

# Efficient Decoding with Labelled Grammars in Moses

**Participant** Philip Williams

**Goal** Implement some easy efficiency improvements for Moses chart decoding

- ▶ An alternative, faster-loading rule table file format
- ▶ Sharing of common target phrase objects to save memory
- ▶ A variant of the rule lookup algorithm that uses unlabelled dotted rules

## Existing Moses Rule Table Format

```
the " European [X][NN-NK] " [X] |||  
die " Europäische [X][NN-NK] " [NP-SB] |||  
0.200885 0.0500384 0.267846 0.0406821 6.0177e-05 2.718 |||  
3-3 |||  
4 3 2
```

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Loading a rule involves:

1. Parsing the line
2. Looking up every symbol in global vocabulary table

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Loading a rule involves:

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3. Creation of AlignmentInfo object and lookup in set

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Loading a rule involves:

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5. Insertion of source RHS in prefix tree



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Loading a rule involves:

1. Parsing the line
2. Looking up every symbol in global vocabulary table
3. Creation of AlignmentInfo object and lookup in set
4. Creation of Phrase objects for source and target RHSs
5. Insertion of source RHS in prefix tree
6. LM scoring of target RHS

# Compact Rule Table Format

Five sections...

Section 1: terminal / non-terminal vocabulary

124543

[X]

!

"

[PUNC.]

[PUNCPar]

.

...

Neufassungsrichtlinie

Schlüsselmerkmale

# Compact Rule Table Format

Five sections...

Section 2: source LHS + RHS

3838451

0 1 2

0 1 11

0 1 18

0 1

0 1 0

0 1 0 94

...

0 38379 0

0 38379 0 0

# Compact Rule Table Format

Five sections...

Section 3: target LHS + RHS

18631831

3 1

4 1

4 2

3 5

3 6

7 8

...

139 562 61 351 12 3

39 1853 12 5

# Compact Rule Table Format

Five sections...

Section 4: NT alignment pairs

119204

1-1

1-0 2-1 4-3

1-4 2-2 3-3

1-3 2-2

1-2

...

1-8 2-2 4-6 5-10

1-4 3-0 4-2 6-7

# Compact Rule Table Format

Five sections...

Section 5: Rules with scores + counts

```
30741964
0 0 0 9.72706e-05 3.4606e-06 0.442855 0.44254 1 2.718
: 22764 5 3
0 1 0 0.000224542 3.95963e-05 0.0781407 0.884923 1
2.718 : 1044 3 1
0 2 0 1.49565e-05 6.62752e-06 0.267846 0.811155 1
2.718 : 53725 3 2
...
3838450 12694721 10 0.00459651 0.0001169 0.234422
0.008 0.00027722 2.718 : 51 1 1
```

# Comparison

## Setup

- ▶ English-German target syntax grammar
- ▶ Hiero-style rule extraction with target labels, 'generous' extract settings
- ▶ Filtered for newstest2009 (2,525 sentences)
- ▶ 30,741,964 rules after filtering
- ▶ Timed full Moses run for first sentence of test set
- ▶ Rule tables on local disk

## Results

Table shows times for second run with each table type

<b>Format</b>	<b>Real</b>	<b>User</b>	<b>Sys</b>
Original	29m43.796s	29m20.406s	0m22.829s
Compact	4m43.067s	4m22.172s	0m20.786s

# Summary + Remaining Work

## Summary

- ▶ Created tool to convert rule table to compact format
- ▶ Added compact table support to Moses

## Remaining work

- ▶ Tool to convert from compact format back to original format
- ▶ Some refactoring required before code is ready for commit
- ▶ Format still far from optimal (mmap?)
- ▶ Sharing target phrases(?)
- ▶ Work on improving rule lookup algorithm for large non-terminal sets