

Temporal and Spatial Data Management

Exercise Series 4

Task 4.1: Consider a relation that records the following information about employments:

- Employee Jake was hired in the shipping department for the period from time 10 to time 15. This fact became current in the database at time 5.
- The personnel office discovers that Jake had really been hired from time 5 to time 20. The database is corrected at time 10.
- At time 15 the personnel department was informed that the original time was correct. The database is corrected immediately.
- At time point 20 the following updates are performed:
 - Jake was not in the shipping department, but in the loading department
 - The fact (Jake,Ship) is removed from the current state, and the fact (Jake,Load) is inserted
 - A new employee Kate is hired for the shipping department for the time from 25 to 30

Draw the state of the relation at time 21 in two dimensional space spanned by transaction and valid time

Task 4.2: Construct a real world example where intervals are important and cannot easily be captured by time points.

Task 4.3: Consider the relation $R(Name, Salary, Dept, TT, VT)$ and tuple $t = (Jane, 40, Sales, [3, now], [5, now])$.

Show the state of the relation for transaction time 1, ..., 6. Graphically display the region defined by the timestamp of this tuple.

Task 4.4: Consider the definition of the temporal join in Snodgrass' tuple timestamped model. Give algebra expressions that illustrate limitations of this definition. Discuss possible solutions.



Task 4.5: Consider the data models of Snodgrass, Jensen, Ben-Zvi, and Gadia. Give for each model a strong and weak point, respectively.

Task 4.6: Explain why the following statement is not a solution for Q1:

```
select CustID, TapeNum
from CheckOut
where T=7 or T=8 or T=9
```

Task 4.7: Consider the query: When was T1234 but no other tape checked out? Describe how this query can be answered in respectively, SQL + ADT, IXSQL, SQL/TP, TSQL2, and ATSQL.