Source Capabilities

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Source capabilities [YGMU99]

Limited interface

- sources (or source wrappers) support only limited query patterns
- mediators defined using views
- full query evaluation at the mediator level

Issues

- describing source (wrapper) capabilities
- describing mediator capabilities
- capability-based query rewriting

Templates

- template $\equiv$ a vector of attribute adornments
- sources export sets of templates
- view templates depend on mediator properties:
  - basic evaluation
  - postprocessing
  - passing bindings between join arguments
- a query has to match some view template to be answerable

Attribute adornments

1. f: the attribute may or may not be specified in the query (*free*)
2. u: the attribute cannot be specified in the query (*unspecifiable*)
3. b: the attribute must be specified in the query (*bound*)
4. c[S]: the attribute must be specified and its value must be among the elements of the set S (*constant*)
5. o[S]: the attribute may or may not be specified in the query but, if it is specified, its value must be among the elements of the set S (*optional*)

Matching

	f	o[S]	b	c[S]	u
constant a	+	$a \in S$	+	$a \in S$	−
variable	+	+	−	−	+

Deriving view templates

- composing base-view templates attribute-wise
- all combinations are considered but some may yield no result
- repeat if more than two views (composition is commutative and associative)

Composition of adornments

	f	o[S_2]	b	c[S_2]	u
f	f	o[S_2]	b	c[S_2]	u
o[S_1]	o[S_1]	o[$S_1 \cap S_2$]	c[S_1]	c[$S_1 \cap S_2$]	u
b	b	c[S_2]	b	c[S_2]	−
c[S_1]	c[S_1]	c[$S_1 \cap S_2$]	c[S_1]	c[$S_1 \cap S_2$]	−
u	u	u	−	−	u

Other operations

Join

- join attributes: as for union
- non-join attributes: copy base-view adornments

Selection

- copy base-view adornments

Projection

- copy base-view adornments
- hidden attributes have to have f, o, or u adornments

Postprocessing for union

Filtering

- adding a filter operation
- converting u and o to f

Composition of adornments with filtering

	f	o[S_2]	b	c[S_2]	u
f	f	f	b	c[S_2]	f
o[S_1]	f	f	b	c[S_2]	f
b	b	b	b	c[S_2]	b
c[S_1]	c[S_1]	c[S_1]	c[S_1]	c[$S_1 \cap S_2$]	c[S_1]
u	f	f	b	c[S_2]	f

Postprocessing for join

Join

- pass the bindings from the first argument of the join to the second argument
- converting b in the second argument to f

Composition of adornments with passing bindings

	f	o[S_2]	b	c[S_2]	u
f	f	f	f	c[S_2]	f
o[S_1]	f	f	f	c[S_2]	f
b	b	b	b	c[S_2]	b
c[S_1]	c[S_1]	c[S_1]	c[S_1]	c[$S_1 \cap S_2$]	c[S_1]
u	f	f	f	c[S_2]	f

Postprocessing for selection

Selection

- converting u and o to f through filtering
- converting b to f if the value of the attribute can be inferred from the selection condition
- converting c[S] to f if some element of S can be inferred from the selection condition

A query may be answerable in a given database state even if it does not match any of the view templates.

Liberal and conservative templates

- liberal: convert c (in the second argument) to f for joins
- conservative: as before

Query–template matching

- query answerable if it matches at least one conservative template
- query not answerable if it does not match any of the liberal templates
- query may be answerable otherwise: dynamic execution

R. Yerneni, H. Garcia-Molina, and J. Ullman.
Computing Capabilities of Mediators.
In *ACM SIGMOD International Conference on Management of Data*, pages 443–454, 1999.