Topic Maps Query Language 0.11

Washington DC, November 14, 2004

Tutorial

So, what are we doing?

- **Tutorial in TMQL as it currently stands**
- **We have a working draft describing a TMQL**
  - we just don't think it's ready for publication
- **The Tokyo meeting cleared up a number of things**
  - the editors now understand each other sufficiently to be able to teach the language (which is progress :-)

TMQL – the big picture

- **TMQL has three kinds of queries**
  - path expressions, which return single values, sets, or sequences
  - select queries, which return tables, and
  - FLWR (flower) queries, which return many kinds of things
- **Select and FLWR queries can use path expressions**

Accuracy

- I *think* I have understood Robert's parts of this correctly
- However, I don't *know* that for certain
- So, what I'm presenting here is my view of this, somewhat restated from Robert's terms

Path expressions

Common sublanguage
Simple expressions

Path expressions

- **XPath-like common sublanguage for all TMQL parts**
- **Works like this:**
  - the first subexpression produces a set/sequence of values,
  - after this come the steps, which apply operations to the set/sequence to produce a new one
  - the steps are chained in a sequence
  - the end result is the set/sequence produced by the last step

Typical first step

- **$m**
  - reference to variable 'm' sent as a parameter to the query
  - the result of this is the topic map itself (that is, the node representing it)

Robert likes this approach; personally I'd prefer to avoid the variable, and instead have the topic map be implicit

Typical second step

- **$m / composer**
  - the '/' produces all topics and associations in the topic map, then filters them according to the value produced by the 'composer' expression
  - the 'composer' expression evaluates to the composer topic
  - the filtering is by type, so the result is all topics of type 'composer' (or some subtype thereof)

Robert and I *both* like this bit :-)

Three typical steps

- **$m / composer # date-of-birth**
  - the '#' produces all topic names and occurrences of the topics produced by '$m / composer', then filters them by type so that only the date-of-birth occurrences remain
- **$t # date-of-birth**
  - same as above, but starting from a variable '$t' containing a topic
- **puccini # date-of-birth**
  - would find Puccini's date of birth
  - Robert claims this isn't allowed; LMG not sure document says that, or even that it should

LMG comments on the '#' operator

- **Robert has defined '#' as an expansion to syntax that operates on a 'virtual association' between topics and base name/occurrence**
- **He has two reasons for this**
  - one is how he *appears* to have modelled TMDM using Tau,
  - the other is that he thinks having different operators for conceptually different operations in large path expressions make them easier to read
- **Personally, I do *not* like this**
  - I feel the operation is the same, and that defining all steps as '/' would be much cleaner
  - I also don't feel the underlying metamodel should be exposed directly

Less typical steps

- **$t -> composer \ composed-by / work**
  - '-> composer' selects the associations in which the topic '$t' plays roles of type 'composer'
  - '\ composed-by' filters out those associations which are of type 'composed-by'
  - '/ work' produces all association roles in these associations, then filters them by type so only the 'work' roles remain, then selects the topic playing those roles
  - in short, the works composed by the topic(s) in '$t'

Not very happy with the '->' operator being different from the '/' operator. Robert's arguments are readability, and also that it's doing something different

Filtering with “predicates”

- **$m / opera [premiere-date < “1900-01-01”]**
  - the '[...]' is evaluated relative to the value(s) produced by the expression before it, and filters out everything for which the expression within it is not true
  - in short, this is all operas premiered before 1900
  - predicates can be applied to any step

The term “predicate” is (unfortunately) used to mean both “tolog predicate” and “XPath prediate”, and these are completely different

Dealing with scope

- **$t / @ english**
  - this will produce any characteristics in the English scope
- **$t # bn @ english**
  - this will only produce base names in the English scope
- **$t # oc @ english**
  - only external occurrences
- **$t # rd @ english**
  - only internal occurrences

Select queries

[redacted]

More complex queries

Basic form

- **Select queries take the following form (blue parts being optional)**

  select ...
  from ...
  where ...
  order by ...
  unique
  ?

Non optional part!

Predicates

- **Predicates here take the form**

  predicate-name (*parameter1* , *parameter2*)

- **Parameters can either be literals or variables ($variable)**
  - Literals constrain the result
  - Variables produce results (unless, of course, they are bound already, in which case they also constrain)

A simple example

- **instance-of($A, composer)?**
  - finds all instances of the 'composer' type (and its subclasses)
  - these are bound to the variable $A
  - the result is returned as a single-column table with one row per composer
- **note that the real syntax is as follows:**
  - $A : composer?

Treating association types as predicates

- **composed-by(puccini : composer, $O : work)?**
  - find all $Os which have a composed-by association with 'puccini'
- **composed-by($C : composer, $O : work)?**
  - find all composer/work pairs
- **composed-by($C : composer, tosca : work)?**
  - find the composer(s) of the work “tosca”
- **composed-by(puccini : composer, tosca : work)?**
  - is it true that Puccini composed Tosca?

Treating occurrence types as predicates

- **$WORK : opera, premiere-date($WORK, $DATE), $DATE < “1900-01-01”?**
  - finds first all work/date-combinations, then filters by date
  - note that this also demonstrates chaining of predicates
- **$WORK : opera, $WORK / premiere-date < “1900-01-01”?**

Expressing alternatives

- **$OPERA : opera, {**
  composed-by($OPERA : work, puccini : composer) |
  composed-by($OPERA : work, verdi : composer)
  }?
  - finds all operas composed by Puccini *or* Verdi
  - each branch can contain full predicate lists

Optional clauses

- **$OPERA : work, { premiere-date($OPERA, $DATE) }?**
  - finds all operas and their premiere dates *if they have one*
  - the optional clause can contain any form of predicate list
- **select $OPERA, $OPERA / premiere-date where $OPERA : work?**
  - alternative solution using path expressions

Not sure we need this any more. Leaving it in for the time being.

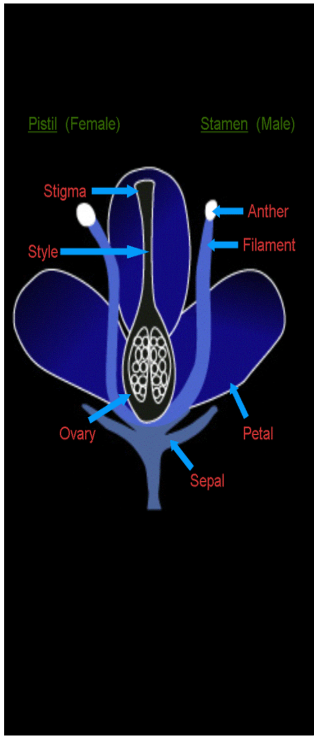
Expressing negation

- **born-in($PERSON : person, $CITY : place), not(located-in($CITY : container, italy : containee))?**
  - not can contain any form of predicate list

Non-existential queries

- **Normal parts of select queries match so long as it is true that there exists *something* which matches the query**
- **We also want to be able to say that we want to find things where *every candidate* meets some particular condition**
- **select $TEAM where**
  $TEAM : team,
  every team-member($TEAM : team, $PLAYER : member)
  satisfies is-injured($PLAYER : patient)?
- **Can also be solved differently**
  - $TEAM : team,
    not(team-member($TEAM : team, $PLAYER : member),
        not(is-injured($PLAYER : patient))?
  - that is, find all teams in which there is not (a team member who is not (injured))

FLWR queries



Even more complex queries

Some background

- **FLWR queries are syntactically inspired by XQuery**
- **The heart of them is predicate lists, like with select queries**
  - however, the predicate list syntax is different
  - it's different because Robert didn't like the select syntax, and I didn't like his
  - so feedback on which is the better syntax would be welcome

Basic structure

- **The structure of FLWR queries is (optional bits in blue)**

```
for $foo in ..., $bar in ...
for $foo2 in ..., $bar2 in ...
let $baz := ...
let $qux := ...
where ...
return ...
order by ...
unique
```

RETURN

- **return (puccini, puccini # date-of-birth, puccini # date-of-death)**
  - creates a 3-tuple consisting of the values produced by the path expressions
  - this is the result of the query
- **In general, RETURN produces the query result**
  - this can be through projection, like in select expressions
  - it can also be generation of XML content or TM results
  - the last two not covered by the existing draft

FOR

- **FOR creates a loop over the sequence/set of results produced by the expression after IN**
- **FOR $composer IN $m / composer**
  RETURN ($composer # bn, $composer # date-of-birth)
  - returns a sequence of 2-tuples, one for each composer

FOR (2)

- **FOR $composer IN $m / composer**
  FOR $opera IN $composer -> composer \ composed-by / work
  RETURN ($composer # bn, $opera # bn)
  - returns all composer name, opera name pairs

WHERE

- **FOR $composer IN $m / composer**
  WHERE composed-by($composer : composer, $opera : work)
  RETURN ($composer # bn, $opera # bn)
  - identical to previous query

LET

Longer WHERE

-
  ```
  WHERE
    composed-by($OPERA : work, $COMPOSER : composer) AND
    based-on($OPERA : result, $WORK : source) AND
    written-by($WORK : work, $AUTHOR : author)
  RETURN
    ($COMPOSER # bn, $AUTHOR # bn)
  ```

Declarations

Common to all sub-languages

Declarations

- URI prefix declarations
- Import declarations
- Rule declarations
- Function declarations