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Oracle10g, DB2, MS SQL Server, MySQL, and Postgre

SQL

C ++

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- (DBMS)

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- (GIS)

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(DBMS)

. [ ]

(LBS)

: [ ]

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Oracle  
DB2 Universal Oracle  
SQL Server IBM  
PostegerSQL My SQL Microsoft

[ ]

Oracle

( - )

( )

[ ]

(GUI)

[ ]

[ ]

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K

[ ]

(DBMS)

[ ]

DBMS

( )

Oracle

DB2 .

SQL Server

[ ]

[ ]

Oracle

Oracle PL / SQL

PL / SQL .



PL / SQL

Oracle

Oracle

Oracle .

( )

Oracle

[ ]

Oracle

[ ]

GIS

[ ] .

Oracle

(LOBS)

Query

Data . [ ]

Data Cartridge

Cartridge

Data Cartridge

Object Table

[ ]

(MDC)

Data Type-Oriented

[ ]

Oracle 10g

[ ]

(MDC)

- 
- 
- 

(TLL)

[ ]( )

Timestamp

Temporal Period Time Point

Element

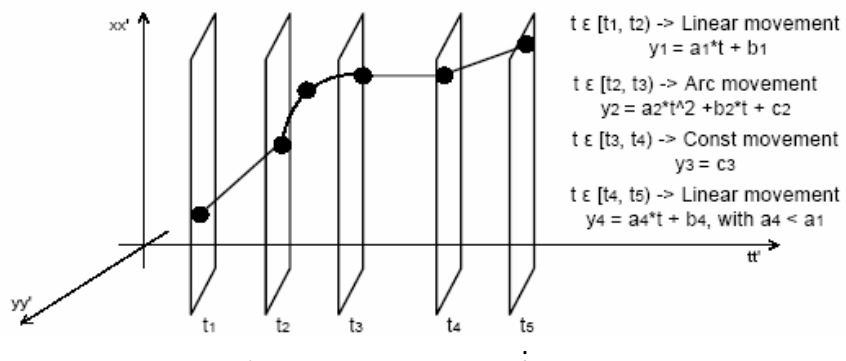
Unit Moving Type  
 Moving Type

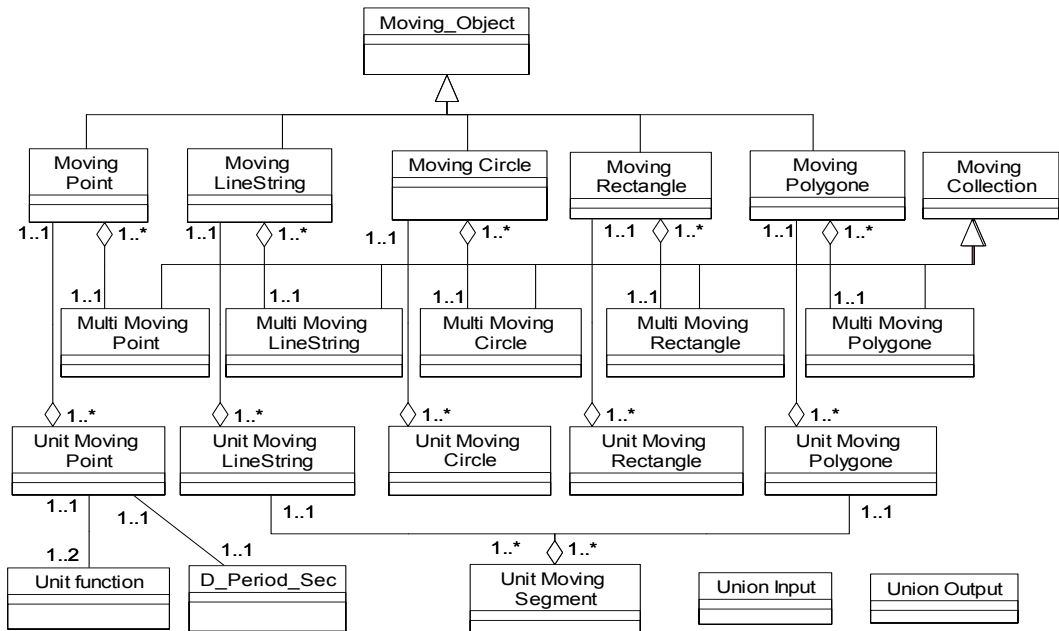
Moving Type  
 Moving  
 Multi\_Type  
 Moving Type  
 Moving\_collection

Multi Moving Type  
 aggregate

Oracle 10g

[ ]





. [ ] (MDC) UML :

:Numeric • Moving Moving Object  
 object Type  
 Moving Moving Type  
 object  
 UML  
 (MDC)

### Moving Object

:Set relationships •  
 MDC  
 Moving Type

object type

:[ ]

checking •

Boolean :Predicate •

Moving Type

Moving object :Projection •

. [ ]

ROAD (ROAD\_ID: NUMBER, LENGTH: NUMBER, ROADTYPE1: VARCHAR2, DISTANCE: NUMBER, RELATED: NUMBER, KEY: VARCHAR2 GEOM: MDSYS.SDO\_GEOMETRY)

CITIES (CITY\_ID: NUMBER, ELEVATION: NUMBER, FCODE: VARCHAR2, GPSX: VARCHAR2, GPSY: VARCHAR2, GPSZ: NUMBER, C\_NAME: VARCHAR2, GEOM: MDSYS.SDO\_GEOMETRY)

FUELST (FUELST\_ID: NUMBER, ELEVATION: NUMBER, FCODE: VARCHAR2, GPSX: VARCHAR2, GPSY: VARCHAR2, GPSZ: NUMBER, GEOM: MDSYS.SDO\_GEOMETRY)

POLICE (POLICE\_ID: NUMBER, ELEVATION: NUMBER, FCODE: VARCHAR2, GPSX: VARCHAR2, GPSY: VARCHAR2, GPSZ: NUMBER, GEOM: MDSYS.SDO\_GEOMETRY)

TERMINALS (TERMINAL\_ID: NUMBER, ELEVATION: NUMBER, FCODE: VARCHAR2, GPSX: VARCHAR2, GPSY: VARCHAR2, GPSZ: NUMBER, GEOM: MDSYS.SDO\_GEOMETRY)

PROVINCE

ROAD

...

: [ ]

Truck (company: Varchar2, id: Varchar2, type: Varchar2, route: Moving\_Point)

Weather (name: Varchar2, kind: Varchar2, extent: Moving\_Polygon)

Truck\_Companies (company: Varchar2, trucks: Moving\_Collection)

Truck id Company

Type

Weather

extent . ...

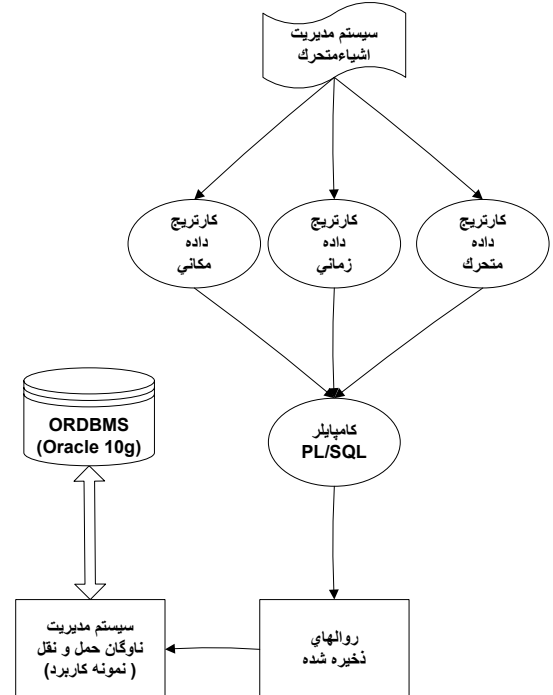
( )

shp2sdo

. [ ]

SQL \* Loader

PROVINCE (PROVINCE\_ID: NUMBER, AREA: NUMBER, PERIMETER: NUMBER, OSTAN\_NAME: VARCHAR2, CODE: NUMBER, GEOM: MDSYS.SDO\_GEOMETRY)



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(Pelekis)

(Theodoulidis)

Query

Query

- 1 - Ott, T. and Swiaczny, F. (2001). *Time-Integrative Geographic Information Systems*. Springer-Verlag Berlin.
  - 2 - Alesheikh, A., Blais, J. A. R., Chapman, M. A. and Karimi, H. (1999). "Rigorous geospatial data uncertainty models for GIS." in *Spatial Accuracy Assessment: Land Information Uncertainty in Natural Resources*, Chapter 24. Edited by: Kim Lowell and Annick Jatou. Ann Arbor Press, Michigan, USA.
  - 3 - Glauca, F., Medeiros, C. B. and Nascimento, M. A. (1998). "An extensible framework for spatio-temporal database applications." *A TIMECENTER Technical Report*.
  - 4 - Dodge, S. (2005). *Evaluating and Extending Spatio-Temporal Database Functionalities for Moving Objects*, M.Sc Thesis, Department of GIS Engineering, K.N.T. University of Technology.
  - 5 - Sistla, P., Wolfson, S. O. and Dao, C. S. (1997). "Modeling and querying moving objects." *Proceedings of the Thirteenth International Conference on Data Engineering (ICDE13)*, Birmingham, UK.
  - 6 - Pelekis, N., Theodoulidis, B., Kopanakis, I. and Theodoridis, Y. (2005). "Literature review of spatio-temporal database models." *Knowledge Engineering Review*.
  - 7 - Pelekis, N. (2002). *STAU: A spatio-temporal extension to ORACLE DBMS*, PhD Thesis, UMIST, U.K.
  - 8 - Pelekis, N., Babis Theodoulidis, Yannis Theodoridis, Ioannis Kopanakis, (2005). *An Oracle Data Cartridge for Moving Objects*, UMIST, U.K.
  - 9 - Oracle10g Release 1, (2003). *Oracle Data Cartridge Developer's Guide*, Part No. B10800-01.
  - 10 - Greenwald, R., Stackowiak, R. and Stern, J. (2004). *Oracle Essentials, Oracle Database*, 10g: 3rd Edition. ISBN: 0-596-00585-7.
  - 11 - Roshannezhad, A. (1996). *The Management of Spatio-Temporal Data in a National Geographic Information System*, PhD Dissertation. ITC, The Netherlands.
  - 12 - Xiaofeng M. and Ding, Z. (2003). "DSTTMOD: A discrete spatio-temporal trajectory based moving object database system." *DEXA2003, LNCS 2736*, Springer Verlag.
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13 - Alesheikh, A., Oskouei, A.K., Atabi, F. and Helalim H. (2005). "Providing interoperability for air quality in-situ sensors observations using GML technology." *International Journal of Environmental Science and Technology*, Vol. 2, No 2, PP. 133-140.

- 1 - Moving Objects
  - 3 - Triggers
  - 5 - At present Queries
  - 7 - K-Nearest Neighbor
  - 9 - Interface
  - 11 - VLDB (Very Large Database)
  - 12 - Open database Connectivity, Java Database Connectivity
  - 14 - Procedural
  - 16 - Indexing
  - 18 - Procedures
  - 20 - Valid Time
  - 22 - Object Type
  - 24 - User Defined Temporal Type
  - 26 - Base Type
  - 28 - Pure Spatial Type
  - 30 - Sliced Representation
  - 32 - Composition
  - 2 - Spatio-Temporal Queries
  - 4 - Past Queries
  - 6 - Future Queries
  - 8 - [www.databasejournals.com](http://www.databasejournals.com) [www.rocket99.com](http://www.rocket99.com)
  - 10 - High performance
  - 13 - Extensible Markup language
  - 15 - Oracle Spatial
  - 17 - Oracle Enterprise
  - 19 - Unit Moving Type
  - 21 - Temporal Literal Library
  - 23 - Interval
  - 25 - Spatio-Temporal Object Type
  - 27 - Pure Temporal
  - 29 - Moving Type
  - 31 - Simple Function
  - 33 - Rate of Change
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