

STEP AP214

Core Data for Automotive Design and Processes

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AP214 개요

정식 명칭 : Core Data for Automotive Design and Processes

파트 번호 : ISO 10303-214

제안 시기 : 1992년 STEP 시애틀 회의 (독일에 의하여 제안)

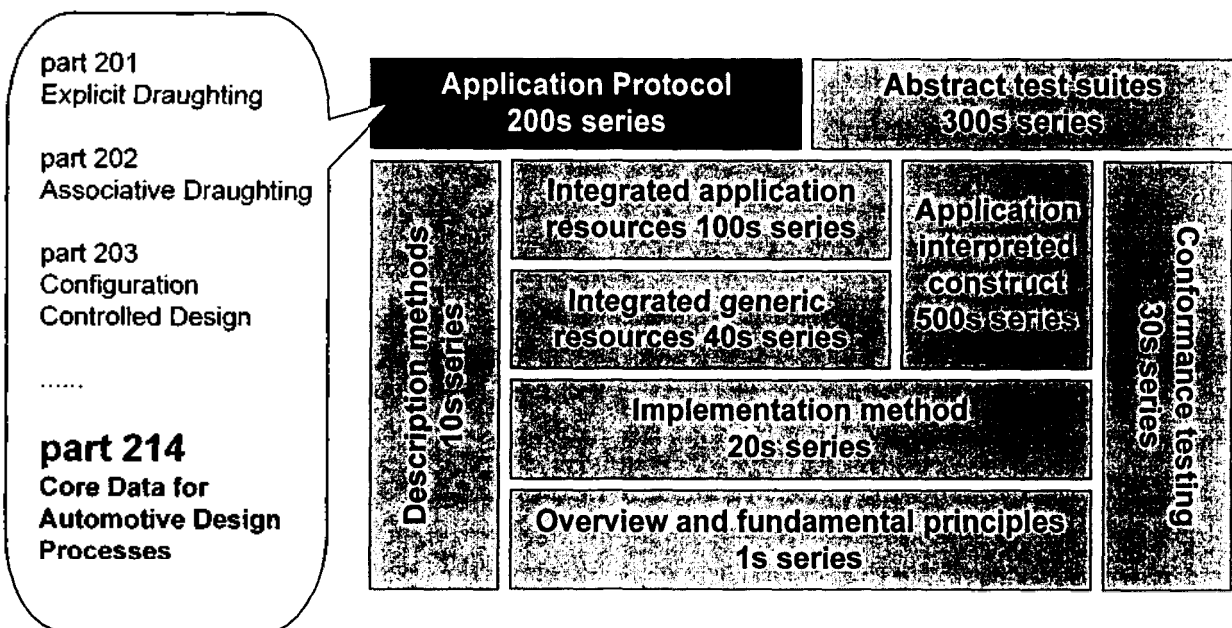
대상 내용 : 자동차의 기획 단계로부터 스타일링, 설계, 실험, 공정 계획, 툴 설계 및 제작, 품질 검사에 이르는 수명 전 주기상에 발생하는 제품 관련 정보

현 상태 : CD (Committee Draft)
DIS (Draft International Standard) 표결 진행중

AP214 제정 참여 멤버

독일	VDA	Daimler-Benz / Mercedes Benz Opel	VW / AUDI	BMW
일본	JAMA	Mitsubishi Nissan Motors / Nissan Diesel Toyota		Honda Mazda
스웨덴	Odette-SWE	Scania	Volvo	
프랑스	GALIA	Peugeot / Citroen		Renault
미국	AIAG	General Motors Chrysler	Ford	

STEP에서의 위치



AP214 정의에 사용된 10303 Part들

Overview

- 1 Overview and fundamental and exchange : application, AAM, AIM,

Description Method

- 11 The EXPRESS language reference manual

Implementation method

- 21 Clear text encoding of the exchange structure
- 22 Standard data access interface

Conformance testing methodology and framework

- 31 General concepts : preprocessor, postprocessor

AP214 정의에 사용된 10303 Part들

Integrated generic resource

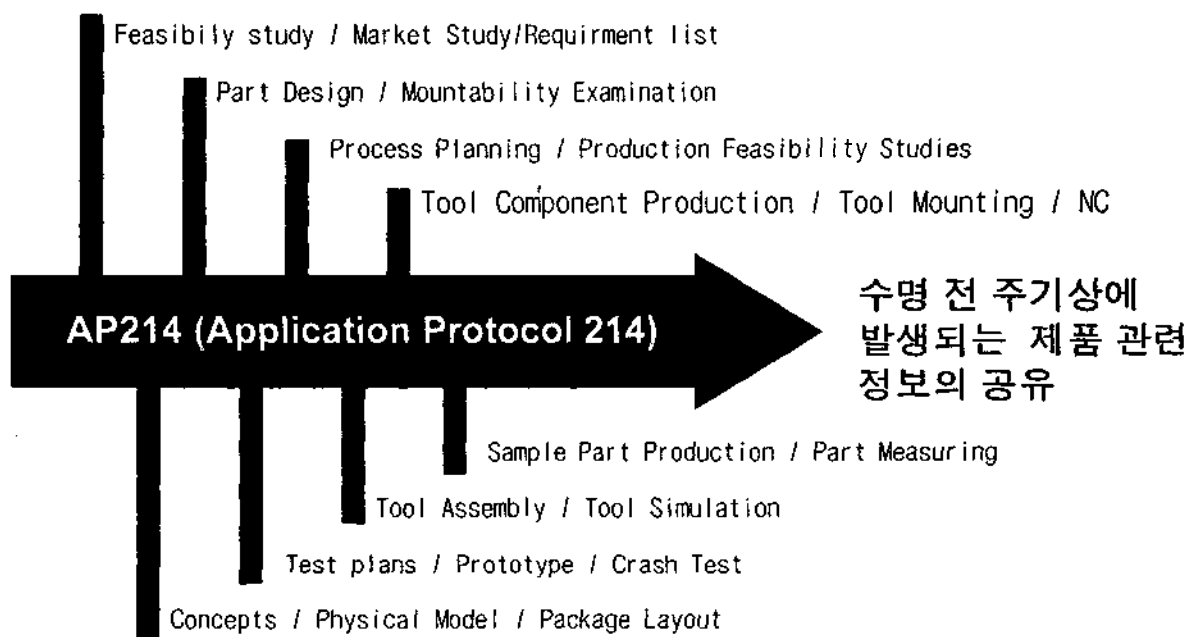
- 41 Fundamentals of product description and support
- 42 Geometric and topological representation :
arcwise connected, bounds, boundary, B-rep, , surface, set
- 43 Representation structures
- 44 Product structure configuration : bill-of-material structure (BOM), , lot
- 45 Materials : material, material property
- 46 Visual representation : annotation, layer, picture, , symbol, visualization
- 47 Shape variation tolerances : form tolerance, , toleranced feature
- 49 Process structure and properties
- 101 Draughting
- 105 Kinematics : base, frame, joint, link, , pair, , placement
- 201 Explicit draughting
- 202 Associative draughting : application interpreted construct (AIC),
externally defined, predefined

AP214 정의에 사용된 10303 Part들

Application interpreted construct (AIC)

501	Edge-based wireframe
503	Geometrically bounded 2d wireframe
504	Draughting annotation
506	Draughting elements
507	Geometrically bounded wireframe
508	Non-manifold surface
509	Manifold surface
510	Geometrically bounded wireframe
511	Topologically bounded surface
512	Faceted boundary representation
514	Advanced boundary representation
515	Constructive solid geometry
517	Mechanical design geometric presentation
515	Constructive solid geometry
517	Mechanical design geometric presentation

정보 처리 범위

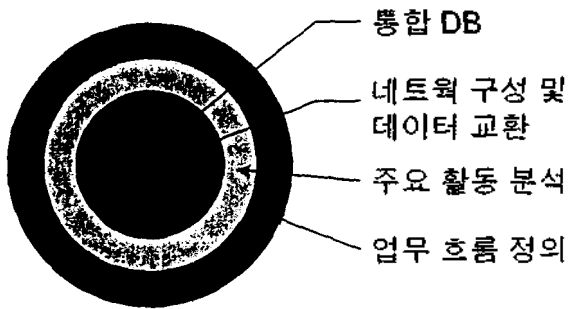


AP214의 활용 초점

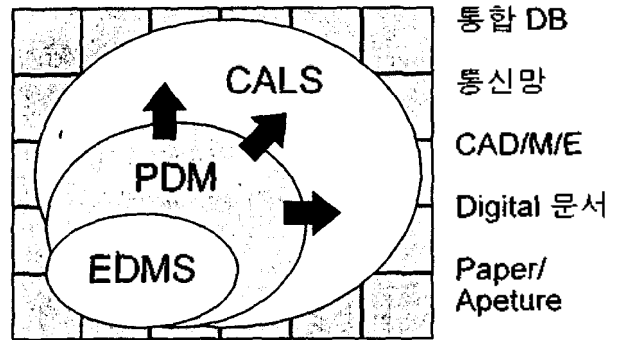
자동차 산업에서의 종합 정보 체계(Extended PDM) 구축 기반

시스템 전개를 위한 기능 보유

CALS 표준 : 안정적인 시스템 보장



정보 시스템 전개 4단계



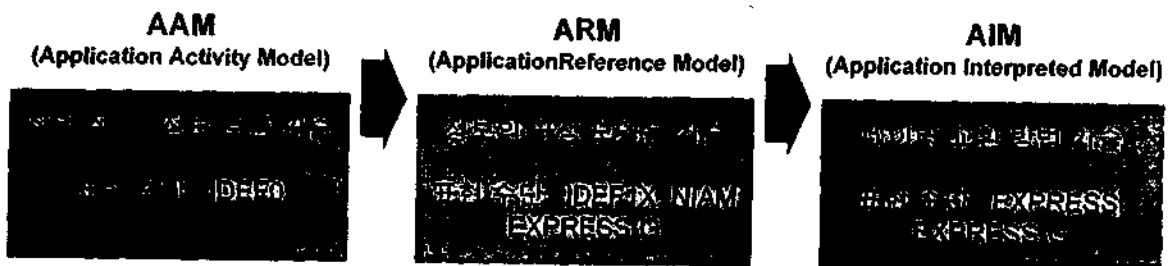
과 부서 기업 계열 국내 국제

Application Protocol 개발 절차

응용 프로토콜

- 특정 산업 분야의 정보 표현
- 해당 산업에 대한 정확한 분석을 통하여 정보 요구 추출
- 정보 요구를 만족시키는 적합한 공용자원 사용

응용 프로토콜의 개발 절차와 정보 모델

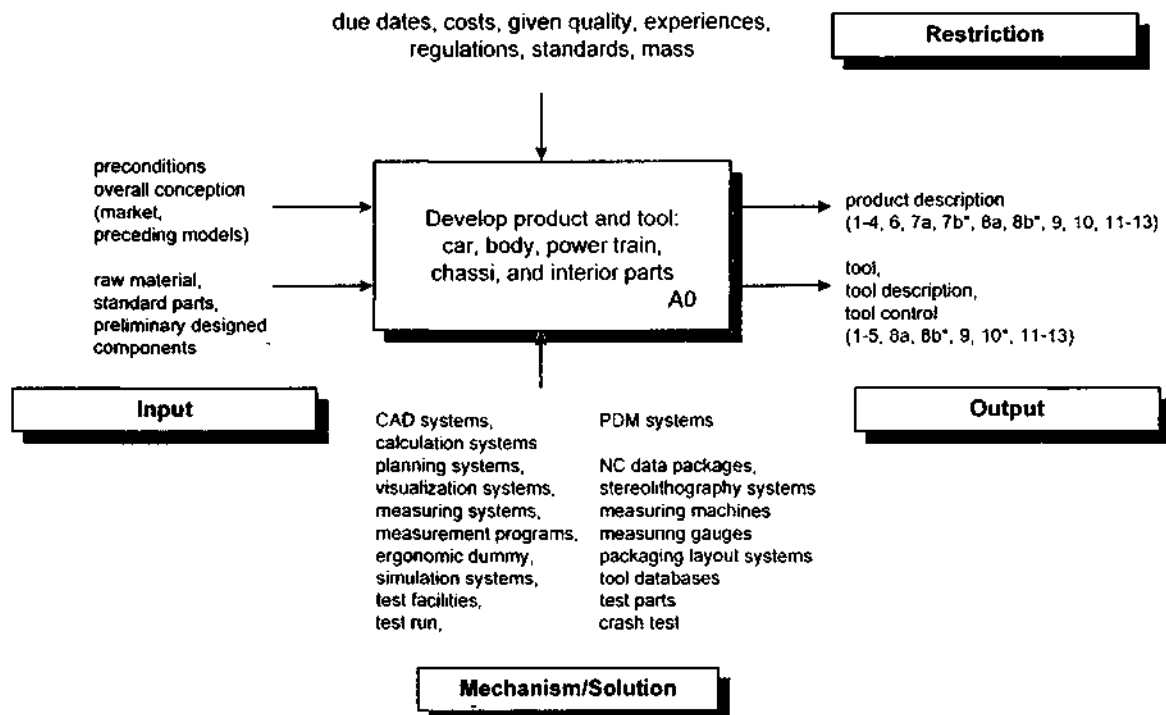


AAM Data Classes

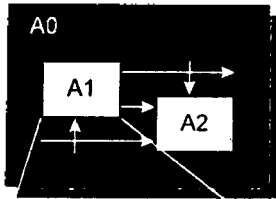
* F.S : Full Support, R.O:Reference Only, O.S:Out of Scope

1	o			Drawing data : dimensions, views, layout, etc	D1, D2, P1, P2
2	o			Wireframe data : points, polygons, conics, curves, etc.	G1, G2
3	o			Surface Data : Unbounded and Bounded surfaces planes, open shells, etc	G3, G8
4	o			Solid Data : B-Rep, CSG, etc	G4, G5, G7
5		o		Process Control Data : NC-data, RC-data, MC-data, etc.	E1
6	o			Visualization data : Color, Linestyle, Point style, etc.	P1 - P3
7a	o			Simulation data :	K1
7b			o	Other Simulation data	-
8a	o			Compound model and Analysis data	G6
8b			o	Compound representation FEA data	-
9	o			Form feature data : general feature, solid features, panel features, transition features, compound features, patterns	FF1 - FF3
10			o	Parametric design data	-
11	o			Material, Surface conditions, and Tolerance data	PR1,C1,T1,T2
12	o			Product structure and Management data : Version and release management, Work Management, Assembly Structure, Fastening information, Process Operation, Process Plan, Specification Control, etc	S1 - S8
13				Compound documents : requirements, feasibility studies, etc	E1
14a	o			Scan data	MD1
14b			o	Other Measured data	-

AAM Diagram of node A-0 : Core data for automotive mechanical Design processes



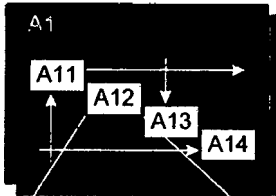
AAM Diagram Navigation



A0 : Develop product and Tool (Car body, P/T,)

A1 : Develop product

A2 : Develop Tool

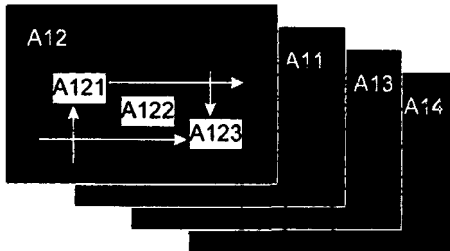
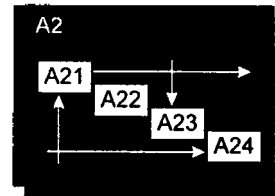


A11 : Define Product

A12 : Style Product

A13 : Design Product

A14 : Evaluate Product

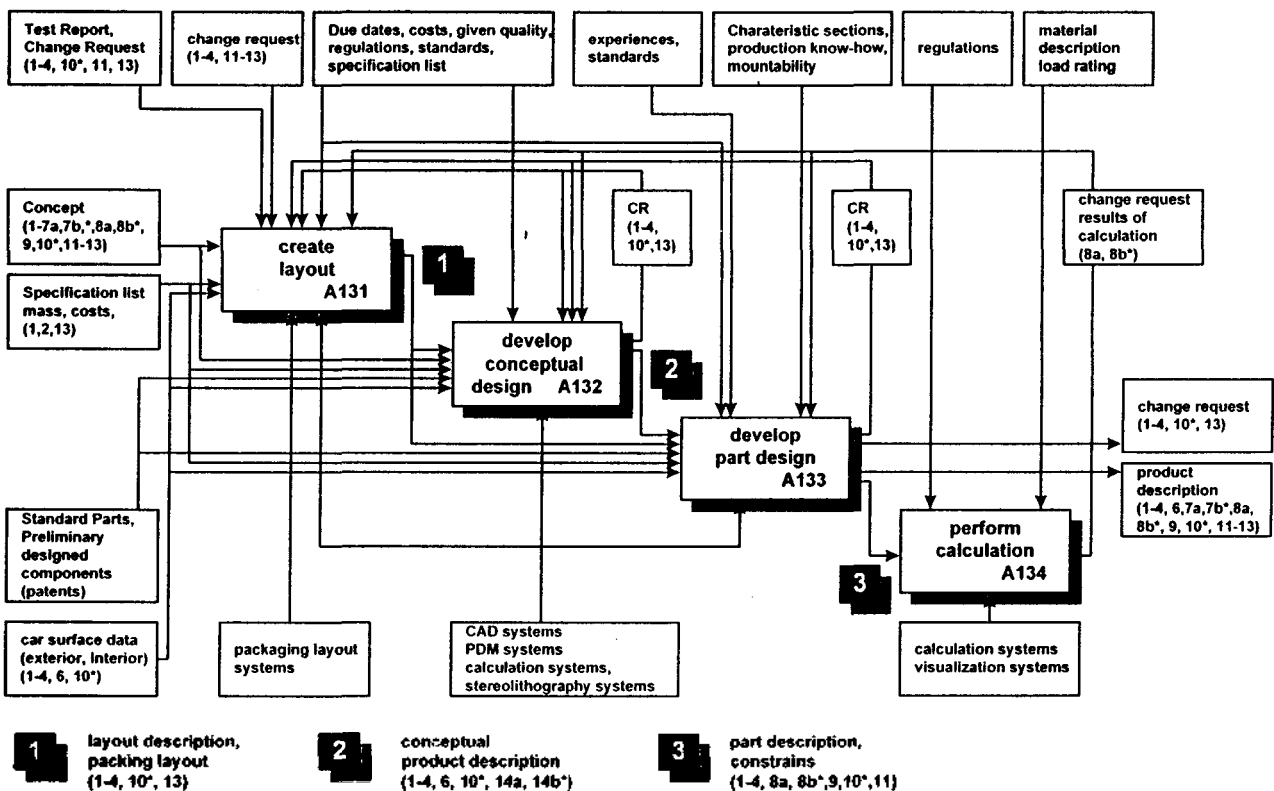


A121 : Develop Concept

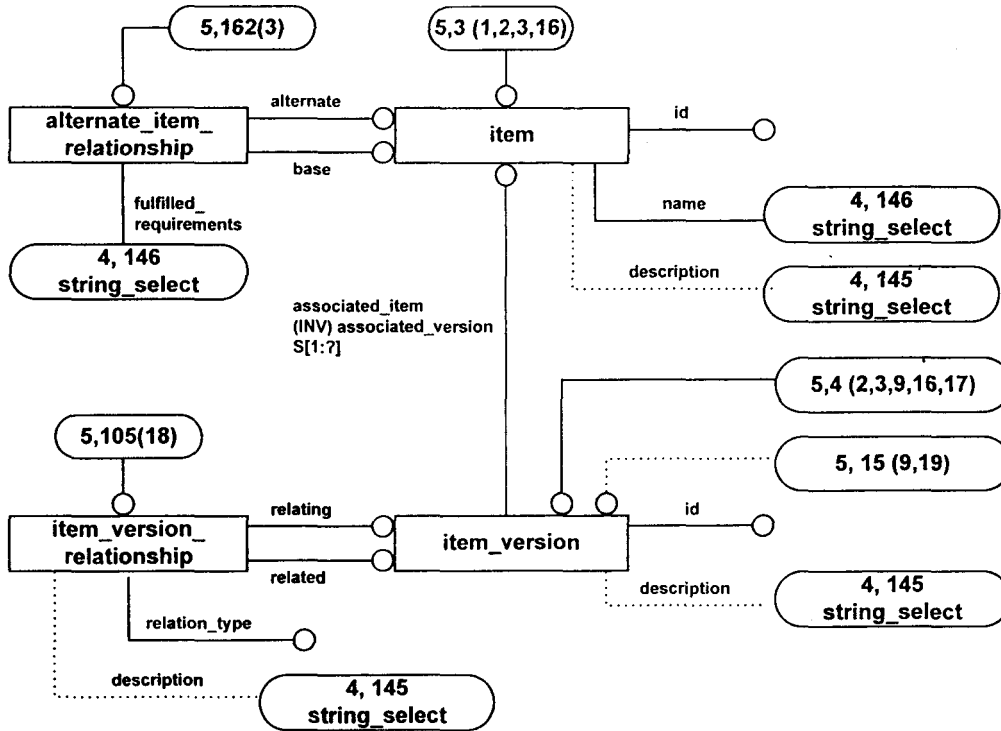
A122 : Create Physical Model

A123 : Style Shape (Exterior and Interior)

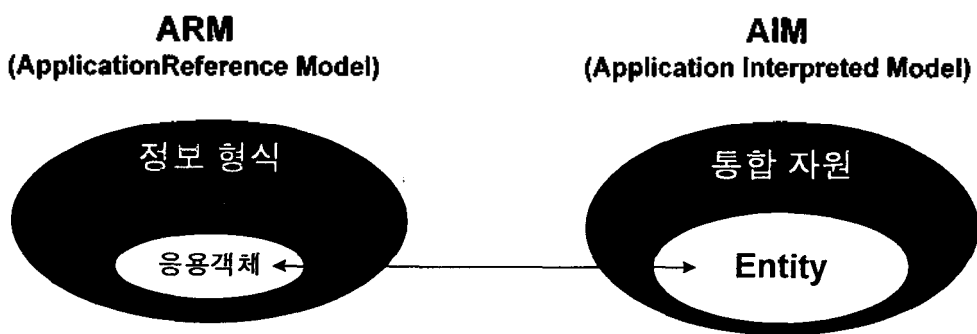
AAM Diagram of Node A13 : Design product



ARM Diagram in EXPRESS-G (Item 에 관련된 일부)



ARM과 AIM간의 Mapping



Application Object (응용 객체)

- 응용 분야의 모든 정보를 표현하는 최소 단위
- 통합 자원의 적합한 요소들에 Mapping (사상) 되어있음

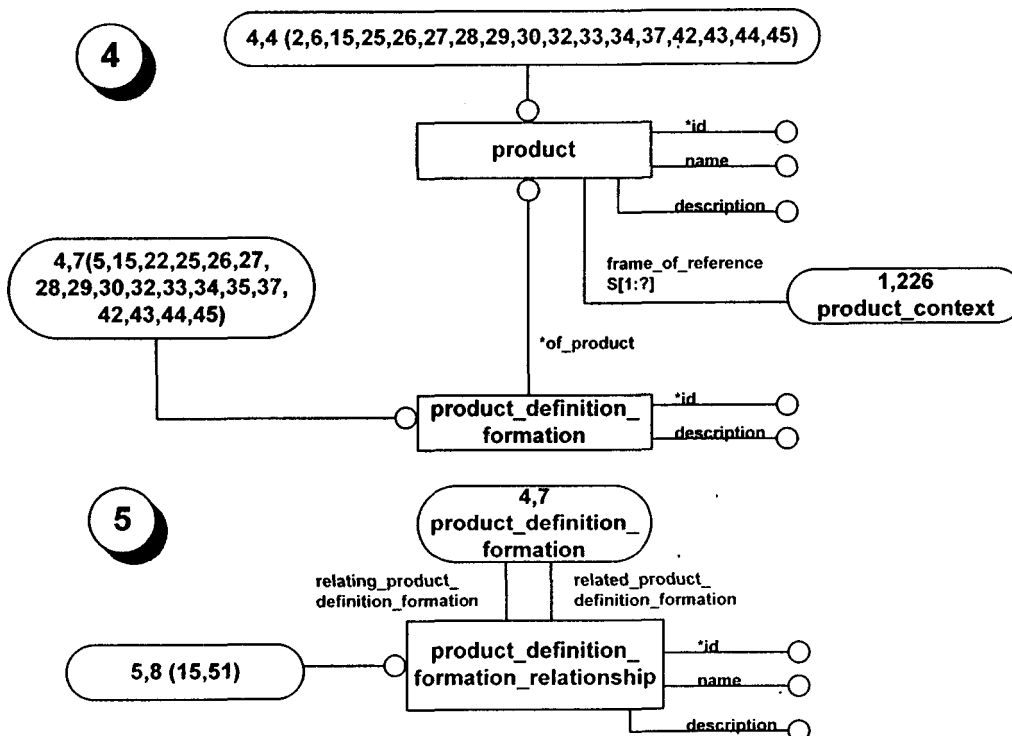
AIM Entity

- 응용 프로그램에서 활용되는 단위
- EXPRESS에 의해 기술되는 엔티티
- 제약 조건등이 부여되어 응용객체의 요건을 만족

AP214에서의 Mapping Example

Application Elements	AIM Element	State/Ref
ITEM ITEM_VERSION	product product_definition_formation	41
B_SPLINE_CURVE LINE PLANE EDGE_TRANSITION	b_spline_curve line plane shape_aspect_relationship	503 503 512 214

AIM Diagram in EXPRESS-G (product에 관련된 일부)



AP214 에서 다루는 정보 단위들 (Unit of Functionality)

Product Structure

- o product_management_data
- o element_structure
- o item_definition_structure
- o effectivity
- o work_management
- o classification
- o specification_control
- o process_plan

Presentation

- o geometric_presentation
- o annotated_presentation
- o shaded_presentation

Product Properties

- o item_property

Geometry/Topology

- o wire_frame_model_2D
- o wireframe_model_3D
- o connected_surface_model
- o faceted_b_rep_model
- o b_rep_model
- o compound_model
- o csg_model
- o geometrically_bounded_surface_model

Draughting

- o explicit_draughting
- o associative_annotation

Tolerance

- o dimension_tolerances
- o geometric_tolerances

Measured data

- o measured_data

Form Feature

- o user_defined_feature
- o included_feature
- o generative_feature_shape

Surface Condition

- o surface_conditions

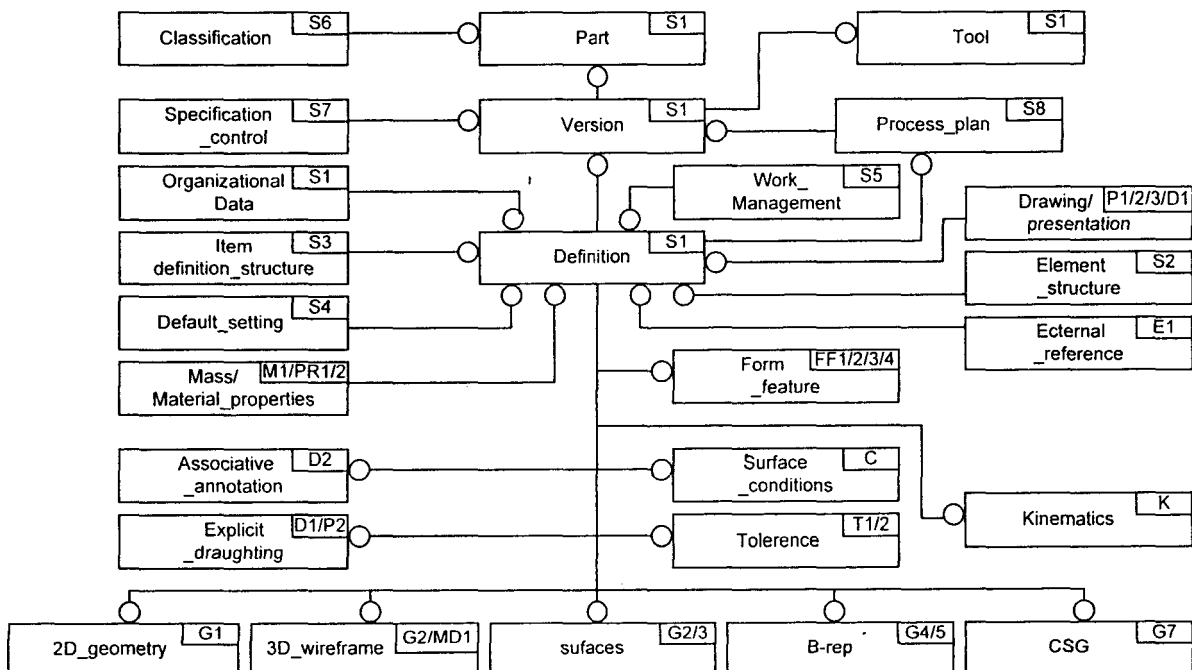
Kinematics

- o kinematics

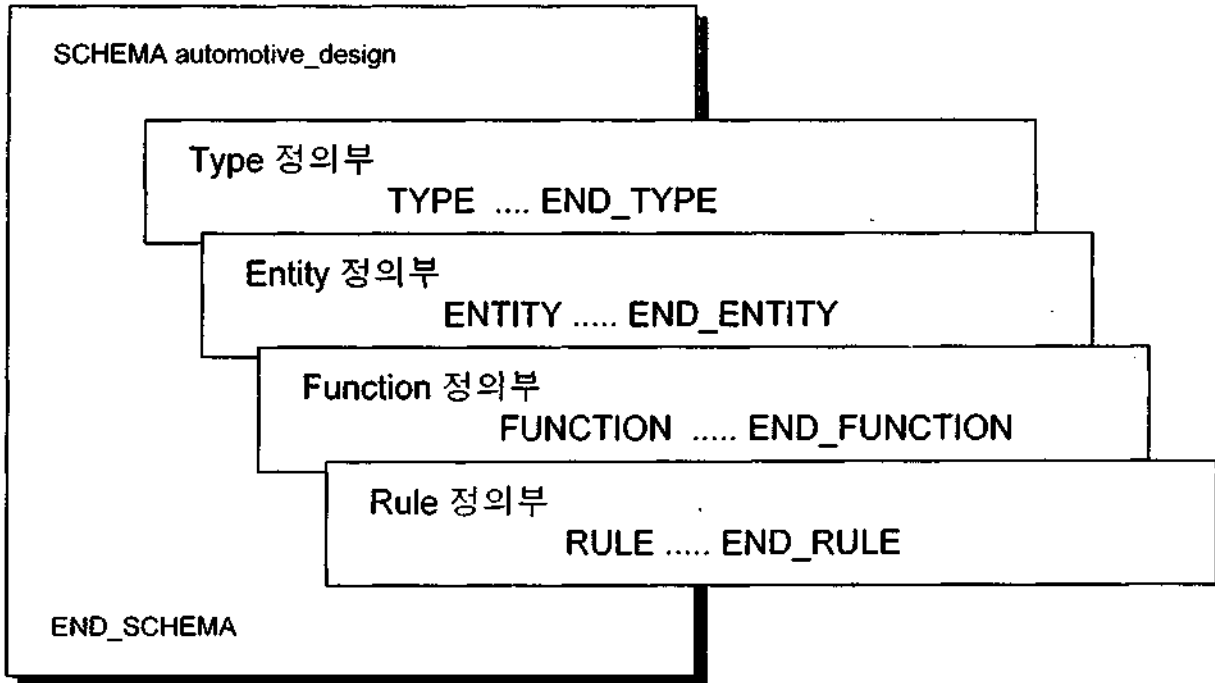
External Reference

- o external_reference_mechanism

AP214 EXPRESS-G Model with UoFs



EXPRESS에 의한 AP214 Schema 정의



EXPRESS에 의한 Entity 정의

```

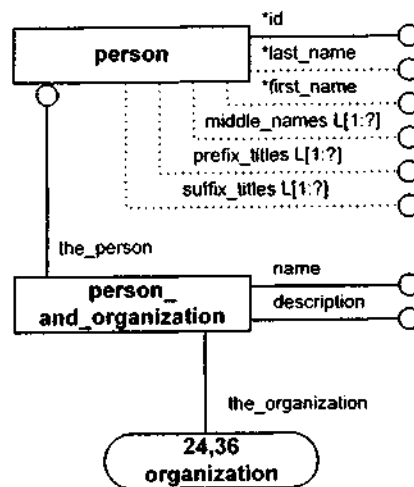
ENTITY person;
id : identification;
last_name : OPTIONAL label;
first_name : OPTIONAL label;
middle_name : OPTIONAL LIST[1:?] OF label;
prefix_titles : OPTIONAL LIST[1:?] OF label;
suffix_titles : OPTIONAL LIST[1:?] OF label;
WHERE
  wr1 : EXISTS(last_name) OR EXISTS(first_name);
END_ENTITY;

```

```

ENTITY person_and_organization;
name : label;
description : text;
the_person : person;
the_organization : organization;
END_ENTITY;

```



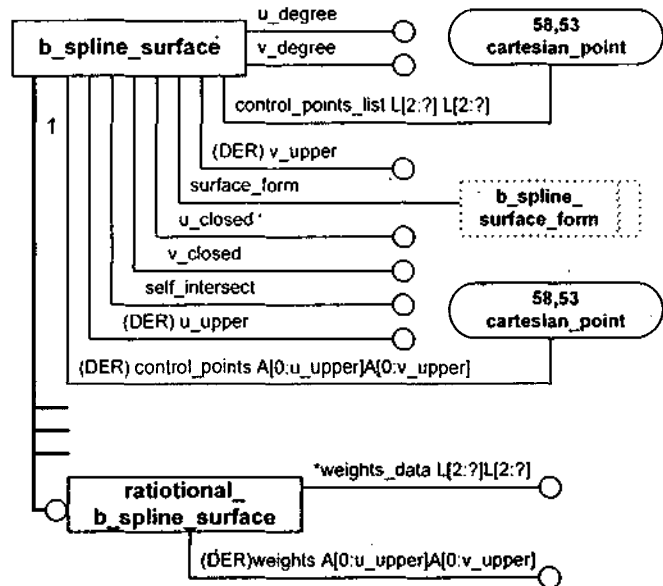
EXPRESS에 의한 Entity 정의

```

ENTITY b_spline_surface
  SUPERTYPE OF (ONEOF
    (b_spline_surface_with_knots, ...,
     rational_b_spline_surface)
  SUBTYPE OF (bounded_surface)
  u_degree : INTEGER;
  v_degree : INTEGER;
  control_points_list : LIST[2:?] OF .....
  surface_form : b_spline_surface_form;
  u_closed : LOGICAL;
  .....
  DERIVE
    u_upper : INTEGER :
      = SIZEOF(control_points_list) - 1;
  ....
END_ENTITY

ENTITY rational_b_spline_surface
  SUBTYPE OF (b_spline_surface);
  weights_data : LIST[2:?] OF REAL
  DERIVE ...
END_ENTITY

```



EXPRESS에 의한 TYPE, FUNCTION, RULE의 정의

• TYPE 정의

```

TYPE csg_primitive = SELECT
  (sphere, block, right_angular_wedge, torus,
   right_circular_cone, right_circular_cylinder);
ENDTYPE

```

• RULE 정의

```

RULE product_requires_version FOR (product);
  WHERE
    wr1 : SIZEOF(QUERY(p <* product |
      SIZEOF(USEDIN
        (p, 'AUTOMOTIVE_DESIGN.' +
         'PRODUCT_DEFINITION_FORMATION.
          OF_PRODUCT')) < 1)) = 0;
  ENDRULE

```

• FUNCTION 정의

```

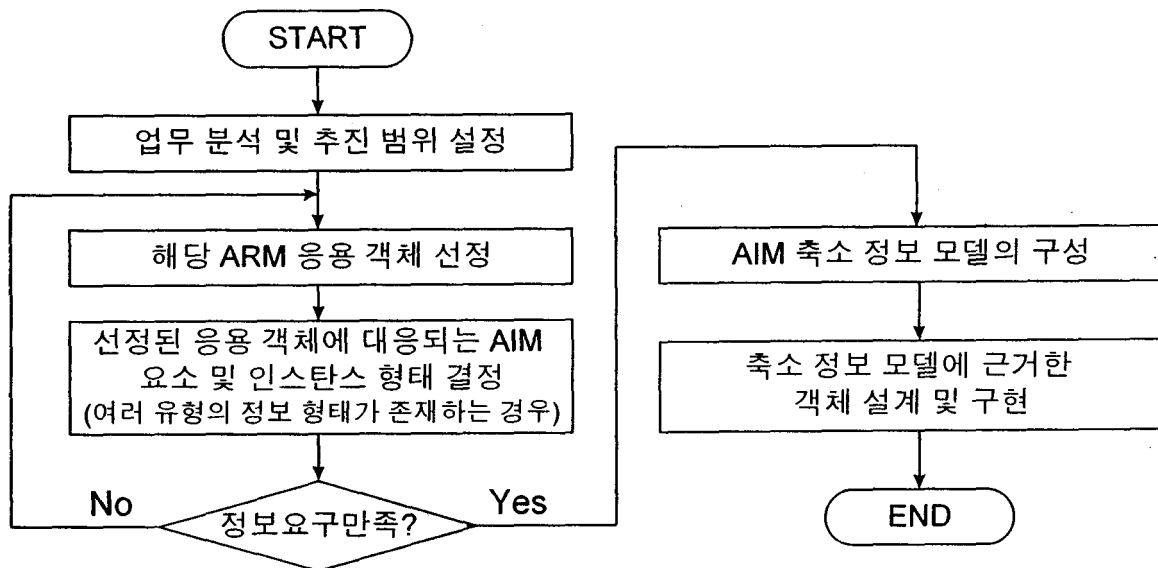
FUNCTION dot_product(arg1, arg2 : direction) : REAL;
  LOCAL
    scalar : REAL;
  ....
  ENLOCAL;
  IF NOT EXISTS(arg1) OR NOT EXISTS(arg2)
  THEN
    ....
  BEGIN
    vec1 := normalise(arg1);
    vec2 := normalise(arg2);
    ....
    REPEAT i := 1 TO ndim;
      scalar := scalar + vec1.direction_ratios[i]* .....
    END_REPEAT;
    ....
  RETURN (scalar);
  END FUNCTION

```

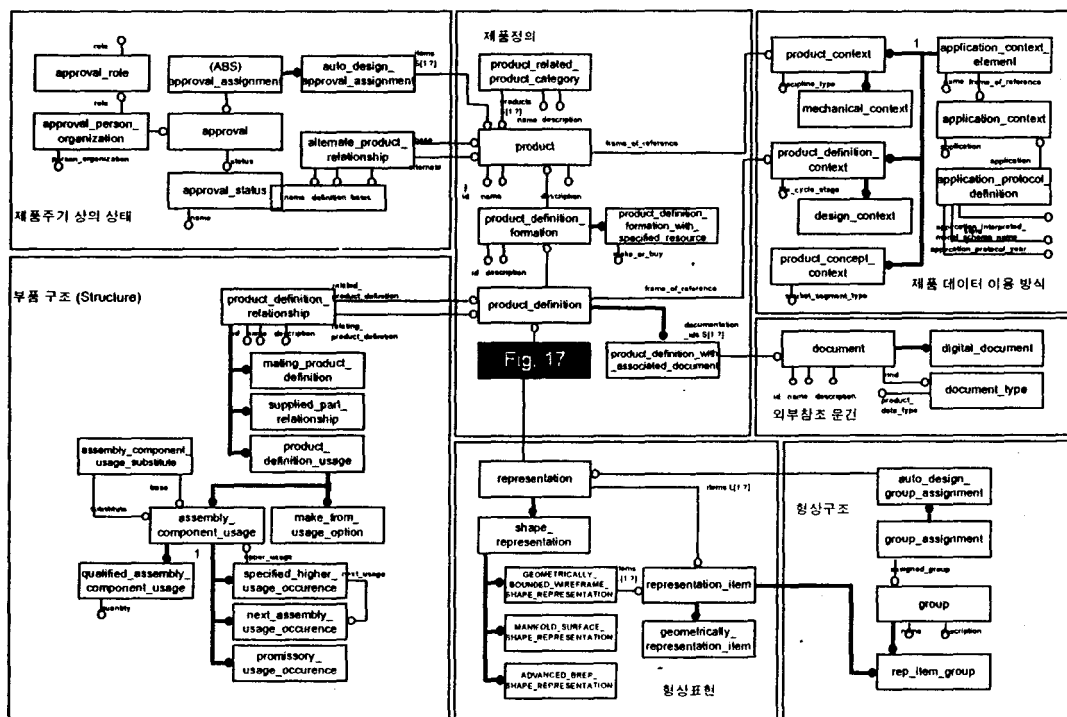
AIM 축소 정보 모델 (Subset) 구성

목적 : 각 기업에 적합한 정보 모델을 구성하기 위함

방법 : 기 구성된 AIM 전체 모델에서 필요한 AIM Entity들을 추출



AIM 축소 정보 모델 구성의 예



축소 정보 모델에 근거한 소규모 PDM 시스템

