

제품모델링과 CALS



KAIST

기계공학과

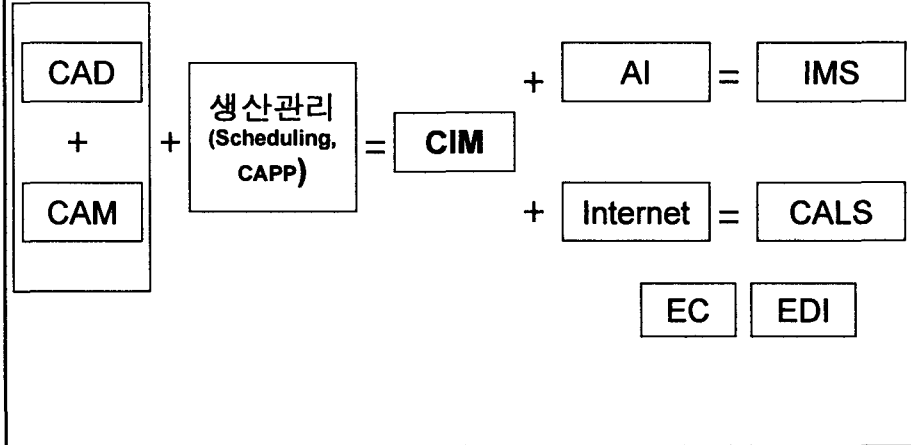
한순홍

<http://graphics.kaist.ac.kr>

CALS

- Computer Aided Logistic Support
- Continuous Acquisition and Lifecycle Support
- Commerce at Light Speed (광속의 상거래)
- 산업의 인터넷

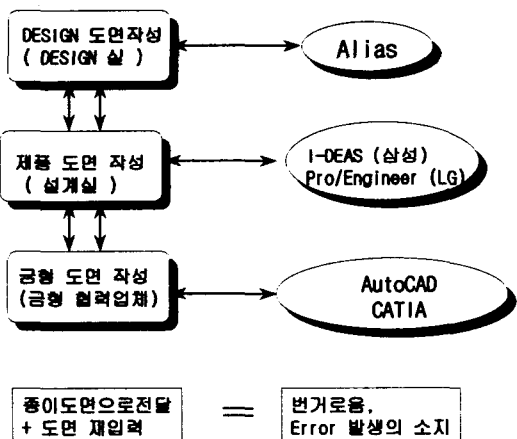
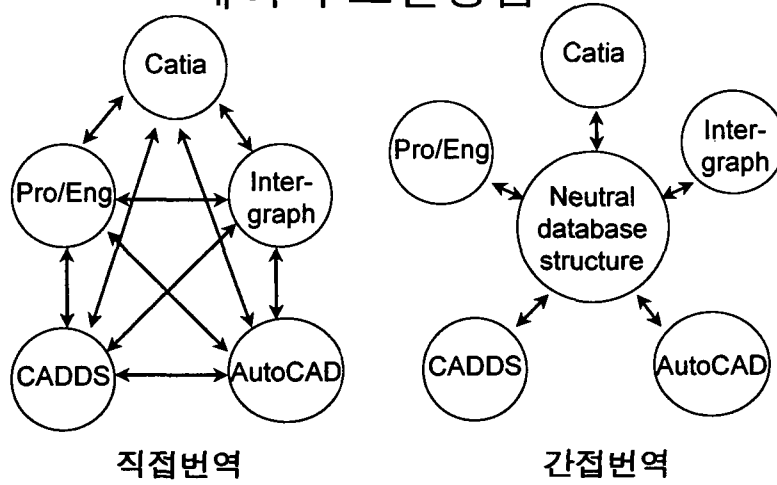
기술발전의 단계



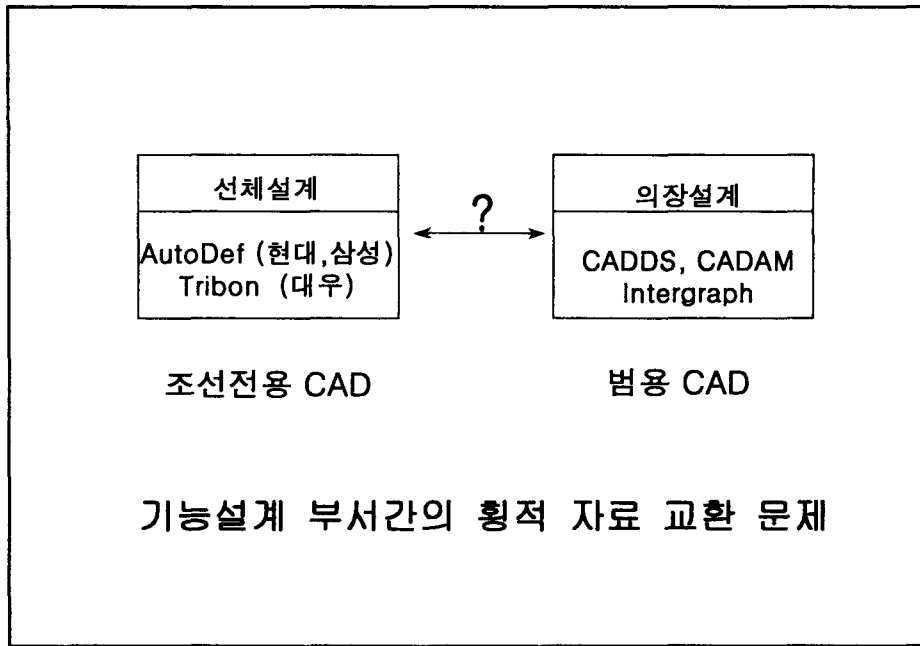
CALS 표준화의 필요성

- 독일의 자동차 산업 :
 - 110개의 서로 다른 CAD 시스템 사용
- 제품모델의 교환 문제
 - 설계단계간의 종적 자료교환 (시간축)
 - 기능설계 부서간의 횡적 자료교환 (공간축)

서로다른 자동화 시스템간의 데이터 교환방법



설계 단계간의 종적 자료 교환 문제



ISO의 HLSGC

- High Level Steering Group on CALS
- 첫번째 회의: 1996년 11월, ISO, 제네바
- 의장: H. Matre, AFNOR 프랑스

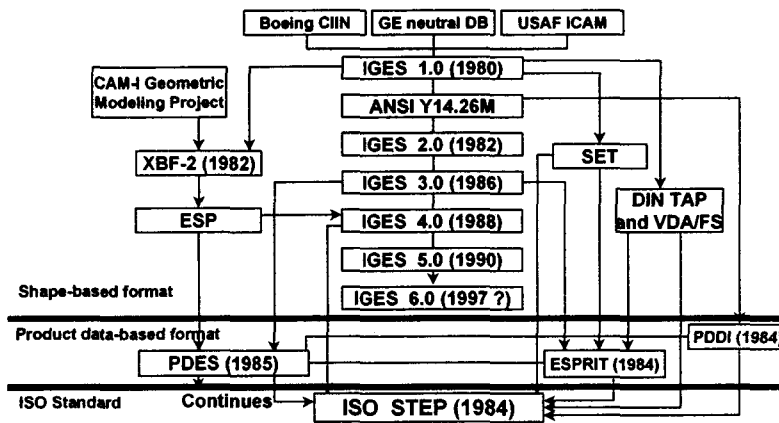
3 가지 중요한 표준

●EDIFACT

●STEP

●SGML

IGES의 변천 과정



STEP

- Standard for the Exchange of Product Model Data
- 제품모델 정보교환을 위한 국제표준
- 제품모델 (Product Model) = 형상모델 (Geometric Model) + α (기능, 속성, 접속관계, 생산 정보)
- ISO / TC184 / SC4 : Industrial Data

ISO TC184/SC4 STEP on a Page ISO 15303

APPLICATION PROFILES	
I CAD Based Drafting (96)	C * 218 Ship Shaped Frame (96)
I 1 Applicable Drafting (96)	C * 217 Ship Piping (96)
I 2 Computational Controlled Design (96)	C * 219 Ship Structures (96)
C 204 Mechanical Design Using Boundary Rep (96)	219 Dimension Inspection (Discard/Reuse)
C 206 Mechanical Design Using Surface Rep (96)	W 220 Periodical Circuit Assemblies - Stp Planning (96)
E 208 Mechanical Design Using Workframe (Intermediate)	W 221 Process Plant Fundamental Data & Its Schema Rep (96)
E 207 Sheet Metal Dsg Planning and Design (96)	W 222 Design-Intent for Composites Structures (96)
C 209 Life Cycle Product Change Process (96)	C * 223 Stp of Dgn and Stp Product Sbs for Cost Plans (96)
C 208 Compact & Mod. Struct. Asst & Retail Dgn. (96)	C 224 Mech Parts Def for P-Plg Using Maching Face (96)
C 216 Electronic Printed Ckt Assy Product Dgn (96)	C 225 Struct Ship Elements Using Explicit Shape Rep (96)
W 211 Electronic P-C Assy Test, Dsg, & Reassembly (96)	C * 226 Ship's Mechanical of Systems (96)
C 212 Electro-mechanical Design and Installation (96)	C 227 Plant Spatial Configuration (96)
B 213 Non-CAD (96) Process Plans for Mach'n Partwork	W 228 Building Blockset P/MAC (96)
C 214 Core Data for Automating Mech Dgn Processes (96)	W 229 Foundry Parts (96)
C * 215 Ship Arrangements (96)	W 230 Building Structural Frame - Worksheet (96)
	W 231 Process Engineering Data (96)
	W 232 Technical Data Packaging, Core Info. & Exchange

APPLICABLE INFORMATION RESOURCES		
I 100 Drafting	C 104 Finite Element Analysis	W Subsets
W 101 Ship Structures	I 105 Kinematics	F Subsets
I 102 CAD Data Exchange	W 106 Building Core Model	F Functionality
	W Permanent Capability	M Mechanical

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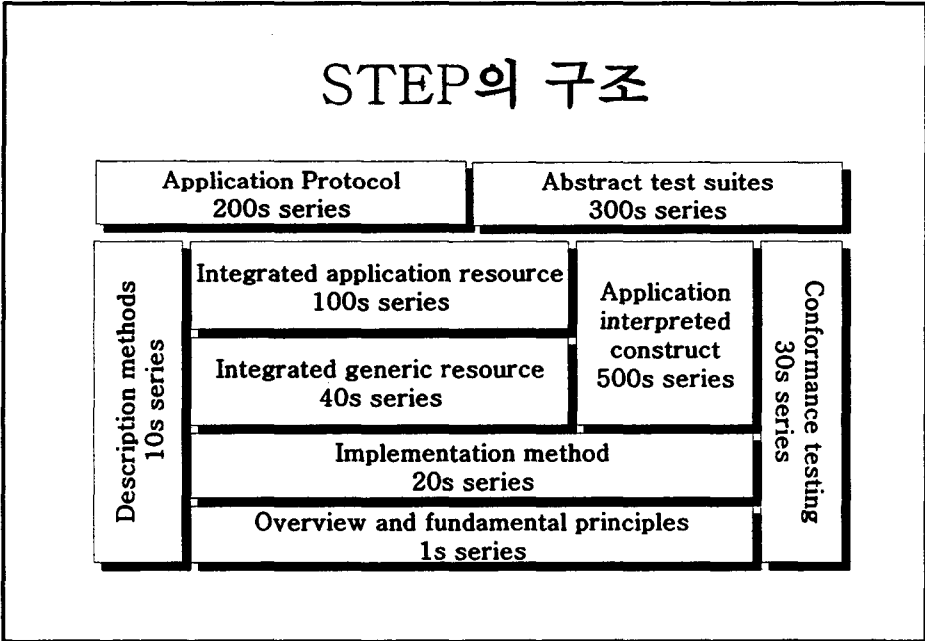
STEP RELEASE	
A Approved for Release	C Approved for Release (CD circulation - not right)
P Preliminary Release	E Enquiry (eg. CD circ. - FDS int.)
D Drafting Release	I Approved for I (CD circ. - not int. right)
W Working Draft Release	M Publication (eg. SMT Standard approved & published)

Legend Part Status
A - Preliminary Stage (Proposed - approve NP status)
P - Proposed (eg. NP Application - NP approval)
W - Preliminary (eg. Working Draft devel. - CD right)
C - CD for Comment (CD issue prior to CD right)

Legend Part Status
C - Approved for Release (CD circulation - not right)
E - Enquiry (eg. CD circ. - FDS int.)
I - Approved for I (CD circ. - not int. right)
M - Publication (eg. SMT Standard approved & published)

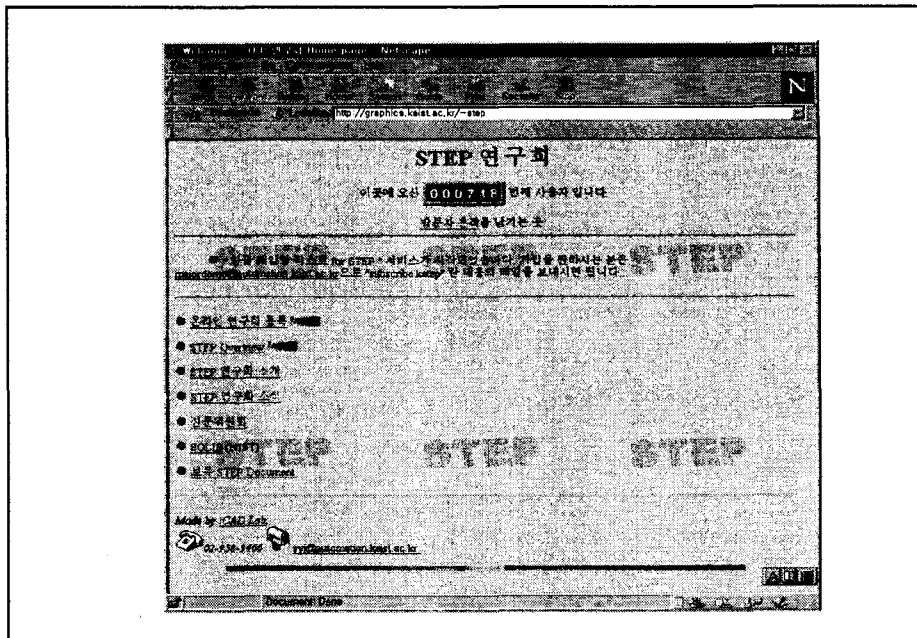
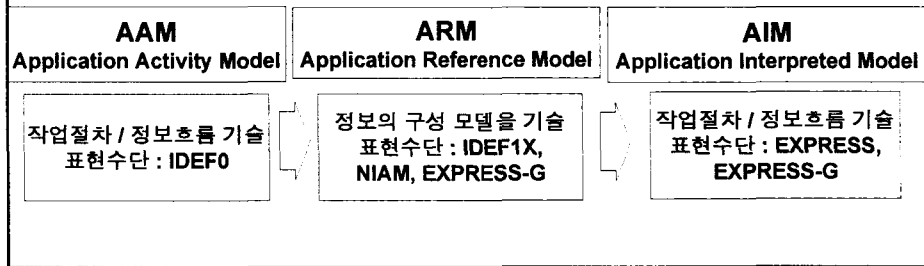
	AP201	AP202	AP203	AP214
CV / CADD5(V5.2)	X	-	X	X
Dassault / Catia(V4.1.6)	-	-	X	X
EDS/UG(V11.1)	X	X	X	X
AutoCAD(V13)	-	-	X	-
Hewlett Packard(V4.0)	-	-	X	X
Intergraph	X	X	X	X
MCS/Aries(V7.1)	-	-	X	-
Pro/Engineer(V16.0)	-	-	X	X
SDRC(V3.0)	-	-	X	X
MicroCADAM	-	X	-	-
ITI/STEPWorks	-	-	X	-
STEP Tools/ACIS	-	-	X	-

표 CAD Vendor들의 STEP 지원



응용프로토콜 (Application Protocol)

- ▲ 특정 산업 분야의 정보 표현
 - ♣ 해당 산업에 대한 정확한 분석을 통하여 정보요구 추출
 - ♣ 정보 요구를 만족시키는 적합한 공용자원 사용
- ▲ 응용프로토콜의 개발 절차와 정보 모델



STEP Mosaic

- Product Model on WWW
- Virtual manufacturing
- 3 Key technologies

- 1) Netscape, WWW
- 2) OMG CORBA (Object Management Group,
Common Object Request Broker Architecture)
- 3) STEP

가상 제조

- 스타일 디자인 전문업체
- 부품 CAD 모델 다운로드
 - 부품 공급업체 홈페이지에서
- 가상제품을 컴퓨터 상에서 조립
- 컴퓨터 화상회의 : 동시공학
- 조립도, 부품도, 상세도면, 재료명세서
- 설계변경 자동 갱신 / 통보

3차원 CAD란 무엇인가 ?

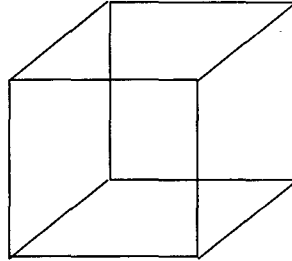
- 2차원 도면
- 3차원 와이어프레임
- 곡면 모델링
- 솔리드 모델링
- Enabling Technology
 - 기술발전이 가져온 변화

2 차원 도면

- 도면을 기반으로한 설계업무 흐름
- 정보의 중복과 일관성 부재
- 도면관리 문제
- 설계변경 관리

3 차원 Wireframe

- 속도 / 성능
- 해석상의 모호성



곡면 모델링

- 공구경로 생성
 - Tool Path
- NURBS
 - Non-Uniform Rational B-Spline
- 안/밖의 구분

솔리드 모델링

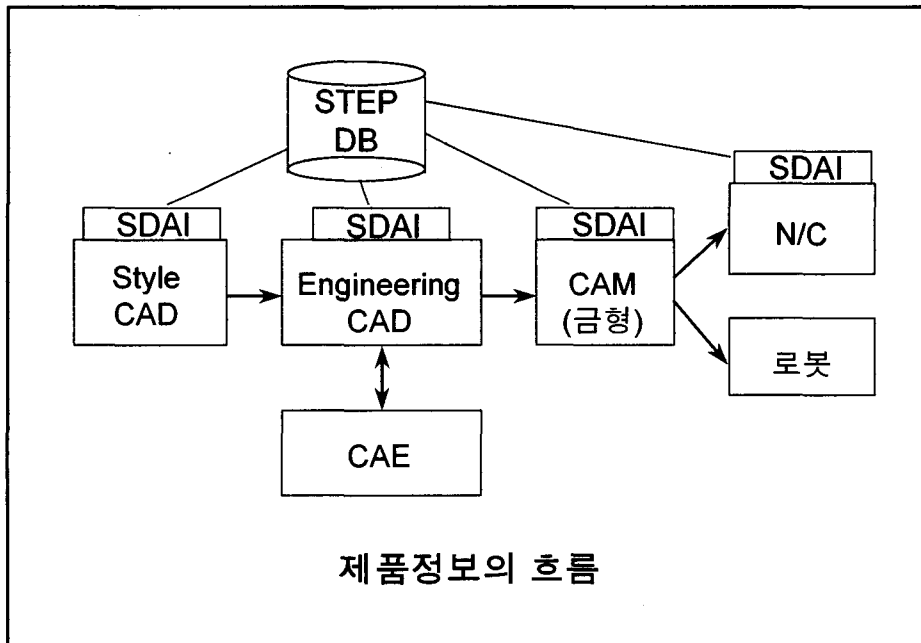
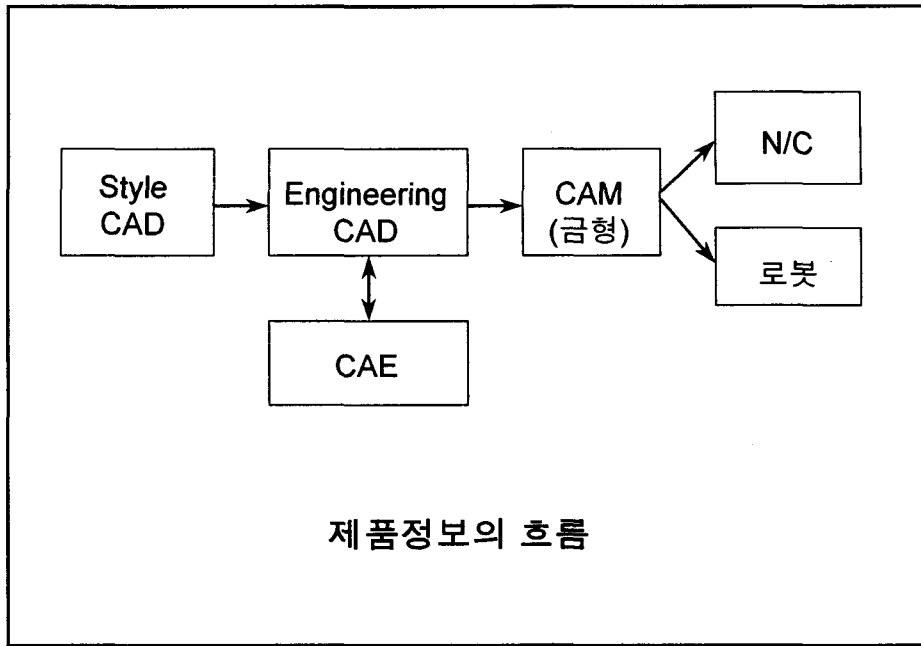
- 위상기하 (Topology)
- Geometry와 Topology의 분리

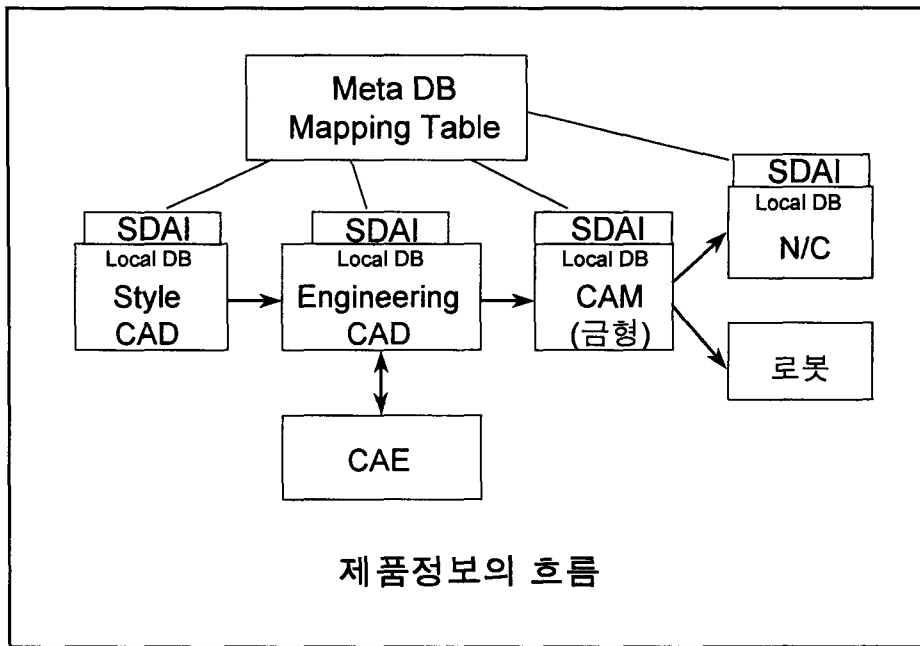
- 간섭 확인
- 조립성 : 장착성, 탈착성
- 메쉬 생성

외국의 사례

- Boeing 777 Digital Mockup
- Virtual Manufacturing

- www.nist.gov : Net-CAD
- www.niip.org : ECRC
 - SNSPs : supplier network service points
- www.scra.org : RAMP
- www.pdes.org : IGES, STEP





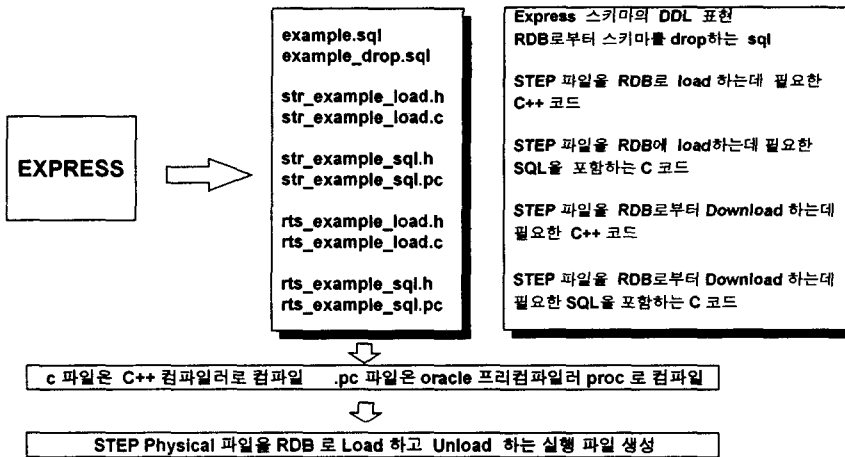
JAVA-based DB access

- CGI-based DB access의 단점 ;
- HTTP server가 병목현상
- Batch mode로만 작동 : 속도저하
- single-query만 처리 가능
- 복잡한 session-oriented query는 불가
- 보안문제 (security)
- 그래픽 기능

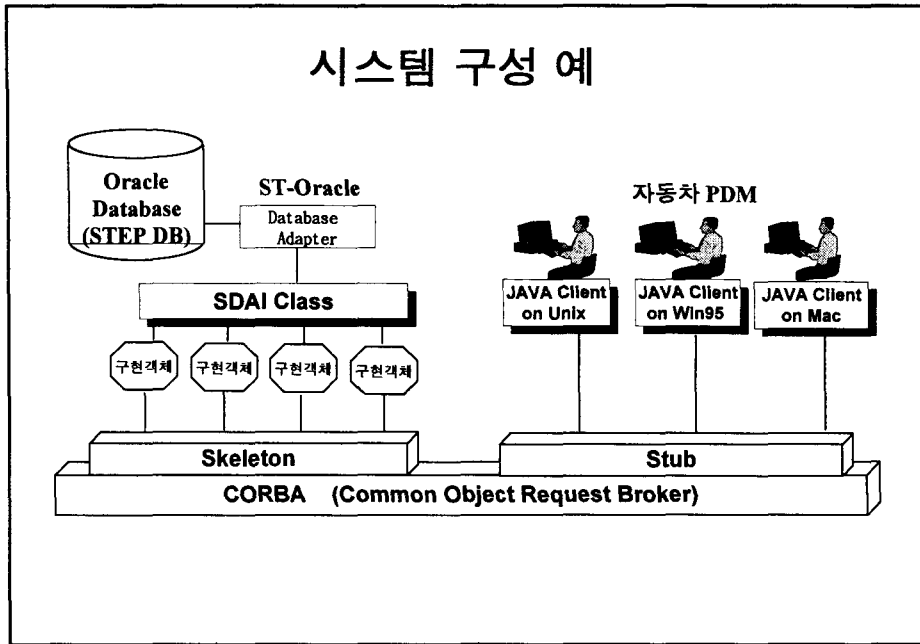
CORBA

- common object request broker architecture by OMG
- DOC (distributed object computing)
- socket level programming을 면제
- CORBA의 JAVA 버전

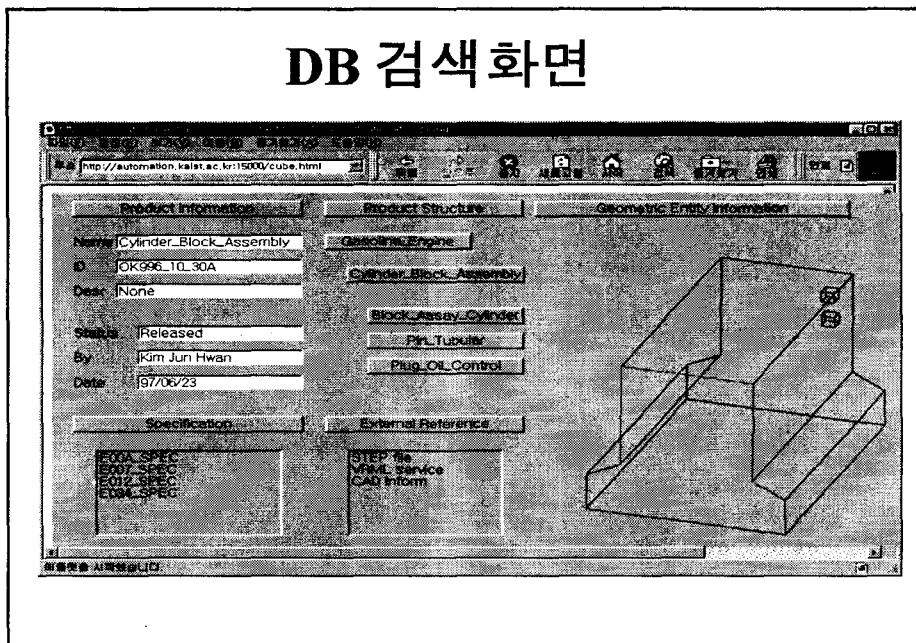
STEP 파일의 RDB로의 Load 와 Unload



시스템 구성 예



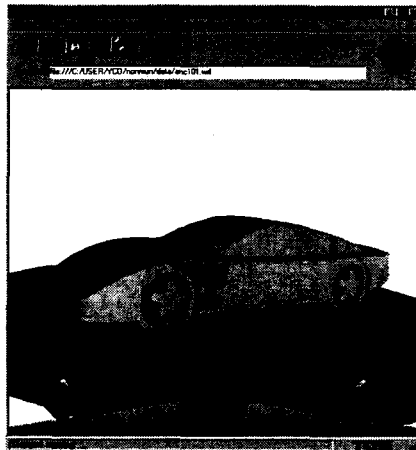
DB 검색 화면



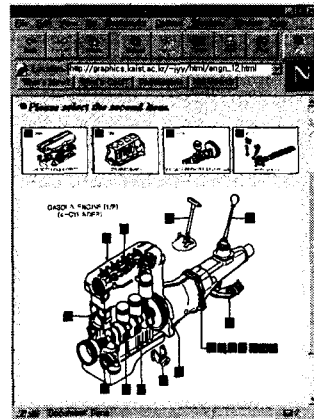
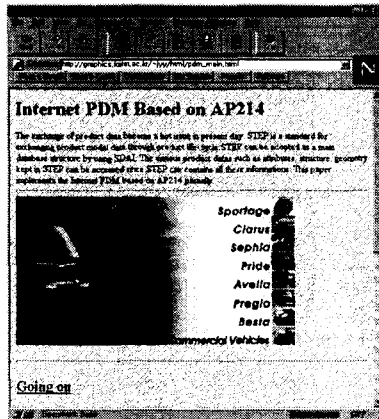
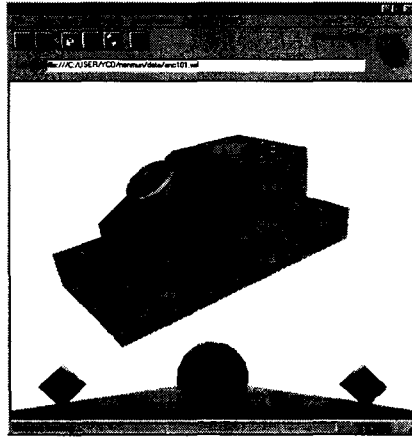
VRML

- Virtual Reality Modeling Language
- Scene description language
 - not programming language
- History
 - SIGGRAPH, July 1994
 - Version 1.0 Specification, May 1995
 - Version 2.0 Specification, August 1996
- Navigation and hyperlink

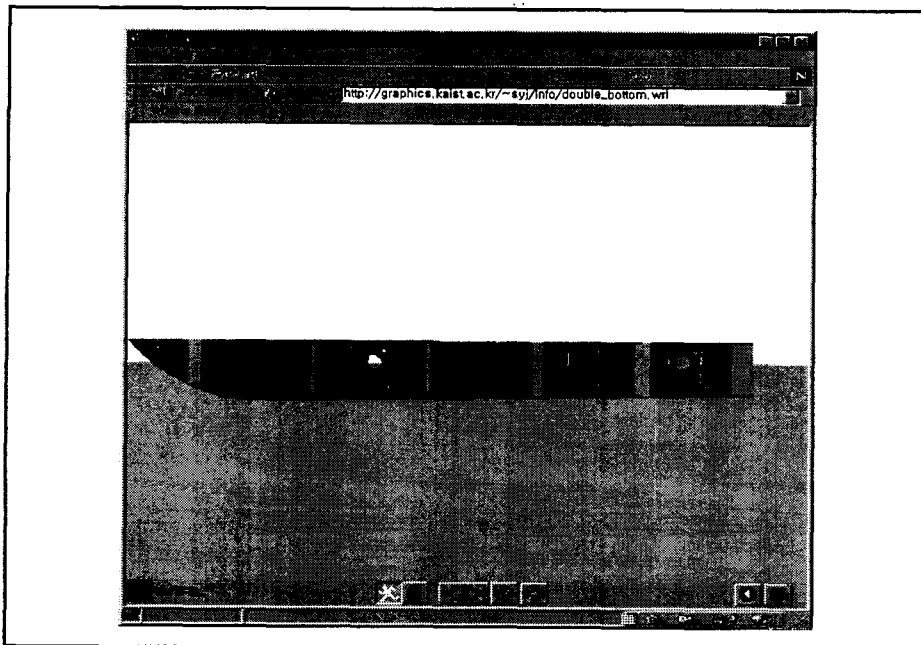
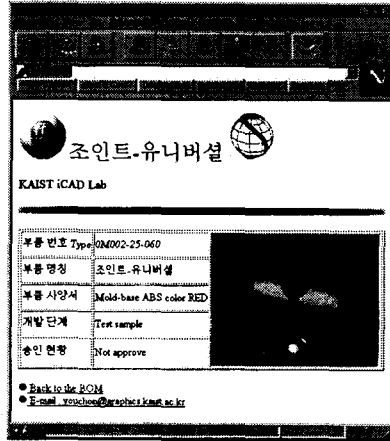
곡면모델의 가시화

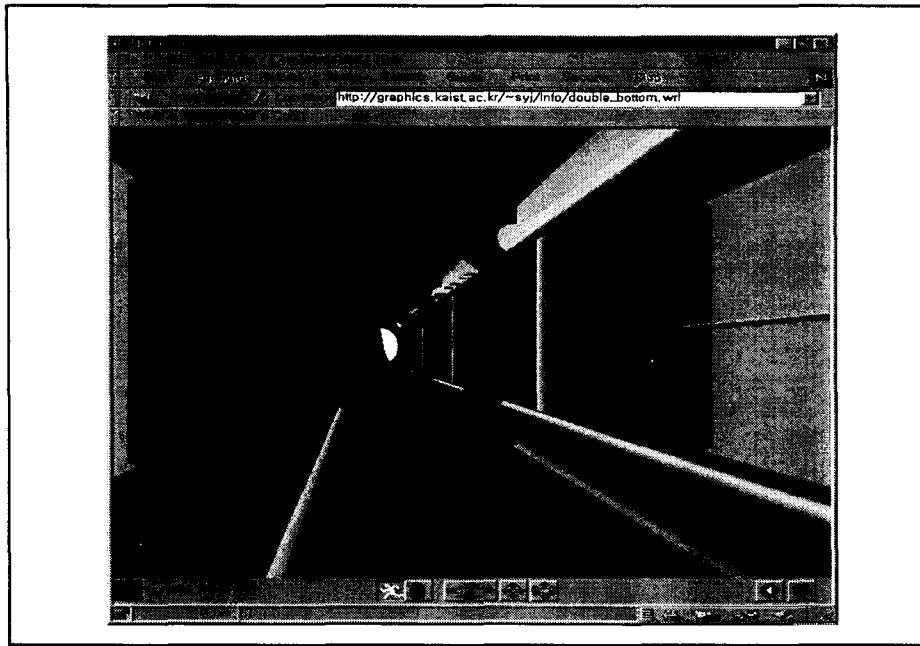


솔리드모델의 가시화



BOM과 형상정보의 동시 표현





기술 추세

- 인터넷
 - 고급정보인 설계정보를 더 넓게/빨리/싸게 공유
- 표준 (IGES, STEP, CALS)
 - 해외 합작선, 해외 거래선, 외주업체
- 지능형
- 저가 보급형: PC CAD
- VR (인공현실감)
 - 시뮬레이션, 애니메이션