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Master-Basismodul

Topic: Implication of the Temporal Alignment on the Probabilistic Attribute

Temporal Databases have been introduced to provide support for time-varying information by keeping track of historical (past, present, future) information and data changes. Each tuple represents an event and is accompanied by a **timestamp** which determines the time interval during which this event took place (valid time) or was recorded in the database (transaction time). *For example, if we assume recording valid time, according to the following table, Ann will be in Zurich from May to July.*

People

	Name	Dest	T
p_1	Ann	Zurich	[May,July)
p_2	Joe	Zurich	[June, July)
p_3	Tim	Bozen	[June, August)

Weather

	Loc	Weather	T
w_1	Zurich	Sun	[May,June)
w_2	Bozen	Sun	[June, July)
w_3	Bozen	Rain	[July, Septem)

The **temporal splitter** and the **temporal aligner** are two primitives which have been introduced in order to reduce the operators of a temporal algebra to operators of the nontemporal relational database while preserving necessary properties [1]. The role of these primitives is to transfom each tuple of an argument relation into a set of tuples with adjusted interval timestamps thus facilitating the operations.

Q1: How many people are going to Zurich?

Temporal Adjustment

	Name	Dest	T
p_{1a}	Ann	Zurich	[May,June)
p_{1b}	Ann	Zurich	[June,July)
p_2	Joe	Zurich	[June, July)
p_{3a}	Tim	Bozen	[June, July)
p_{3b}	Tim	Bozen	[July, August)

Result

	Count	T
q_1	**1**	**[May,June)**
q_2	**2**	**[June, July)**

Q2: What will the weather be during Tim's trip?

Temporal Adjustment

	Name	Dest	T
p_{3a}	Tim	Bozen	[June, July)
p_{3b}	Tim	Bozen	[July, August)

	Loc	Weather	T
w_2	Bozen	Rain	[June, July)
w_{3a}	Bozen	Rain	[July, August)
w_{3b}	Bozen	Rain	[August, Septem)

Result

	Name	Loc	Weather	T
q_1	**Tim**	**Bozen**	**Sun**	**[June, July)**
q_2	**Tim**	**Bozen**	**Rain**	**[July, August)**

Applications such as data integration, information extraction and scientific data management, have started gaining increased popularity and, thus, emerged the need to consider uncertainty and introduce **probabilistic [3] temporal databases**. As a result, each temporal relation has been extended by a probabilistic attribute in the sense that each tuple is accompanied by a numerical confidence value in the range [0,1], interpreted as a **probability value**.

People

	Name	Dest	T	P
p_1	Ann	Zurich	[May,July)	0.3
p_2	Joe	Zurich	[June, July)	0.2
p_3	Tim	Bozen	[June, August)	0.8

Weather

	Loc	Weather	T	P
w_1	Zurich	Sun	[May,June)	0.6
w_2	Bozen	Sun	[June, July)	0.4
w_3	Bozen	Rain	[July, Septem)	0.3

The main goal of this project is to fully understand the way the temporal primitives work and how they affect the value of certain attributes [2]. Having achieved that, it is expected that the probabilistic attribute is taken into consideration and the impact the alignment process has on it is also studied.

Tasks

1. Literature study on the temporal alignment
2. Solution of some representative use cases of the temporal primitives
3. Adaptation of the probabilistic attribute as a common attribute (unmodified during temporal alignment) and application in the use cases
4. Assessment of the adaptation method in a 3-pages report
5. Oral Exam

References

[1] Anton Dignös, Michael H. Böhlen, and Johann Gamper. Temporal alignment. In *SIGMOD Conference*, pages 433–444, 2012.

[2] Anton Dignös, Michael H. Böhlen, and Johann Gamper. Query time scaling of attribute values in interval timestamped databases. In *ICDE*, 2013.

[3] Dan Suciu, Dan Olteanu, Christopher Ré, and Christoph Koch. *Probabilistic Databases*. Synthesis Lectures on Data Management. Morgan & Claypool Publishers, 2011.

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End/Exam date: 26-03-2013 (4:30 pm)

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