2.4.3 Regular Expressions

In order to search for spelling variants, different forms of a lemma or else, you need to formulate RegEx expressions in ANNIS. For this, you put your query in between slashes.

In this section we use the following convention:

- Examples for RegEx are in `Monospace`
- Whole queries as used in ANNIS are in `/Monospace with slashes/`
- Results of queries are in *italic*
- Individual letters are in pointy brackets, e.g. <a>

A (very) short introduction to RegEx

RegEx takes a pattern of characters you enter into the search field and looks for matches of these characters in the database. Let us assume that the database to be queried is a string of characters like "the man manually attached the tube in Manchester" without any separation of tokens and words. Let us now query the three letters *man*. In this case, RegEx looks for the letter <m> followed by an <a> and then an <n> in the database, regardless of what the pattern is preceded or followed by. As a result, you will get *man* and *manual*, but you will not get *Manchester*, because the RegEx search is case sensitive, see below.

However, RegEx also allows you to search for such things as alternatives (*man* or *men*), for word boundaries etc. RegEx is a syntax widely spread in programming languages. In what follows, we try to offer an easy overview over the functions you might use most often in this corpus. For more information, we refer you to http://www.regular-expressions.info/regular-expressions.info.

Case sensitivity

Your search is case sensitive, i.e. the system does strictly differentiate between upper and lower case. Queries for *MAN* or for *man* or for *mAn* have completely different results. If you want to query for all three variants, you have to work with alternatives (see below), thus, eg. `/[mM][aA][nN]/` or `/(man|Man|MAN|MAn|MaN|maN)/`.

Characters, letters and digits

In RegEx, a character is not the same as a letter. In most cases, everything you enter with one key on your keyboard is one character. So a digit, a full stop (.), a TAB or a carriage return (ENTER, RETURN etc.) is also a character you can search for. In rare cases it takes two keys to enter a character, e.g. for a <è> on an American keyboard or for a <ñ> on a Swiss keyboard.

Letters

Simple

You can search for every letter or combination thereof in the corpus by just typing it into the search field. What you type in has to be identical to the whole token.

Example: The simple query `"man"` or the RegEx query `/man/` will search for a lowercase <m> followed by a lowercase <a> and a lowercase <n>. Nothing more and nothing less.

Alternatives

If you want to have alternative letters in one specific spot you can put the alternatives into square brackets.

Example: `/m[aei]n/` will look for occurrences of either

- *man*
- *men*
- *min*

Variable letters

If you are looking for any letter, you can use `\w` (remember as: word character.)

Example: `/m\wn/` will look for (among others):

- *mAn*
- *mBn*
- *mCn*

- *man*
- *mbn*
- *mcn*

Something similar can be achieved with `[a-z]` and `[A-Z]` respectively. Here you look for occurrences of any letter as well, but this time case sensitive.

E.g `/m[A-Z]n/`

This search string can also be reduced to e.g. `[m-q]`to find any letter between <m> and <q>, however useful this may be.

N.B.: `\w` covers all letters from <A> to <z>, i.e. uppercase and lowercase. In our corpus, it also includes special letters like <äöüàéèß>. However, it does not include special characters such as punctuation, spaces, <&> etc.

Any character

If you want to search for any character, use a fullstop.

Example: `m.n` will look for (among others):

- *mAn*
- *mBn*
- *man*
- *mbn*
- *m&n*
- *m n*
- *m_n*
- *m?n*

Diacritica

This corpus is set up so as to recognize umlauts and letters with accents as individuals (keep in mind that this is not the case in many other uses of RegEx. Especially in programs that were developed in the US, a <ü> is not considered as a letter but rather as a boundary). In our corpus, seearching for `/mange/` will therefore not find any occurrences of *mangé*.

Digits

Just like `\w` above, you can use `\d` to stand in for any digit.

Example: `/n\d/` will look for (among others): *n0 n1 n9*

Separators

Individual separating characters

Many different characters can occur in between your letters and digits: commas, full stops, spaces etc. Most of these characters can be used for queries like letters or numbers:

- space
- comma
- dash (-)
- semicolon (;)
- curly brackets ({})
- colon (:)
- ampersand (&)
- percent (%)
- exclamation mark (!)

NB: most of these characters do have a special function as well when they appear in a specific position. As you will see below, { } is one of the possible ways to search for repeating characters. Thus, the character <{> can be recognized as a character in its own right or as a syntactic function depending on its position. The same goes for most of these characters.

Other separators are reserved by the RegEx syntax. To use them by their ordinary value, you have to

place a backslash in front of them. Thus, you type in `/m\*n/` to look for *m***n*. These characters are:

- asterisk (*)
- full stop (.)
- all other brackets ([()])
- slash, pipe and backslash (/|\)
- question mark (?)
- plus (+)
- dollar ($)
- caret (^)

In the very probable case this list is not exhaustive, just type in the character you are wondering about. If you get an error, you have to put a backslash in front of it.

Word boundaries

In ANNIS you can query on different layers. For example, you can search for a string of characters in every token or you can search for the same string over whole messages (please keep in mind: this approach is very slow and can result in time-outs!). Depending on which approach you choose for, you have to consider the surrounding environment to your search string.

Let us look again at the sentence "the man manually attached the tube in Manchester". On the **token level**, this sentence consists of eight individual tokens:

the	man	manually	attached	the	tube	in	manchester

On the **message level**, on the other hand, this is a string with characters and spaces:

the man manually attached the tube in Manchester

Accordingly, the system for querying is different. If you query for `/man/` on the token level, you will find exactly one occurrence, namely the token *man*, because all other tokens contain more than those three characters, e.g. *manually* contains five more characters.

If you query for *man* on the message level, you will find nothing, because ANNIS will search for a whole message that contains only these three characters. In order to actually find the word you are looking for, you have to query for "any characters (`.*`) followed by the string *man* followed by any characters" (the function *any characters* consists of the character full stop that stands for *any character* as shown above. The asterisk stands for an endless repetition as explained in the next section). Such a string will look like:

```
msg=/.*man.*/
```

and will find *man* but also *manually*.

If you want to find only *man*, you have to query for the three letters surrounded by boundaries (ie. spaces, tabs, fullstops, commas, new-lines etc.). The string for a boundary is `\b`. The query for *man* and only *man* within a message would thus look as follows:

```
msg=/.*?\bman\b.*/
```

Quantifiers

Sometimes you might be looking for an expression which can be written with or without repeating letters (e.g. you might want to look for *hallo, haaallo, haloooo*). Since you do not know how often the individual vowels were repeated, you have to use quantifiers to tell the system that the preceding character can be repeated a certain number of times. Your options are as follows:

- `?` A question mark means a repetition of 1 or 0 times
- `*` An asterisk means a repetition of 0 or more times
- `+` A plus sign means a repetition of 1 or more times
- `{n,m}` Two boundaries in curly brackets mean a repetition of at least n but not more than m times

Example: `/h+a+l+o+/` will find all variants of *hallo*

Alternatives

Above, you have seen that you can query for different letters in one spot, e.g. you can search for *man* and *men* with the expression `m[ae]n`. But what if you want to look for either *n8* or *night* or *nacht* or *nuit*? Here you have to set a <8> equal to the letter sequence *eight*, *acht* and *uit*. To achieve this, you set the whole expression in parentheses and separate the individual variants by a pipe (|).

Example: `(n(8|acht|ight|uit)/` will look for:

- *n8*
- *nacht*
- *night*
- *nuit*

A final word

What you have read here is only a selection of illustrations of the possibilities RegEx offers. To keep things more or less simple for you, we tried to document all the features you are likely to use. Also, there are different implementations of RegEx in different programs and they support different features. Thus, if you want to use RegEx more intensively or in other places, please read the according manual. If you need more functions, please check http://www.regular-expressions.info/regular-expressions.info.

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