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Test Generation by generating essence specifications. Currently only generates domains and their attributes. Three kinds of errors:

- Refinement errors
- Inconstancies in solutions
- Errors in SR

1 Refinement

Missing refinement rules for

- partition of matrixes
- partition of some very nested type
- These monstrosites:

```
  matrix indexed by [int(1..4), int(1..5)] of function (surjective,
          total,
          injective)
      matrix indexed by [int(5..5)] of int(3..5)
        --> matrix indexed by [int(3..3)] of int(5..5)

    matrix indexed by [int(1..2), int(2..2)] of function (size 1,
          minSize 3,
          maxSize 5,
          injective,
          surjective,
          total)
     set (size 4,
          minSize 4,
          maxSize 4) of
         relation of
             (int(2..3) *
              int(5..5) *
              int(1..4))
         --> matrix indexed by [int(3..3)] of relation (total) of
(int(5..5))
```

2 Inconstancies

2.1 testgen/summary1/gInconsistent/1405236473

```
find var0:
        matrix indexed by [int(1..4)] of function (maxSize 0, injective)
                                                int(2..2) --> int(3..4)
```

Should have the solution `[ function(), function(), function(), function() ]` . Of the 3 eprimes generated 2 produce the correct answer and 1 causes an exception in savilerow.

Listing 1.1: 0001.eprime

```
language ESSENCE' 1.0

find var0_FunctionAsReln_RelationAsSet_SetExplicitVarSize_tuple1:
        matrix indexed by [int(1..4), int(1..0)] of bool
find var0_FunctionAsReln_RelationAsSet_SetExplicitVarSize_tuple2_tuple1:
        matrix indexed by [int(1..4), int(1..0)] of int(2..2)
find var0_FunctionAsReln_RelationAsSet_SetExplicitVarSize_tuple2_tuple2:
        matrix indexed by [int(1..4), int(1..0)] of int(3..4)
such that true
```

produces the following exception and still returns zero. The eprime has very odd bounds 1..0

```
WARNING: interval 1..0 is out of order. Rewriting to empty interval.
WARNING: interval 1..0 is out of order. Rewriting to empty interval.
WARNING: interval 1..0 is out of order. Rewriting to empty interval.
Exception in thread "Thread-0" java.lang.AssertionError
  at savilerow.expression.CompoundMatrix.<init>(CompoundMatrix.java:44)
  at savilerow.expression.Flatten.simplify(Flatten.java:62)
  at savilerow.treetransformer.TransformSimplify.processNode(TransformSimplify.java:40)
  at savilerow.treetransformer.TreeTransformerBottomUpNoWrapper.recursiveSearch(TreeTransformer
  at savilerow.treetransformer.TreeTransformerBottomUpNoWrapper.recursiveSearch(TreeTransformer
  at savilerow.treetransformer.TreeTransformerBottomUpNoWrapper.transform(TreeTransformerBottom
  at savilerow.model.Model.simplify(Model.java:89)
  at savilerow.model.Model.transform(Model.java:178)
  at savilerow.model.ModelContainer.destroyMatrices(ModelContainer.java:791)
  at savilerow.model.ModelContainer.instancePreFlattening1(ModelContainer.java:250)
  at savilerow.model.ModelContainer.process(ModelContainer.java:52)
  at savilerow.SRWorkThread.run(SRWorkThread.java:74)
Savile Row timed out.
```

2.2 testgen/summary1/gInconsistent/1405242962

```
find var0:
  matrix indexed by [int(3..5)] of set (size 2, minSize 4, maxSize 2) of
    relation of (set (size 1, minSize 4, maxSize 4) of int(3..4))
```

Should have no solutions, but 2 of the five eprime sampled produced solutions.

3 Errors in SR

```
# time savilerow -mode Normal -in-eprime 0003.eprime -run-solver

language ESSENCE' 1.0

find var0_SetExplicitVarSize_tuple1: matrix indexed by [int(1..0)] of bool
find var0_SetExplicitVarSize_tuple2_SetOccurrence:
        matrix indexed by [int(1..0), int(2..4)] of bool
such that true
```

Savilerow finds a solution but in the output there are no letting statements.

```
language ESSENCE' 1.0
$ minion Nodes: 1
$ minion TotalTime: 0.000291
$ minion TimeOut: 0
$ Savile Row TotalTime: 0.145
```