8. Exercise: CAD Data in Databases

1. Geometrical Data in RDBMS

For the storage of CAD data in RDBMS, the following alternatives exist:

(1) Only metadata
(2) Storage as BLOB
(3) Storage in Database Filesystem
(4) Storage as structured data in Tables

Explain the alternatives and discuss advantages and disadvantages regarding:
- Ease of access,
- Concurrent accesses by many engineers,
- Consistency, and
- Performance!

2. CAD Data in Object-Relational DBMS (ORDBMS)

a) Given the example based on SQL:2003 below
- explain the effect of the inheritance between the 2 types!
- explain the effect of the table hierarchy!
Refer to [1] (available in Google Books) for a short explanation of both concepts!

```sql
CREATE TYPE geometry_type (  
    label VARCHAR(100)
);  

CREATE TYPE we_edge_type UNDER geometry_type (  
    vertex1 REF(we_vertex_type),  
    vertex2 REF(we_vertex_type),  
    aface REF(we_face_type),  
    bface REF(we_face_type),  
    neighbours REF(we_edge_type) ARRAY(4),
);  

CREATE TABLE geometry_object OF geometry_type;  
CREATE TABLE edge OF we_edge_type UNDER geometry_object;  

...```
b) The following example from [2] as discussed in the lecture demonstrates the feature of nested tables available in current ORDBMS. Accordingly, data of one object (here: part) can be stored in one row of a table. Discuss possible advantages and disadvantages of this storage method!

<table>
<thead>
<tr>
<th>ID</th>
<th>NAME</th>
<th>FACES</th>
<th>EDGES</th>
<th>VERTICES</th>
<th>LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>bracket</td>
<td>f1</td>
<td>e1</td>
<td>v1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>v2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>v3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>v1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>e3</td>
<td>v3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>v4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>e4</td>
<td>v2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>v4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f2</td>
<td>e5</td>
<td>v5</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>v6</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>e6</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
3. **CAD Data in Object-oriented DBMS**

Assuming the ACIS schema from [3] in the graphics below (where rectangles represent types/classes and arrows represent references/pointers):

- Explain the persistence concepts of *Named Objects* and *Persistence by Reachability*
- What would be a suitable (named) entry object to store a geometry? Why?

---

