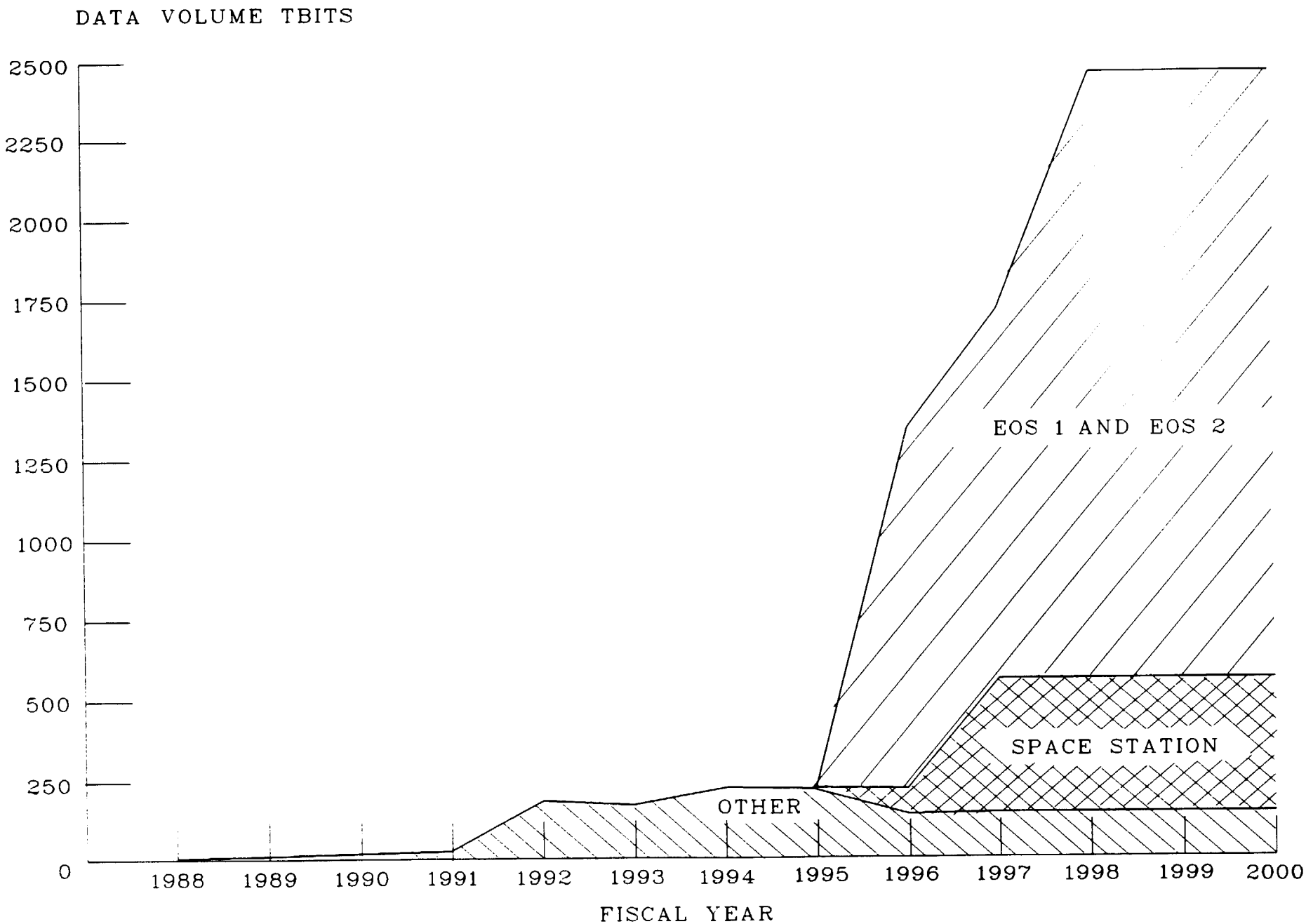
OHIO STATE UNIVERSITY CCDS CORPORATE PARTNERS AND AFFILIATES

AMOCO (HOUSTON, TX)
ARCO (PLANO, TX)
DECISION IMAGES (PRINCTON, NJ)
ENVIRONMENTAL SYSTEMS RESEARCH INSTITUTE (REDLANDS, CA)
ERDAS, INC. (ATLANTA, GA)
EXXON (HOUSTON, TX)
GAS RESEARCH INSTITUTE (CHICAGO, IL)
INTERGRAPH CORPORATION (HUNTSVILLE, AL)
GEORGE J. IGEL AND COMPANY (COLUMBUS, OH)
KRIG RESEARCH (BEAVERTON, OR)
QUEST VENTURES (SAN FRANCISCO, CA)
SANTE FE MINING (ALBUQUERQUE, NM)
TEXACO (HOUSTON, TX)
TRIMBLE NAVIGATION (SUNNYVALE, CA)
TYDAC TECHNOLOGIES (ARLINGTON, VA)
ULTIMAP CORPORATION (MINNEAPOLIS, MN)
UNOCAL (BRIA, CA)
DEPARTMENT OF TRANSPORTATION (38 STATES)
DOT/FEDERAL HIGHWAY ADMINISTRATION (WASHINGTON, DC)
NASA/GODDARD SPACE FLIGHT CENTER (GREENBELT, MD)
NASA/STENNIS SPACE CENTER (SSC, MS)
NOAA/NATIONAL OCEAN SURVEY (WASHINGTON, DC)
USGS/NATIONAL MAPPING DIVISION (RESTON, VA)
WASHINGTON DEPARTMENT OF NATURAL RESOURCES (OLYMPIA, WA)
OHIO STATE UNIVERSITY SCHOOL OF BUSINESS (COLUMBUS, OH)

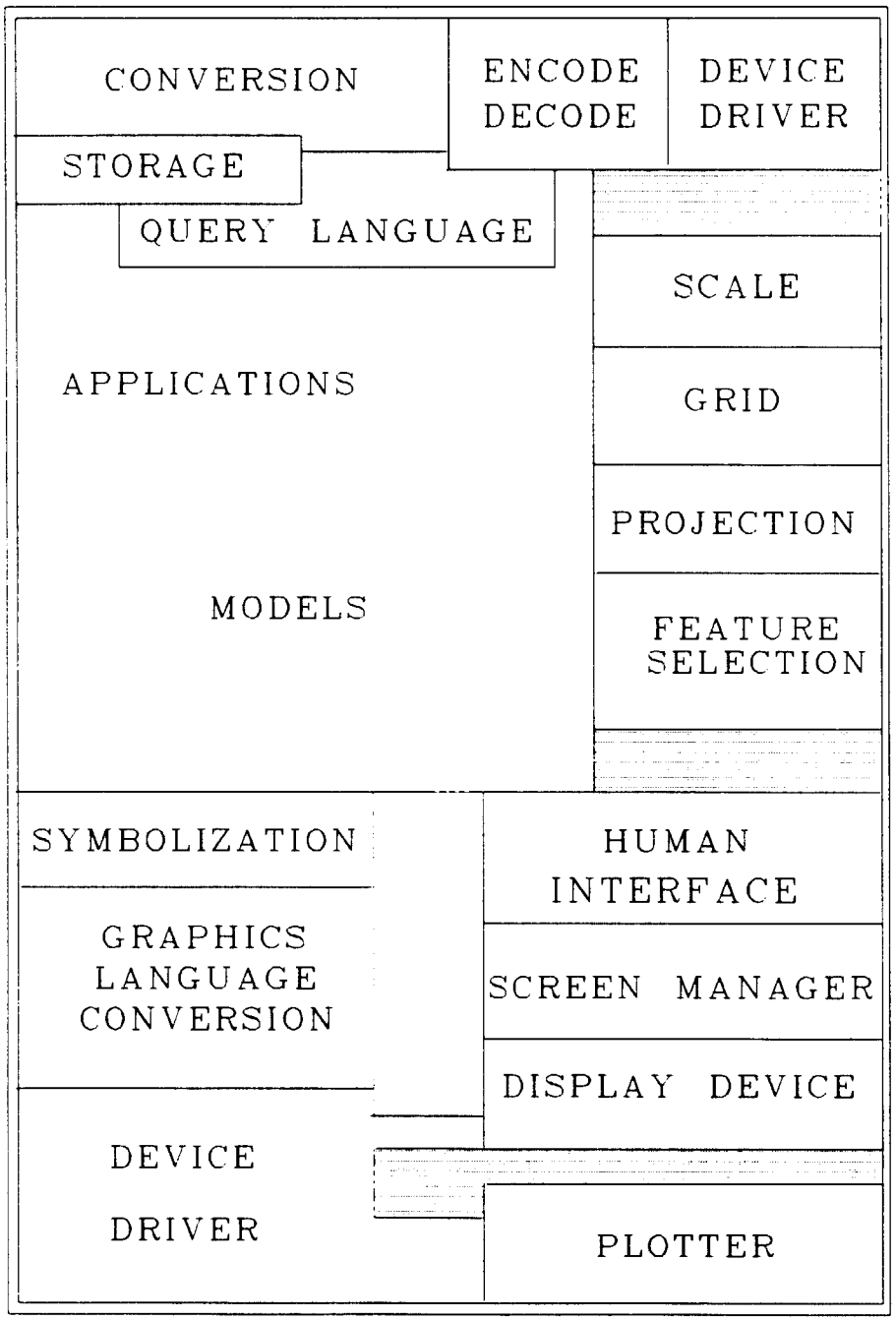
ESTIMATED ANNUAL ROYALTIES



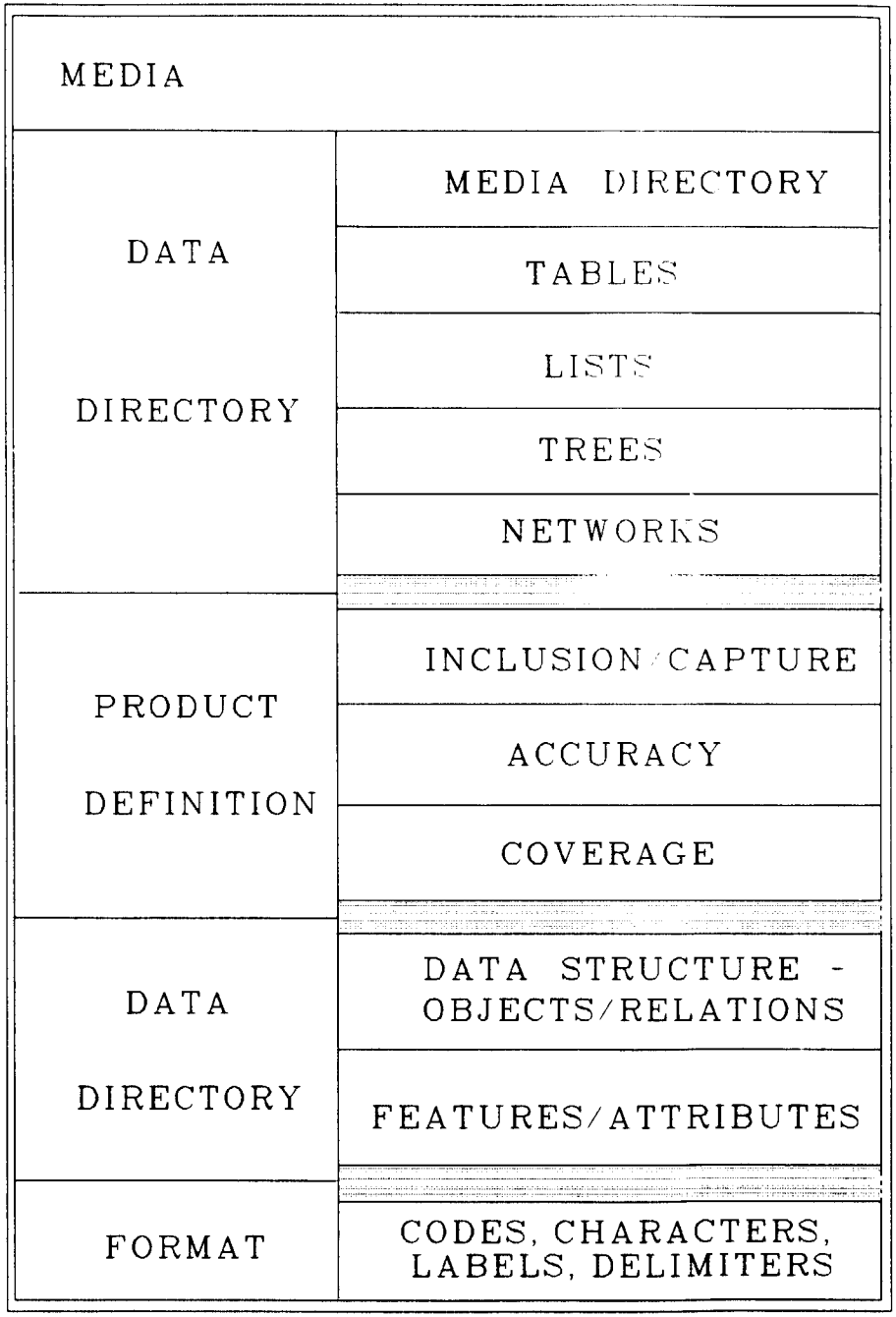
ANNUAL DATA VOLUME BY LOCATION OF MISSION

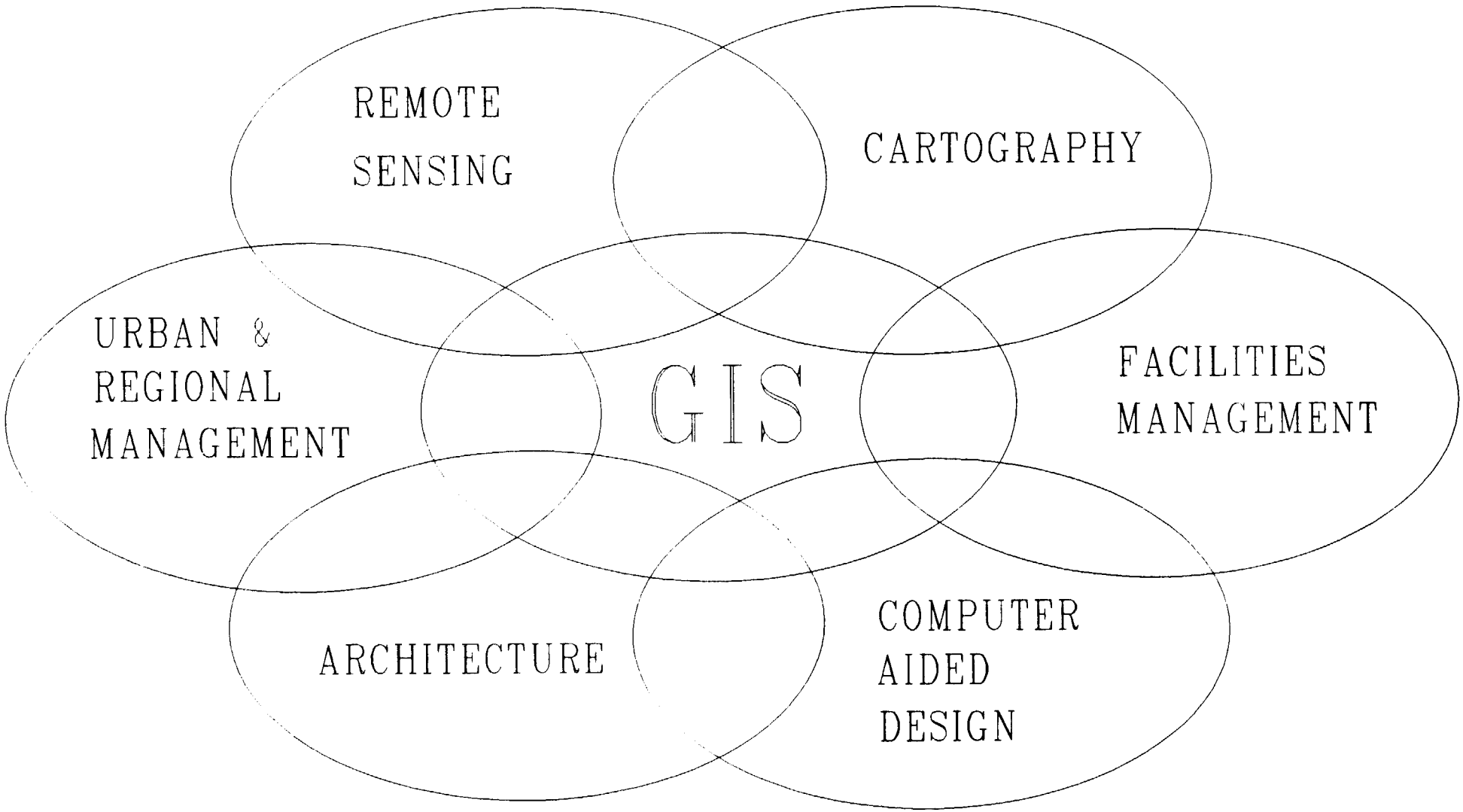


EXPLOITATION SYSTEM



PRODUCT



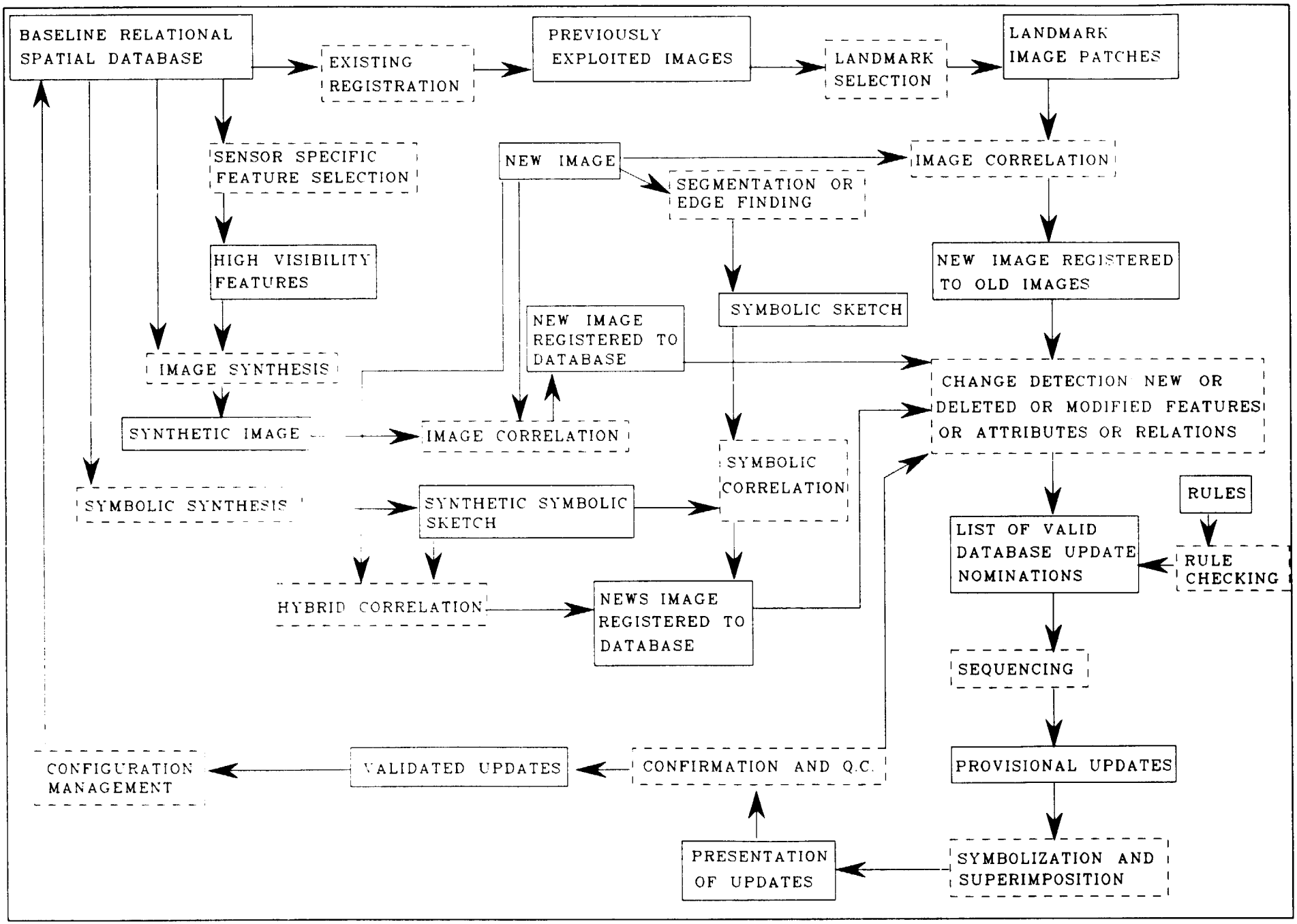


THE OVERLAPPING SPATIAL DATA DISCIPLINES

SOME SPATIAL THEMES

- TOPOGRAPHY (CONTOURS)
- TOPOGRAPHY (SHADED RELIEF)
- TOPOGRAPHY (FORM LINES,...)
- ROADS (MAJOR, MINOR,...)
- RAILROADS (NO. OF TRACKS)
- PRIMARY POLITICAL B'ND'RIES (CITY, COUNTY, COUNTRY,...)
- ADMINISTRATIVE BOUNDARIES (SCHOOL, FIRE, POLICE, ZIP,...)
- LAND OWNERSHIP
- GEOLOGY: SURFACE AND SUBSURFACE, FAULTS, ...
- VEGETATION (TYPE, SIZE, CONDITION, ...)
- SOIL
- FLIGHT CONTROL ZONES
- BUILDINGS
- WATER BODIES (LAKES, RIVERS, OCEANS,...)
- AIRPORTS, RUNWAYS,...
- POPULATION & DENSITY
- POPULATION ATTRIBUTES (INCOME, FAMILY SIZE,...)
- CLIMATE
- WEATHER, RAINFALL, TEMPERATURE, WIND, ...
- MILITARY ZONES
- OPERATIONAL PLANS
- FORCE DEPLOYMENT
- NAVIGATION AIDS (BUOYS, BEACONS, ...)
- SHIPPING CHANNELS
- ANCHORAGES
- POPULATED PLACE NAMES
- NATURAL FEATURE NAMES
- HIGHWAY NAMES AND NUMBERS
- REFERENCE GRID
- MAP GRID
- ADDRESSES OR SCHEME
- BATHYMETRY (SOUNDINGS)
- BOTTOM CONTOURS
- OTHER MAN-MADE FEATURES: DAMS, MINES, PARKING LOTS, MONUMENTS, ...
- LINES OF COMMUNICATION
- ANTENNAE
- WETLANDS
- FLOOD PLAINS
- SURVEY BENCHMARKS
- CITY/COUNTY INFRASTRUCTURE WATER SERVICES, GAS, ELECTRIC, TELEPHONE, CABLE, ...
- MILITARY AND SPECIAL INTELLIGENCE
- BRIDGES, TUNNELS, MINES, ...

MODIFIED IMAGE UNDERSTANDING PROGRAM



KEY ISSUES

1. LEVEL OF INFORMATION VS. PRESENTATION

2. DATA BASES,
   SPATIAL: OBJECTS, QUERY SUPPORT, LINKAGE, SCHEMA: CELLS, LAYERS
   RELATIONAL: OBJECTS, ATTRIBUTES

3. PRESENTATION
   SYMBOLIZATION AND RENDERING

4. MODELING

5. INITIALIZATION
   DATA CAPTURE

6. MAINTENANCE
   UPDATE AND INTERACTION

PRESENTATION ISSUES

1. SYMBOLIZATION
2. GENERALIZATION
3. DISPLACEMENT
4. TEXT PLACEMENT
5. DEVICE DRIVER
6. ZOOM AND ROAM
7. AGGREGATION
8. RESYMBOLIZATION
9. THEMATIC LAYERING
10. TRANSPARENCY
11. SUPERIMPOSITION
12. COMBINATION OF RASTER AND VECTOR
13. PROJECTION
14. ACCURACY AND PRECISION
15. RESOLUTION
16. MARGINALIA: LEGEND, SCALE, SERIES, TITLE, NOTES,
17. GRIDS, TICS, GRADUICULES, HATCHURES
18. COLOR, COLOR SEPARATION,
19. CONTOUR LABELS
20. BATHYMETRY
21. . . . . .

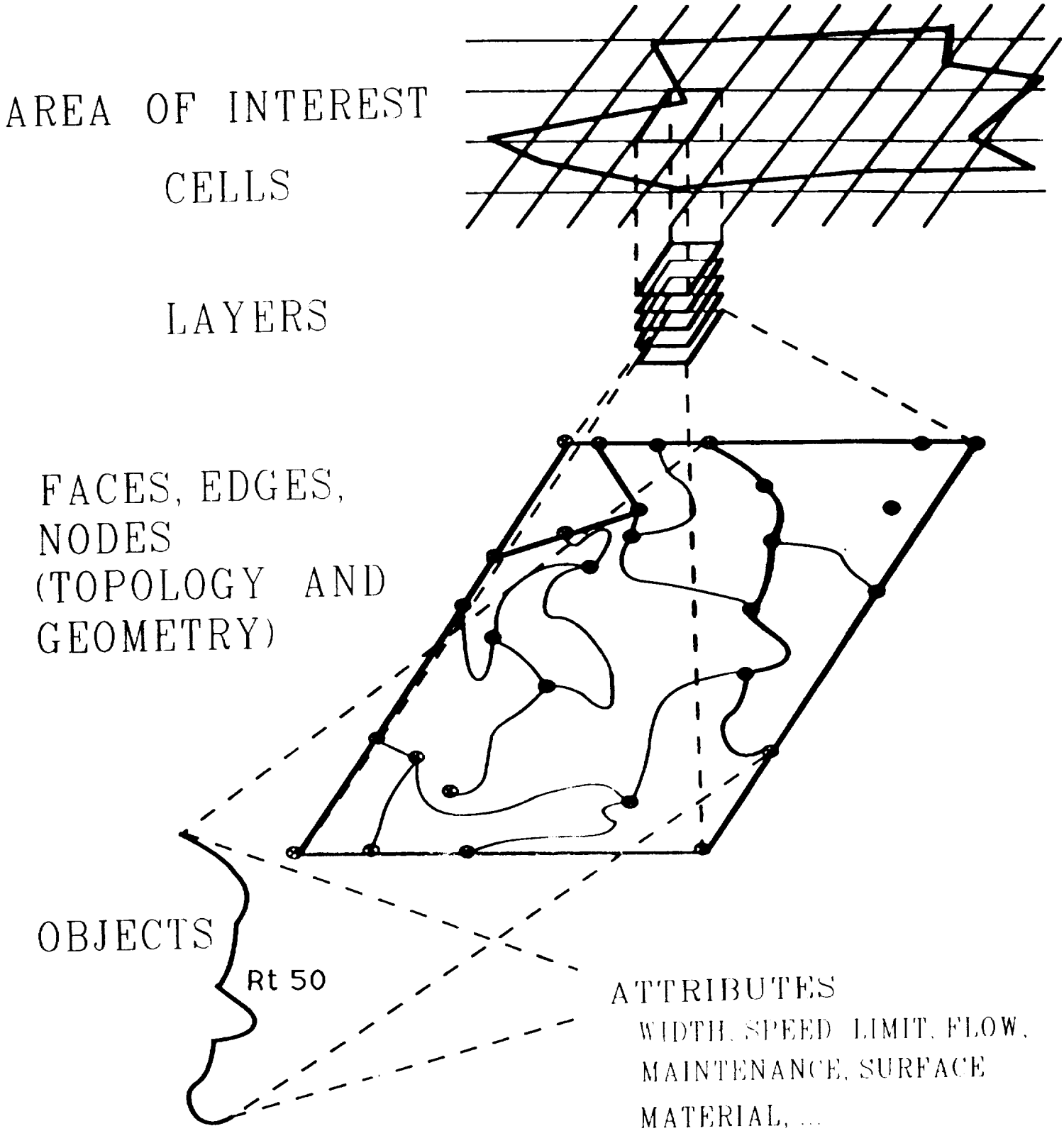
PRESENTATION:

- DATA IS PIXELS OR STROKES
- INTENDED FOR HUMAN EYE
- PRE-SYMBOLIZED, FIXED SCALE
- REQUIRES NEARLY STATIC DATA
- OFTEN LACKS DATA STRUCTURE
- MOST ANALYSIS PERFORMED BY HUMAN VISUAL CORTEX
- STRAIGHTFORWARD INDICES

INFORMATION:

- DATA HIGHLY STRUCTURED AND ENCODED
- COMPUTER ANALYSIS INTENDED
- SCALE INDEPENDENT
- ALLOWS DYNAMIC DATA
- REQUIRES SYMBOLIZATION FOR VISUALIZATION
- COMPLEX RETRIEVAL INDICES

TYPICAL GIS DATA STRUCTURE



SUMMARY

In closing I would like to impart the message that there are many future opportunities for CCDS activities that are directly linked to industry strategic objectives. In the field of mapping, remote sensing and GIS the near term opportunities may exceed all that have occurred in the past 10 years. I strongly believe that a national spatial data infrastructure must be established in this country if we are to remain a national leader in the information age. I am sure, the centers can have a profound impact on this mammoth task.

Intergraph Corporation

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Special Presentation: Remote Sensing

Dr. Jacqueline Michel
Director of Environmental Technology Division
Research Planning, Inc.

Dr. Bruce Davis
Project Manager of Technology Utilization and
Application Division
NASA Stennis Space Center

Oil Spill Environmental Sensitivity Index (ESI) Mapping Using Remote Sensing and Geographic Information System Technology

PROJECT SPONSORED BY

NASA OFFICE OF COMMERCIAL PROGRAMS

Jacqueline Michel, Ph.D.
Research Planning, Inc.

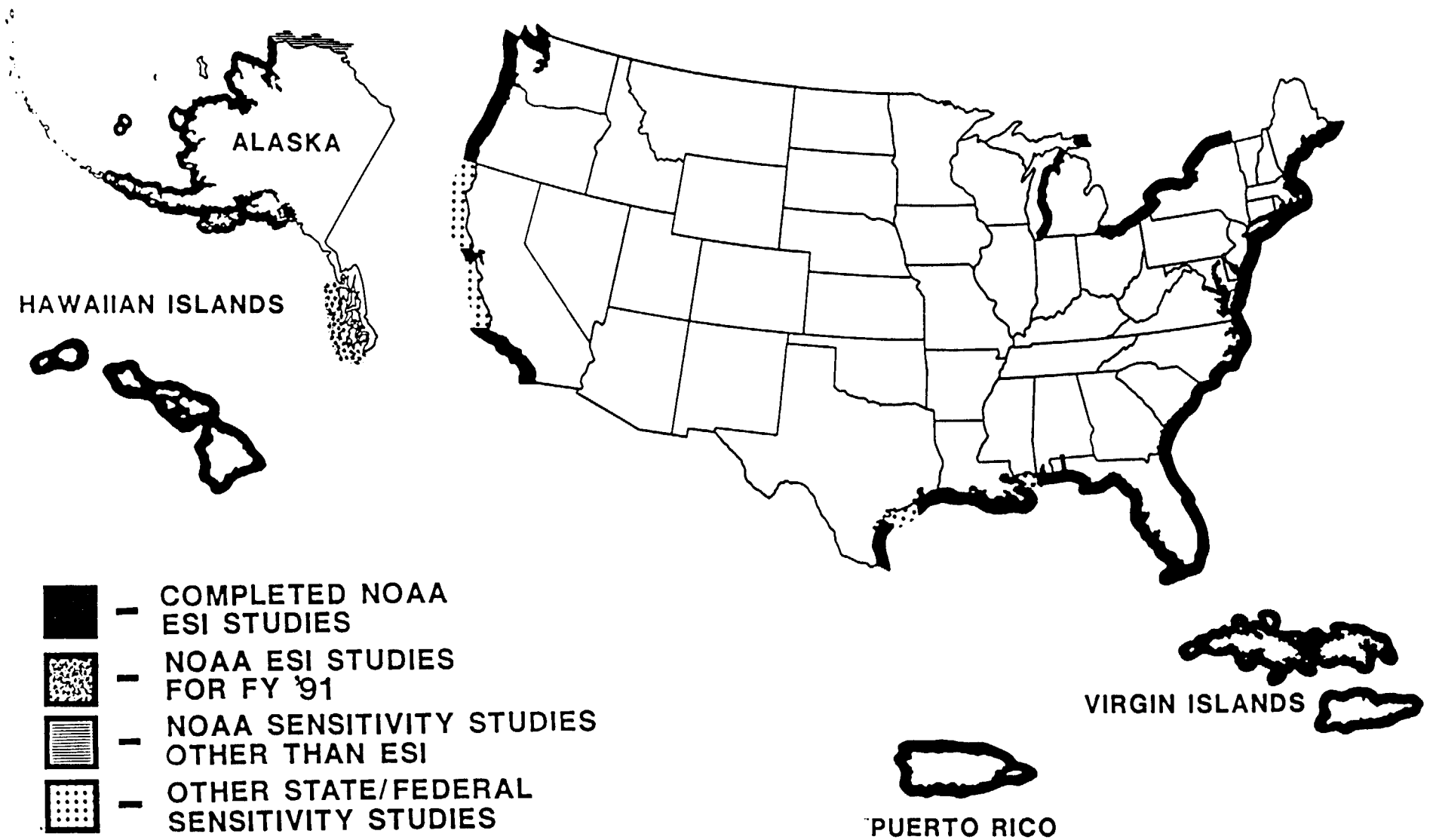
John R. Jensen, Ph.D.
University of South Carolina

Bruce A. Davis
NASA

RESEARCH PLANNING, INC.

- **Specialized environmental science company.**
- **Business Objective:** Develop a DIGITAL Environmental Sensitivity Index (ESI) database product which focuses on oil spill response, coastal zone development, and conflict management using remote sensing and geographic information system (GIS) technology.
- **Market Strategy:** Build on RPI's original ESI map client base to market the DIGITAL ESI database and expand the market for this product into other environmental applications.

STATUS OF ENVIRONMENTAL SENSITIVITY INDEX MAPPING



RESEARCH PLANNING, INC. IS WELL POSITIONED TO TAKE THE LEAD IN OIL SPILL PLANNING & RESPONSE USING THE DIGITAL ESI ATLAS PRODUCT

- Produced 41 of 45 ESI atlases totaling > $1.6 million
- Doing first full DIGITAL ESI of Southeast Alaska
- Most actual oil spill response experience

RESEARCH PLANNING, INC.
DIGITAL ENVIRONMENTAL SENSITIVITY INDEX (ESI)
MARKETING PLAN

- As a result of the *EXXON VALDEZ* (1989), *WORLD PRODIGY* (1990), and *MEGA BORG* (1990) oil spills, state and federal governments as well as private industry are demanding improved database products for planning and response. RPI's DIGITAL ESI atlases are poised to meet this demand. RPI is in a very strong position to capture at least 35% of the U.S. and 10% of the international market.

- The U.S. market is projected to be $7.5 million dollars by 1995.

- The international market is projected to be $5.0 million dollars by 1995.

- Research Planning, Inc. is attacking this market at both the national and international levels.

NATIONAL MARKETING PLAN

Existing Market:

- Automate existing ESI maps for NOAA and State governments.

Potential Market:

- Marine Spill Response Corporation (MSRC)
  - $750M for oil spill response
  - $33M for R&D
- Oil Pollution Act of 1990
  - Mandates sensitivity mapping for U.S.
- Major Oil Companies
  - All revising their contingency plans (which includes sensitivity mapping)

PERSIAN GULF SPILL

- Participated in response and analysis for the Persian Gulf Spill.
- NASA EOCAP Project was key in positioning RPI to participate more fully.
- Used remote sensing for oil spill tracking and mapping of sensitive resources.

SIGNIFICANCE OF NASA SPONSORSHIP

- **Able to demonstrate future sensor resolutions to potential clients:**

  NASA CAMS digital data (5 x 5 and 10 x 10m) and CIR aerial photography were *invaluable* for demonstrating ESI digital mapping technology using current and simulated future sensor systems.

- **High quality marketing products:**

  NASA provided high quality display of remote sensing and ESI mapping output products which were *indispensible* for marketing the technology.

- **Leverage for developing a relationship with MSRC (Marine Spill Response Corporation):**

  Using this NASA EOCAP to obtain a significant market share of the research by the MSRC.