Portable Lexical Analysis for Parsing of Morphologically-Rich Languages

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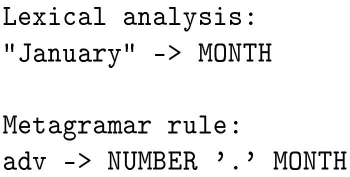
- the pre-terminal is then used in formal grammar of system `Synt`

Lexical analysis



```
Lexical analysis:
"January" -> MONTH

Metagramar rule:
adv -> NUMBER '.' MONTH
```

Figure: The basis of lexical analysis

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- this approach has several disadvantages:
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  - decision tree handling
- we decide to replace current lexical analysis with more affable form
- the new form consists of word, lemma, tag, word index and corresponding pre-terminal for word, lemma, tag and word index

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- lexical rule: regular expression + action (in C language)

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- the input for re2c and flex is lexical rule and macro definition

Lexical analysis

```
def scan(string){
------ macro part ------
    IS_NUMBER = [0-9]+;
         ...
------ rule  part ------
    .*"\t".*"\t"{IS_NUMBER} {
------   action   ------
          preterm=NUM;
          }
         ...
 }

 def analyze(input_str){
     scan(input_str);
 }
```

Figure: Input for re2c and flex

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- at the end we picked out much faster re2c tool

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- we create a preprocessing script that converts an input mapping definition file into a re2c source file
- definition file is plain text, that contains lexical rules: tag, lemma, word, word index and pre-terminal

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- comments starts with #= character
- definition file supports top macro comments and line macro comments

Macro

```
#=top macro comment
m=IS_NUMBER     [0-9]+    #=line macro comment
```

Figure: Definition of macro with user comments

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- the action contains pre-terminal that have to be assigned for this structure
- the comments is same as in macro definition

Lexical rule

```
#=lexica rule top comment
.*   {IS_MONTH}   .*  WI   preterm=MONTH #=comment
```

Figure: Lexical rule with user comments

Lexical rule

- in second part (the action) the user can use predefined variables word, lemma, morf_info,word_index and lemma_index.

```
"k1".*  .*  {FU} WI  if(word_index>0){preterm=NPR;}
```

Figure: Lexical rule with predefined variable

Evaluation

Tool	Time of generating scanner
`flex`	22.9 min
`re2c`	1.4 min

Evaluation (6160 sentences in brief format)

Lexical analyzer	Analysis time
former `Synt` lexer	3.33 min
`re2c`	3.19 min

Thank you for attention.