Query Optimization

Exercise Session 9

Bernhard Radke

January 16, 2017

Genetic Algorithms

Big picture

- Create a “population”, i.e. create p random join trees
- Encode them using ordered list or ordinal number encoding
- Create the next generation
  - Randomly mutate some members (e.g. exchange two relations)
  - Pairs members of the population and create “crossovers”
- Select the best, kill the rest

Details

- Encodings
- Crossovers

Encoding

Ordered lists

- Simple
- Left-deep trees: Straight-forward
- Bushy trees: Label edges in join-graph, encode the processing tree just like the execution engine will evaluate it

Ordinal numbers

- Are slightly more complex
- Manipulate a list of relations (careful: indexes are 1-based)
- Left-deep trees: $(((R_1 \bowtie R_4) \bowtie R_3) \bowtie R_2) \bowtie R_5$
- Bushy trees: $(R_3 \bowtie (R_1 \bowtie R_2)) \bowtie (R_4 \bowtie R_5)$

Encoding

Ordered lists

- Simple
- Left-deep trees: Straight-forward
- Bushy trees: Label edges in join-graph, encode the processing tree just like the execution engine will evaluate it

Ordinal numbers

- Are slightly more complex
- Manipulate a list of relations (careful: indexes are 1-based)
- Left-deep trees: $(((R_1 \bowtie R_4) \bowtie R_3) \bowtie R_2) \bowtie R_5 \ \mapsto\ 13211$
- Bushy trees: $(R_3 \bowtie (R_1 \bowtie R_2)) \bowtie (R_4 \bowtie R_5)$

Encoding

Ordered lists

- Simple
- Left-deep trees: Straight-forward
- Bushy trees: Label edges in join-graph, encode the processing tree just like the execution engine will evaluate it

Ordinal numbers

- Are slightly more complex
- Manipulate a list of relations (careful: indexes are 1-based)
- Left-deep trees: $(((R_1 \bowtie R_4) \bowtie R_3) \bowtie R_2) \bowtie R_5 \ \mapsto\ 13211$
- Bushy trees: $(R_3 \bowtie (R_1 \bowtie R_2)) \bowtie (R_4 \bowtie R_5) \ \mapsto\ 12\,21\,23\,12$

Crossover

Subsequence exchange for ordered list encoding

- Select subsequence in parent 1, e.g. $abc\underline{def}gh$
- Reorder subsequence according to the order in parent 2

Subsequence exchange for ordinal number encoding

- Swap two sequences of same length and same offset
- What if we get duplicates?

Subset exchange for ordered list encoding

- Find random subsequeces in both parents that have the same length and contain the same relations
- Exchange them to create two children

Info

- Submit exercises to radke@in.tum.de
- Due January 23, 2017.