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1 Module Pcre : Perl Compatibility Regular Expressions

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Exceptions

`type error =`

| `Partial`

String only matched the pattern partially

| `BadPartial`

Pattern contains items that cannot be used together with partial matching.

| `BadPattern of string * int`

`BadPattern (msg, pos)` regular expression is malformed. The reason is in `msg`, the position of the error in the pattern in `pos`.

| `BadUTF8`

UTF8 string being matched is invalid

| `BadUTF8Offset`

Gets raised when a UTF8 string being matched with offset is invalid.

| `MatchLimit`

Maximum allowed number of match attempts with backtracking or recursion is reached during matching. ALL FUNCTIONS CALLING THE MATCHING ENGINE MAY RAISE IT!!!

| `RecursionLimit`

| `InternalError of string`

`InternalError msg` C-library exhibits unknown/undefined behaviour. The reason is in `msg`.

`exception Error of error`

Exception indicating PCRE errors.

`exception Backtrack`

`Backtrack` used in callout functions to force backtracking.

Compilation and runtime flags and their conversion functions

`type icflag`

Internal representation of compilation flags

`type irflag`

Internal representation of runtime flags

```

type cflag = [ 'ANCHORED
  | 'AUTO_CALLOUT
  | 'CASELESS
  | 'DOLLAR_ENDONLY
  | 'DOTALL
  | 'EXTENDED
  | 'EXTRA
  | 'FIRSTLINE
  | 'MULTILINE
  | 'NO_AUTO_CAPTURE
  | 'NO_UTF8_CHECK
  | 'UNGREEDY
  | 'UTF8 ]
  Compilation flags

val cflags : cflag list -> icflag
  cflags cflag_list converts a list of compilation flags to their internal representation.

val cflag_list : icflag -> cflag list
  cflag_list cflags converts internal representation of compilation flags to a list.

type rflag = [ 'ANCHORED | 'NOTBOL | 'NOTEMPTY | 'NOTEOL | 'PARTIAL ]
  Runtime flags

val rflags : rflag list -> irflag
  rflags rflag_list converts a list of runtime flags to their internal representation.

val rflag_list : irflag -> rflag list
  rflag_list rflags converts internal representation of runtime flags to a list.

  Information on the PCRE-configuration (build-time options)

val version : string
  Version information
  Version of the PCRE-C-library

val config_utf8 : bool
  Indicates whether UTF8-support is enabled

val config_newline : char
  Character used as newline

val config_link_size : int
  Number of bytes used for internal linkage of regular expressions

val config_match_limit : int

```

Default limit for calls to internal matching function

`val config_stackrecurse : bool`

Indicates use of stack recursion in matching function

Information on patterns

`type firstbyte_info = ['ANCHORED | 'Char of char | 'Start_only]`

Information on matching of "first chars" in patterns

`type study_stat = ['Not_studied | 'Optimal | 'Studied]`

Information on the study status of patterns

`type regexp`

Compiled regular expressions

`val options : regexp -> icflag`

`options regexp`

Returns compilation flags of `regexp`.

`val size : regexp -> int`

`size regexp`

Returns memory size of `regexp`.

`val studysize : regexp -> int`

`studysize regexp`

Returns memory size of study information of `regexp`.

`val capturecount : regexp -> int`

`capturecount regexp`

Returns number of capturing subpatterns in `regexp`.

`val backrefmax : regexp -> int`

`backrefmax regexp`

Returns number of highest backreference in `regexp`.

`val namecount : regexp -> int`

`namecount regexp`

Returns number of named subpatterns in `regexp`.

`val names : regexp -> string array`

`names regex`

Returns array of names of named substrings in `regexp`.

```

val nameentrysize : regexp -> int
    nameentrysize regexp
    Returns size of longest name of named subpatterns in regexp + 3.

val firstbyte : regexp -> firstbyte_info
    firstbyte regexp
    Returns firstbyte info on regexp.

val firsttable : regexp -> string option
    firsttable regexp
    Returns some 256-bit (32-byte) fixed set table in form of a string for regexp if available,
    None otherwise.

val lastliteral : regexp -> char option
    lastliteral regexp
    Returns some last matching character of regexp if available, None otherwise.

val study_stat : regexp -> study_stat
    study_stat regexp
    Returns study status of regexp.

val get_stringnumber : regexp -> string -> int
    get_stringnumber rex name
    Raises Invalid_arg if there is no such named substring.
    Returns the index of the named substring name in regular expression rex. This index can
    then be used with get_substring.

val get_match_limit : regexp -> int option
    get_match_limit rex
    Returns some match limit of regular expression rex or None.

    Compilation of patterns
type chtables
    Alternative set of char tables for pattern matching

val maketables : unit -> chtables
    Generates new set of char tables for the current locale.

val regexp :
    ?study:bool ->
    ?limit:int ->
    ?iflags:icflag ->
    ?flags:cflag list -> ?chtabs:chtabs -> string -> regexp

```

`regexp ?study ?limit ?iflags ?flags ?chtables pattern` compiles `pattern` with `flags` when given, with `iflags` otherwise, and with char tables `chtables`. If `study` is true, then the resulting regular expression will be studied. If `limit` is specified, this sets a limit to the amount of recursion and backtracking (only lower than the builtin default!). If this limit is exceeded, `MatchLimit` will be raised during matching.

Returns the regular expression.

For detailed documentation on how you can specify PERL-style regular expressions (= patterns), please consult the PCRE-documentation ("man pcrepattern") or PERL-manuals.

See also www.perl.com[<http://www.perl.com>]

```
val quote : string -> string
    quote str
```

Returns the quoted string of `str`.

Subpattern extraction

```
type substrings
```

Information on substrings after pattern matching

```
val get_subject : substrings -> string
    get_subject substrings
```

Returns the subject string of `substrings`.

```
val num_of_subs : substrings -> int
    num_of_subs substrings
```

Returns number of strings in `substrings` (whole match inclusive).

```
val get_substring : substrings -> int -> string
    get_substring substrings n
```

Raises

- `Invalid_argument` if `n` is not in the range of the number of substrings.
- `Not_found` if the corresponding subpattern did not capture a substring.

Returns the `n`th substring (0 is whole match) of `substrings`.

```
val get_substring_ofs : substrings -> int -> int * int
    get_substring_ofs substrings n
```

Raises

- `Invalid_argument` if `n` is not in the range of the number of substrings.
- `Not_found` if the corresponding subpattern did not capture a substring.

Returns the offset tuple of the `n`th substring of `substrings` (0 is whole match).

```
val get_substrings : ?full_match:bool -> substrings -> string array
    get_substrings ?full_match substrings
```

Returns the array of substrings in `substrings`. It includes the full match at index 0 when `full_match` is `true`, the captured substrings only when it is `false`. If a subpattern did not capture a substring, the empty string is returned in the corresponding position instead.

```
val get_opt_substrings :
    ?full_match:bool -> substrings -> string option array
    get_opt_substrings ?full_match substrings
```

Returns the array of optional substrings in `substrings`. It includes `Some full_match_str` at index 0 when `full_match` is `true`, `Some captured_substrings` only when it is `false`. If a subpattern did not capture a substring, `None` is returned in the corresponding position instead.

```
val get_named_substring : regexp -> string -> substrings -> string
    get_named_substring rex name substrings
```

Raises

- `Invalid_argument` if there is no such named substring.
- `Not_found` if the corresponding subpattern did not capture a substring.

Returns the named substring `name` in regular expression `rex` and `substrings`.

```
val get_named_substring_ofs : regexp -> string -> substrings -> int * int
    get_named_substring_ofs rex name substrings
```

Raises

- `Invalid_argument` if there is no such named substring.
- `Not_found` if the corresponding subpattern did not capture a substring.

Returns the offset tuple of the named substring `name` in regular expression `rex` and `substrings`.

Callouts

```
type callout_data = {
    callout_number : int ;
        Callout number

    substrings : substrings ;
        Substrings matched so far

    start_match : int ;
        Subject start offset of current match attempt

    current_position : int ;
        Subject offset of current match pointer
```

```

capture_top : int ;
    Number of the highest captured substring so far

capture_last : int ;
    Number of the most recently captured substring

pattern_position : int ;
    Offset of next match item in pattern string

next_item_length : int ;
    Length of next match item in pattern string
}

type callout = callout_data -> unit
    Type of callout functions

    Callouts are referred to in patterns as "(?Cn)" where "n" is a callout_number ranging from 0 to 255. Substrings captured so far are accessible as usual via substrings. You will have to consider capture_top and capture_last to know about the current state of valid substrings.

    By raising exception Backtrack within a callout function, the user can force the pattern matching engine to backtrack to other possible solutions. Other exceptions will terminate matching immediately and return control to OCaml.

```

Matching of patterns and subpattern extraction

```

val pcre_exec :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string -> ?pos:int -> ?callout:callout -> string -> int array
    pcre_exec ?iflags ?flags ?rex ?pat ?pos ?callout subj
    Raises Not_found if pattern does not match.

    Returns an array of offsets that describe the position of matched subpatterns in the string subj starting at position pos with pattern pat when given, regular expression rex otherwise. The array also contains additional workspace needed by the match engine. Uses flags when given, the precompiled iflags otherwise. Callouts are handled by callout.

```

```

val exec :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string -> ?pos:int -> ?callout:callout -> string -> substrings
    exec ?iflags ?flags ?rex ?pat ?pos ?callout subj
    Raises Not_found if pattern does not match.

    Returns substring information on string subj starting at position pos with pattern pat when given, regular expression rex otherwise. Uses flags when given, the precompiled iflags otherwise. Callouts are handled by callout.

```

```

val exec_all :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string ->
  ?pos:int -> ?callout:callout -> string -> substrings array
  exec_all ?iflags ?flags ?rex ?pat ?pos ?callout subj

```

Raises `Not_found` if pattern does not match.

Returns an array of substring information of all matching substrings in string `subj` starting at position `pos` with pattern `pat` when given, regular expression `rex` otherwise. Uses `flags` when given, the precompiled `iflags` otherwise. Callouts are handled by `callout`.

```

val next_match :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string ->
  ?pos:int -> ?callout:callout -> substrings -> substrings
  next_match ?iflags ?flags ?rex ?pat ?pos ?callout subtrs

```

Raises

- `Not_found` if pattern does not match.
- `Invalid_arg` if `pos` let matching start outside of the subject string.

Returns substring information on the match that follows on the last match denoted by `subtrs`, jumping over `pos` characters (also backwards!), using pattern `pat` when given, regular expression `rex` otherwise. Uses `flags` when given, the precompiled `iflags` otherwise. Callouts are handled by `callout`.

```

val extract :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string ->
  ?pos:int ->
  ?full_match:bool -> ?callout:callout -> string -> string array
  extract ?iflags ?flags ?rex ?pat ?pos ?full_match ?callout subj

```

Raises `Not_found` if pattern does not match.

Returns the array of substrings that match `subj` starting at position `pos`, using pattern `pat` when given, regular expression `rex` otherwise. Uses `flags` when given, the precompiled `iflags` otherwise. It includes the full match at index 0 when `full_match` is `true`, the captured substrings only when it is `false`. Callouts are handled by `callout`. If a subpattern did not capture a substring, the empty string is returned in the corresponding position instead.


```

val extract_opt :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string ->
  ?pos:int ->
  ?full_match:bool -> ?callout:callout -> string -> string option array
  extract_opt ?iflags ?flags ?rex ?pat ?pos ?full_match ?callout subj
  Raises Not_found if pattern does not match.

Returns the array of optional substrings that match subj starting at position pos, using
pattern pat when given, regular expression rex otherwise. Uses flags when given, the
precompiled iflags otherwise. It includes Some full_match_str at index 0 when
full_match is true, Some captured-substrings only when it is false. Callouts are
handled by callout. If a subpattern did not capture a substring, None is returned in the
corresponding position instead.

```

```

val extract_all :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string ->
  ?pos:int ->
  ?full_match:bool -> ?callout:callout -> string -> string array array
  extract_all ?iflags ?flags ?rex ?pat ?pos ?full_match ?callout subj
  Raises Not_found if pattern does not match.

Returns an array of arrays of all matching substrings that match subj starting at position
pos, using pattern pat when given, regular expression rex otherwise. Uses flags when
given, the precompiled iflags otherwise. It includes the full match at index 0 of the
extracted string arrays when full_match is true, the captured substrings only when it is
false. Callouts are handled by callout.

```

```

val extract_all_opt :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string ->
  ?pos:int ->
  ?full_match:bool ->
  ?callout:callout -> string -> string option array array
  extract_all_opt ?iflags ?flags ?rex ?pat ?pos ?full_match ?callout subj
  Raises Not_found if pattern does not match.

Returns an array of arrays of all optional matching substrings that match subj starting at
position pos, using pattern pat when given, regular expression rex otherwise. Uses flags

```

when given, the precompiled `iflags` otherwise. It includes `Some full_match_str` at index 0 of the extracted string arrays when `full_match` is `true`, `Some captured_substrings` only when it is `false`. Callouts are handled by `callout`. If a subpattern did not capture a substring, `None` is returned in the corresponding position instead.

```
val pmatch :  
  ?iflags:irflag ->  
  ?flags:rflag list ->  
  ?rex:regexp ->  
  ?pat:string -> ?pos:int -> ?callout:callout -> string -> bool  
  pmatch ?iflags ?flags ?rex ?pat ?pos ?callout subj  
  
  Returns true if subj is matched by pattern pat when given, regular expression rex otherwise, starting at position pos. Uses flags when given, the precompiled iflags otherwise. Callouts are handled by callout.
```

String substitution

```
type substitution
```

Information on substitution patterns

```
val subst : string -> substitution  
  
  subst str converts the string str representing a substitution pattern to the internal representation
```

The contents of the substitution string `str` can be normal text mixed with any of the following (mostly as in PERL):

- `$/0-9/+-` - a "\$" immediately followed by an arbitrary number. "\$0" stands for the name of the executable, any other number for the n-th backreference.
- `$/` - the whole matched pattern
- `$/'` - the text before the match
- `$/'` - the text after the match
- `$/+` - the last group that matched
- `$/` - a single "\$"
- `$/!` - delimiter which does not appear in the substitution. Can be used to part "\$0-9+" from an immediately following other number.

```
val replace :  
  ?iflags:irflag ->  
  ?flags:rflag list ->  
  ?rex:regexp ->  
  ?pat:string ->  
  ?pos:int ->  
  ?itempl:substitution ->  
  ?templ:string -> ?callout:callout -> string -> string
```

`replace ?iflags ?flags ?rex ?pat ?pos ?itempl ?templ ?callout subj` replaces all substrings of `subj` matching pattern `pat` when given, regular expression `rex` otherwise, starting at position `pos` with the substitution string `templ` when given, `itempl` otherwise. Uses `flags` when given, the precompiled `iflags` otherwise. Callouts are handled by `callout`.

Raises Failure if there are backreferences to nonexistent subpatterns.

```
val qreplace :  
  ?iflags:irflag ->  
  ?flags:rflag list ->  
  ?rex:regexp ->  
  ?pat:string ->  
  ?pos:int -> ?templ:string -> ?callout:callout -> string -> string  
  qreplace ?iflags ?flags ?rex ?pat ?pos ?templ ?callout subj replaces all substrings  
  of subj matching pattern pat when given, regular expression rex otherwise, starting at  
  position pos with the string templ. Uses flags when given, the precompiled iflags  
  otherwise. Callouts are handled by callout.
```

```
val substitute_substrings :  
  ?iflags:irflag ->  
  ?flags:rflag list ->  
  ?rex:regexp ->  
  ?pat:string ->  
  ?pos:int ->  
  ?callout:callout ->  
  subst:(substrings -> string) -> string -> string  
  substitute_substrings ?iflags ?flags ?rex ?pat ?pos ?callout ~subst subj  
  replaces all substrings of subj matching pattern pat when given, regular expression rex  
  otherwise, starting at position pos with the result of function subst applied to the  
  substrings of the match. Uses flags when given, the precompiled iflags otherwise.  
  Callouts are handled by callout.
```

```
val substitute :  
  ?iflags:irflag ->  
  ?flags:rflag list ->  
  ?rex:regexp ->  
  ?pat:string ->  
  ?pos:int ->  
  ?callout:callout -> subst:(string -> string) -> string -> string  
  substitute ?iflags ?flags ?rex ?pat ?pos ?callout ~subst subj replaces all  
  substrings of subj matching pattern pat when given, regular expression rex otherwise,  
  starting at position pos with the result of function subst applied to the match. Uses flags  
  when given, the precompiled iflags otherwise. Callouts are handled by callout.
```

```
val replace_first :
```

```

?iflags:irflag ->
?flags:rflag list ->
?rex:regexp ->
?pat:string ->
?pos:int ->
?itempl:substitution ->
?templ:string -> ?callout:callout -> string -> string
    replace_first ?iflags ?flags ?rex ?pat ?pos ?itempl ?templ ?callout subj
    replaces the first substring of subj matching pattern pat when given, regular expression rex
    otherwise, starting at position pos with the substitution string templ when given, itempl
    otherwise. Uses flags when given, the precompiled iflags otherwise. Callouts are handled
    by callout.

```

Raises Failure if there are backreferences to nonexistent subpatterns.

```

val qreplace_first :
    ?iflags:irflag ->
    ?flags:rflag list ->
    ?rex:regexp ->
    ?pat:string ->
    ?pos:int -> ?templ:string -> ?callout:callout -> string -> string
    qreplace_first ?iflags ?flags ?rex ?pat ?pos ?templ ?callout subj replaces the
    first substring of subj matching pattern pat when given, regular expression rex otherwise,
    starting at position pos with the string templ. Uses flags when given, the precompiled
    iflags otherwise. Callouts are handled by callout.

val substitute_substrings_first :
    ?iflags:irflag ->
    ?flags:rflag list ->
    ?rex:regexp ->
    ?pat:string ->
    ?pos:int ->
    ?callout:callout ->
    subst:(substrings -> string) -> string -> string
    substitute_substrings_first ?iflags ?flags ?rex ?pat ?pos ?callout ~subst subj
    replaces the first substring of subj matching pattern pat when given, regular expression rex
    otherwise, starting at position pos with the result of function subst applied to the
    substrings of the match. Uses flags when given, the precompiled iflags otherwise.
    Callouts are handled by callout.

val substitute_first :
    ?iflags:irflag ->
    ?flags:rflag list ->
    ?rex:regexp ->
    ?pat:string ->
    ?pos:int ->
    ?callout:callout -> subst:(string -> string) -> string -> string

```

`substitute_first ?iflags ?flags ?rex ?pat ?pos ?callout ~subst` `subj` replaces the first substring of `subj` matching pattern `pat` when given, regular expression `rex` otherwise, starting at position `pos` with the result of function `subst` applied to the match. Uses `flags` when given, the precompiled `iflags` otherwise. Callouts are handled by `callout`.

Splitting

```
val split :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string ->
  ?pos:int -> ?max:int -> ?callout:callout -> string -> string list
  split ?iflags ?flags ?rex ?pat ?pos ?max ?callout subj splits subj into a list of at
  most max strings, using as delimiter pattern pat when given, regular expression rex
  otherwise, starting at position pos. Uses flags when given, the precompiled iflags
  otherwise. If max is zero, trailing empty fields are stripped. If it is negative, it is treated as
  arbitrarily large. If neither pat nor rex are specified, leading whitespace will be stripped!
  Should behave exactly as in PERL. Callouts are handled by callout.

val asplit :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
  ?pat:string ->
  ?pos:int -> ?max:int -> ?callout:callout -> string -> string array
  asplit ?iflags ?flags ?rex ?pat ?pos ?max ?callout subj same as Pcre.split[1] but
  Returns an array instead of a list.

type split_result =
  | Text of string
    Text part of splitted string
  | Delim of string
    Delimiter part of splitted string
  | Group of int * string
    Subgroup of matched delimiter (subgroup_nr, subgroup_str)
  | NoGroup
    Unmatched subgroup
  Result of a Pcre.full_split[1]
```

```
val full_split :
  ?iflags:irflag ->
  ?flags:rflag list ->
  ?rex:regexp ->
```

```
?pat:string ->
?pos:int ->
?max:int -> ?callout:callout -> string -> split_result list
```

`full_split` `?iflags` `?flags` `?rex` `?pat` `?pos` `?max` `?callout` `subj` splits `subj` into a list of at most `max` elements of type "split_result", using as delimiter pattern `pat` when given, regular expression `rex` otherwise, starting at position `pos`. Uses `flags` when given, the precompiled `iflags` otherwise. If `max` is zero, trailing empty fields are stripped. If it is negative, it is treated as arbitrarily large. Should behave exactly as in PERL. Callouts are handled by `callout`.

Additional convenience functions

```
val foreach_line : ?ic:Pervasives.in_channel -> (string -> unit) -> unit
    foreach_line ?ic f applies f to each line in inchannel ic until the end-of-file is reached.
```

```
val foreach_file :
    string list -> (string -> Pervasives.in_channel -> unit) -> unit
    foreach_file filenames f opens each file in the list filenames for input and applies f to each filename and the corresponding channel. Channels are closed after each operation (even when exceptions occur - they get reraised afterwards!).
```

UNSAFE STUFF - USE WITH CAUTION!

```
val unsafe_pcre_exec :
    irflag ->
    regexp ->
    int -> string -> int -> int array -> callout option -> unit
    unsafe_pcre_exec flags rex pos subject subgroup_offsets offset_vector. You should read the C-source to know what happens. If you do not understand it - don't use this function!
```

```
val make_ovector : regexp -> int * int array
    make_ovector regexp calculates the tuple (subgroups2, ovector) which is the number of subgroup offsets and the offset array.
```