JavaScript RegExp

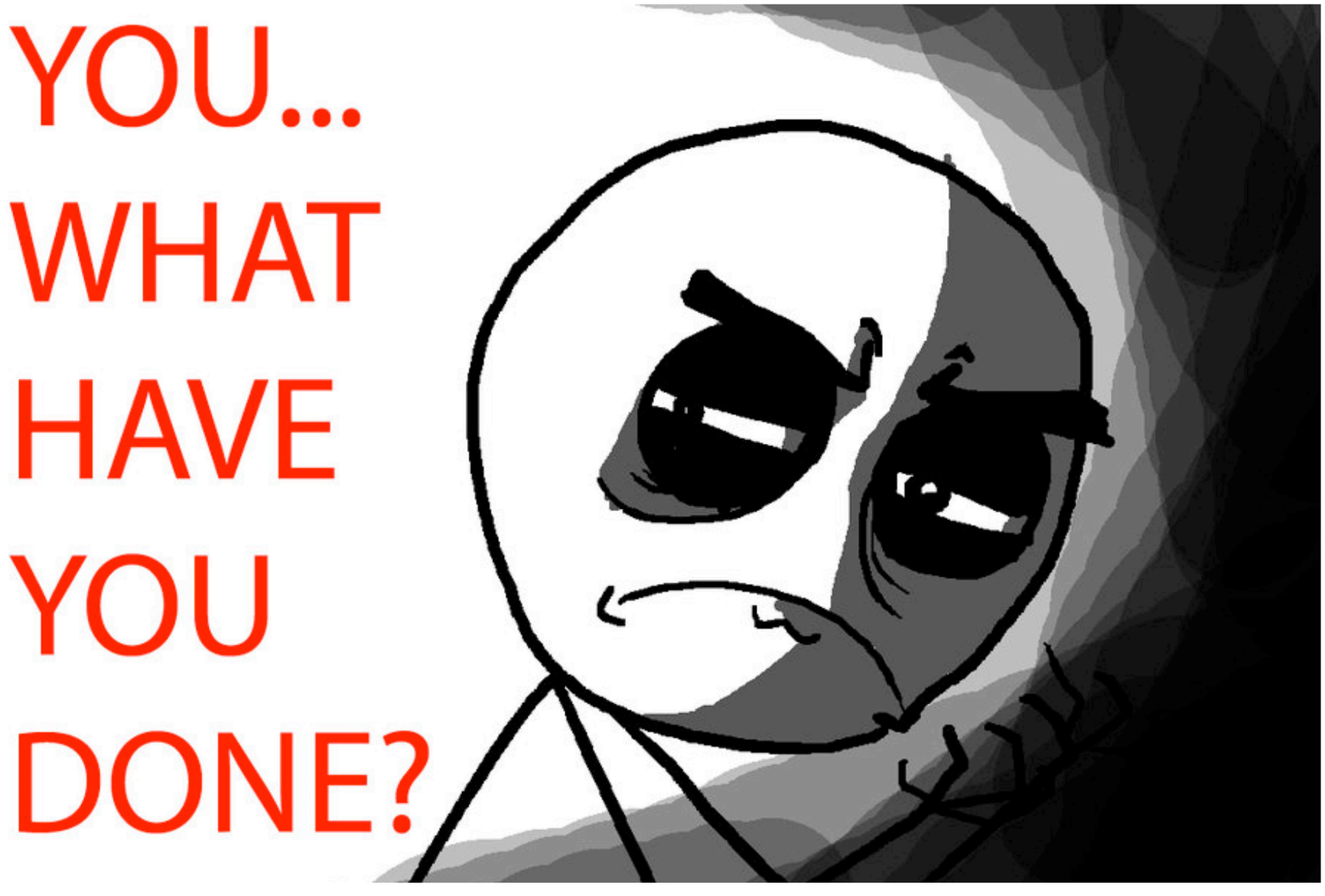
‘cause basis are still important

Andrea Giammarchi

Somebody Told Me This Talk Was "Too In Depth" ... so ...

- they see me explainin' ... they're hatin'
- I had to cut 2/3 of this talk
- ... but I did something better than that ...
- ... and definitively I didn't take it personal ...

Somebody Told Me This Talk Was "Too In Depth" ... so ...



so ... here the talk!

JavaScript Regular Expression
is such a cool thing!

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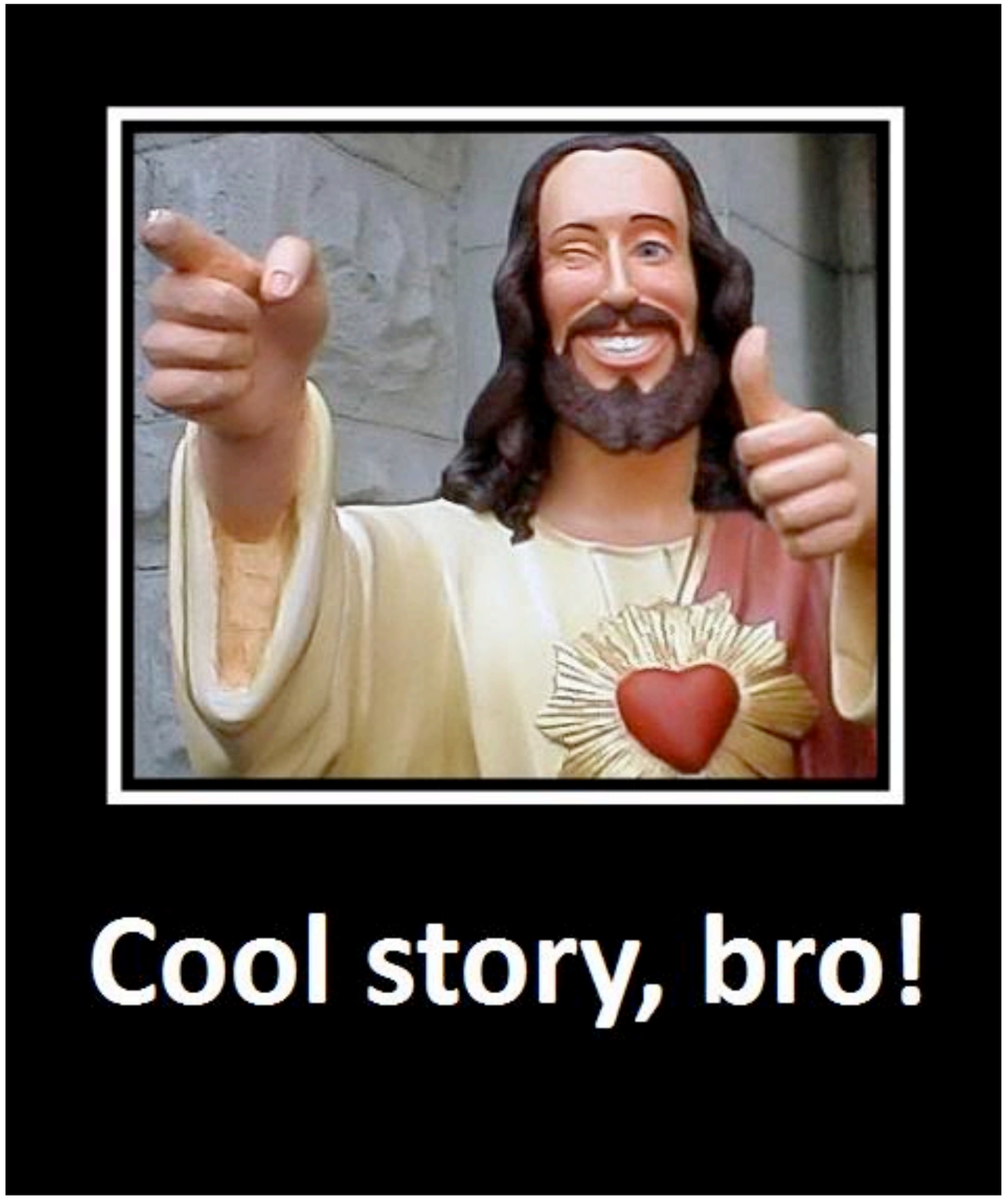


Thanks!

... jokes a part ...

- this talk does indeed go in depth
- so I'll skip some point
- and I'll leave it online as a reference
- but following the reason I made it complete

How Many Developers Still See RegExp

How Many Developers Still See RegExp

What Are Regular Expressions About

- simplified searches over different conditions
- security friendly (if you know what you are doing)
- great help for any kind of string validation (not only forms, any sort of string)

Two Ways To Create A RegExp

- literal: recommended
- (?:new)?RegExp: only if necessary
- don’t worry about that “new” thingy, you gonna understand it at the end of these slides

Literal RegExp

- `var re = /this is RegExp/;`
- processed at compile-time (faster and safer)

new RegExp

- `var re = new RegExp(“this is RegExp”);`
- `var re = RegExp(“this is RegExp”);`
- `var re = RegExp(“this is RegExp”, “gim”);`
- `// ... right ... but who’s gim ?`

3 Optional Flags

- g: global multiple searches/substitutions
  - `var s = "bb";`
  - `s.replace(/b/,  "a"); // ab`
  - `s.replace(/b/g, "a"); // aa`
  - `/b/g.global; // true`

3 Optional Flags

- g: a common mistake (ES5+)

```
// WRONG: endless loop
while (m = /b/g.exec(s)) {
  console.log(m);
}
```

3 Optional Flags

- g: a common mistake: FIXED (ES3+)
- `// OK`
- `var re = /b/g;`
- `while (m = re.exec(s)) {`
- `  console.log(m);`
- `}`

3 Optional Flags

- i: ignore case/case insensitive searches
  - `var s = "bb";`
  - `/B/.test(s);  // false`
  - `/B/i.test(s); // true`
  - `/B/i.ignoreCase; // true`

3 Optional Flags

- m: multi-line search
  - `var s = "bb\nbb";`
  - `/^bb$/.test(s);  // false`
  - `/^bb$/m.test(s); // true`
  - `/^bb$/m.multiline; // true`

“y” Optional Flag

- y: sticky search
- not cross browser (SpiderMonkey idea)
- similar to “g”, probably not needed

from Literal to RegExp

```
RegExp.prototype.toJSON = function () {
  return [
    this.source,
    (this.global ? "g" : "") +
    (this.ignoreCase ? "i" : "") +
    (this.multiline ? "m" : "")
  ];
};
// and back ...
RegExp.apply(null, JSON.parse(JSON.stringify(/"/g))); // /"/g
```

2 Methods

- .exec(text:String):Array|null
- .test(text:String):Boolean

.exec(text:String):Array|null

- `var str = “bab”, re = /b/g, match;`
- `match = re.exec(str); // [“b”]`
- `re.lastIndex; //”b” 1 ==> “ab” // where to start`
- `match = re.exec(str); // [“b”]`
- `re.lastIndex; // “bab” 3 ==> “”`
- `match = re.exec(str); // null`
- `re.lastIndex; // “” 0 ==> “bab” reset, reusable`

.exec(text:String):Array|null

- `var str = “bab”, re = /b/g, match;`
- `match = re.exec(str); // [“b”]`
- `match.`**`index`**`; // 0 // where is the match`
- `match.`**`input`**`; // “bab”`
- `match = re.exec(str); // [“b”]`
- `match.index; // 2`
- `match.input.substr(match.index, match[0].length);`
- `// always === match[0]`

.exec(text:String):Array|null

- `// use parenthesis to capture/create sub matches`
- `var str = “bab”, re = /(a)b/g, match;`
- `match = re.exec(str); // [“ab”, “a”]`
- `match.`**`length`**`; // 2`
- `match.input; // “bab”`
- `match.index; // 1`
- `match[1]; // “a” as content of first parenthesis`

.exec(text:String):Array|null

- `var str = “abc”, re = /(a(b))(c)/g, match;`
- `match = re.exec(str); // [“abc”, “ab”, “b”, “c”]`
- `match.length; // 4`
- `match.index; // 0`
- `match[1]; // “ab” as content of first parenthesis`
- `match[2]; // “b” as first nested parenthesis`
- `match[3]; // “c” as content of third parenthesis`

.exec(text:String):Array|null

- `// ?: to ignore capturing`
- `var str = “abc”, re = /(a(?:b))(c)/g, match;`
- `match = re.exec(str); // [“abc”, “ab”, “c”]`
- `match.length; // 3`
- `// nested parenthesis ignored`
- `match[1]; // “ab” as content of first parenthesis`
- `match[2]; // “c” as content of second parenthesis`

Why Would You Ignore Capture

- parenthesis pollute the global RegExp function
- `/(a)/.exec("a") && RegExp.$1; // "a"`
- the match inside them may not be relevant for what we need to do
- `/search(?:es)/.test(input);`
- the match array can be smaller (memory and performances)

.test(text:String):Boolean

- `var str = “bab”, re = /b/g;`
- `re.test(str); // true`
- `re.lastIndex; //”b” 1 ==> “ab”`
- `re.test(str); // true`
- `re.lastIndex; // “bab” 3 ==> “”`
- `re.test(str); // false`
- `re.lastIndex; // “” 0 ==> “bab” reset, reusable`

.test(text:String):Boolean

- `// use parenthesis to capture sub matches`
- `var str = “bab”, re = /(a)b/g, match;`
- `re.test(str); // true`
- `RegExp.`**`$1`**`; // “a” as equivalent of match[1]`
- `RegExp`**`[“$&”]`**`; // “ab” as equivalent of match[0]`
- `str.replace(re, “$1”); // “ba”`
- `str.replace(re, “$1-$&”); // “ba-ab”`

.test() VS .exec()

- strictly semantic (true or false, never null)
- no array creation (memory and performances)
- inline creation with capturing parenthesis

```
if (/(M[rs]+) /.test(input)) {
    user.gender = RegExp.$1 == “Mr” ? “m” : “f”;
    user.name = input.replace(RegExp[“$&”], “”);
}
```

RegExp & Replace Helpers

- $1 to $99 for sub-matches
- $& as equivalent of match[0]
- $` as text before the match
- $’ as text after the match
- $$ as dollar sign
- `“ab”.replace(/./g, “$`$’”); // “ba”`
- `src.replace(/jQuery(\.|\()/g, “$$$1”); // $() $.fn`

Special Characters

- \ to escape any special character
- ^ beginning of text or a line with multiline
- $ ending of text or a line with multiline
- `/^\^\$$/.test("^$"); // true`
- `/^\^\$$/.test(" ^$"); // false`

Special Characters

- \ also to refer a match in the RegExp
  - `/(a)b\1/.test(“aba”); // true`
  - `/(a)b\1/.test(“abc”); // false`
  - `/(a)b(c)d\2b\1/.test(“abcdcba”); // true`
  - `/(‘|”).+?\1/.test(‘var t = “some text”;’) // true`

Special Characters

- * zero or more occurrences (char/group)
- + one or more occurrences (char/group)
- ? zero or one occurrence (char/group)
  - `/co+ld?/.test("cool") && /co+ld?/.test("cold")`
  - `/ha\!*/.test("ha") && /ha\!*/.test("ha!!!!!")`

Special Characters

- {n} exact number of occurrences (char/group)
- {n,} from n occurrences to any (char/group)
- {n,m} from n occurrences to m (char/group)
- `/Go{2,}gle/.test("Google") && /Go{2,}gle/.test("Gooooooooooogle")`
- `/^ht{2}ps?\:\/\//.test(url)`

Special Characters

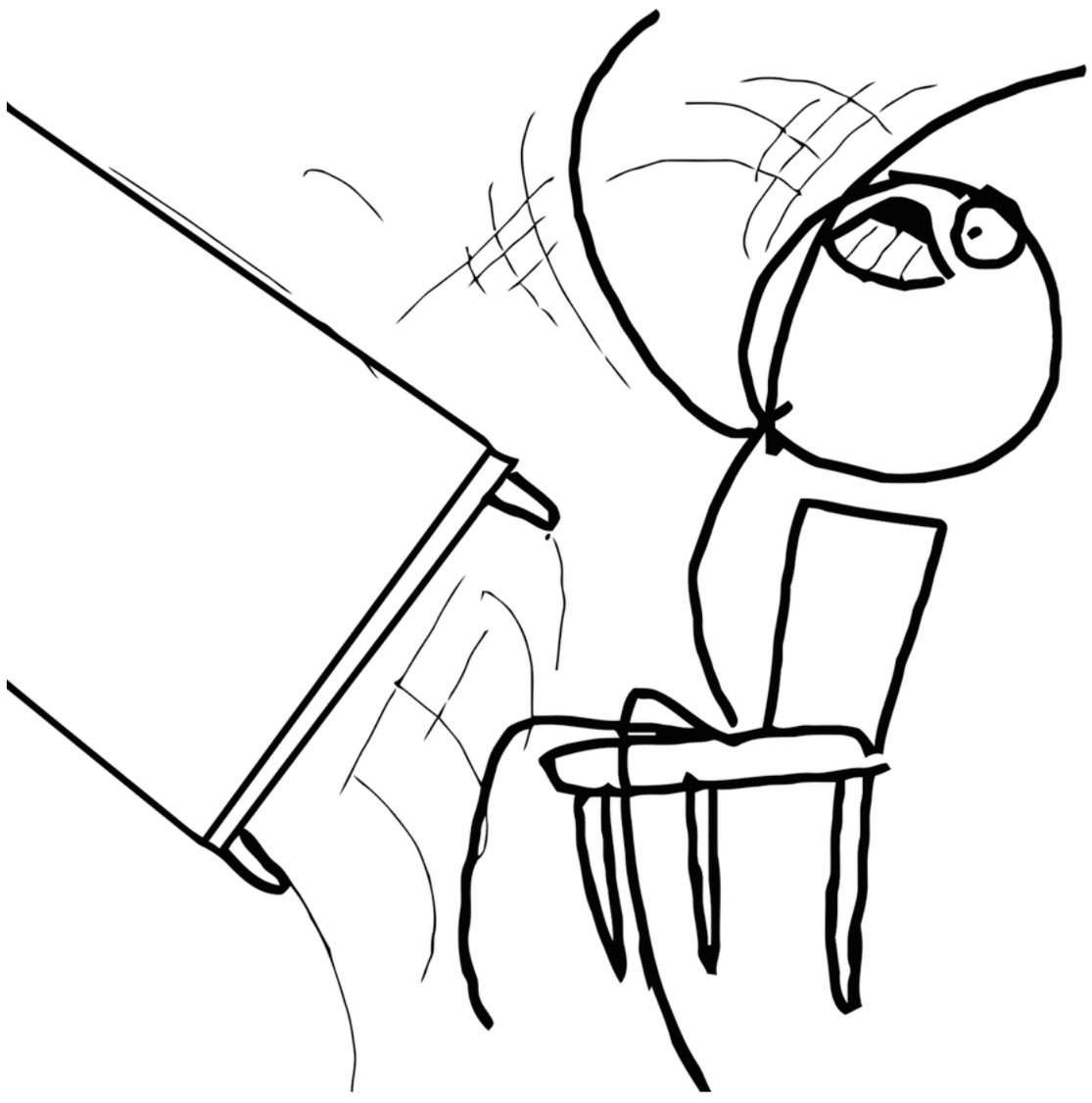
- ? also as “non greedy” operator after quantifiers such + * ? {}
- `/<p>.*<\/p>/.exec(“<p>a</p><p>b</p>”) // result [“<p>a</p><p>b</p>”]`
- `/<p>.*?<\/p>/g.exec(“<p>a</p><p>b</p>”) // result [“<p>a</p>”] and after [“<p>b</p>”]`

Special Characters

- ? also different meaning with parenthesis
- (?:ignore) to avoid capturing
- (?=followedBy) to look after
- (?!notFollowedBy) still looking after
- `/e(?=d)/.exec("r**ed** line").index; // 1 ["e"]`
- `/e(?!d)/.exec("red lin**e**").index; // 7 ["e"]`

No Look Behind

No Look Behind



Grouping Characters

- | used as “or” to match one or more occurrences
  - `/a|b/.test(“abc”); // true`
  - `/^0049|\+49/.test(number); // international prefix`
- can be used inside parenthesis too
  - `/skills: (JavaScript|Ruby)/.test(dev.skills);`
  - `/skills: (?:Perl|PHP|Python)/.test(dev.skills);`

Grouping Characters

- [xyz] match chars x, y, or z
- `/[ab]/.test("abc"); // true`
- `/[ab]/.test("a") rather than /(?:a|b)/.test("a")`
- can be used to match ranges (inclusive)
- `/^(?:0|[1-9][0-9]*)$/.test(number); // non octals`
- `/[A-Za-z]/.test(name); // a to z, case insensitive`
- `/[a-z]/i.test(name); // same as above`

Grouping Characters

- [^xyz] match any char but x, y, or z
- `/[^ab]/.test("abc"); // false`
- `/[^ab]/.test("cde"); // true`
- `/[^a-z]/.test("123"); // true`
- no need to escape except closing bracket
- `/[.]/.test("a"); // false`
- `/[.]/.test("."); // true`
- `/[+.[\]/-]/.test("+.[]/-");`
- if "-" is not used as range, first or last one!

Grouping Characters

- the only exception is [\b] for backspace
- `/[\b]/.test(backSpace); // true`
- do not confuse [\b] with word boundary
- `/\b/.test(backSpace); // not what we are testing`

Boundary

- similar to [^A-Za-z0-9_], matches words boundaries **without capturing**
- `/end\b/.test("is this the end???"); // true`
- `/\bhi\b/i.test(greetings);`
- `greetings as "hi", " hi ", "Hi!", "well, hi", etc.`
- `/\bhi\b/i.exec(" Hi!"); // ["Hi"]`
- `/\Whi\W/i.exec(" Hi!"); // [" Hi!"]`
- the opposite of \b is \B as [A-Za-z0-9_]

Words Characters

- \w as range [A-Za-z0-9_]
- \W as range [^A-Za-z0-9_] or [^\w]
- **Warning**: i18n could be a problem, mūs as example could be a valid word in some language but \w range may not consider it
- `/^\w+$/.test("mouse") !== /^\w+$/.test("mūs");`
- \b may have same side effect
- `/\b\w+\b/.exec("mūs"); // ["m"] rather than ["mūs"]`

Numbers

- \d as range [0-9]
- \D as range [^0-9] or [^\d]
- `/^\d+$/.test(“0123”); // true`
- `/^\D+$/.test(“abc”); // true`
- `/^[+-]?\d*\.?\d+(e\d+)?$/.test(JSNum);`
- `// 1. 1.2 .2 1e2 -1 +1.2e2 ... etc`
- **Warning**: i18n could be a problem due thousand/decimal separator

Spaces

- \n as new line (linefeed)
- \r as carriage return
- \f as form-feed
- \v as vertical tab
- \t as horizontal tab

Spaces

- \s as all previous spaces, plus others
  - `[ \f\n\r\t\v\u00A0\u1680\u180e\u2000\u2001\u2002 \u2003\u2004\u2005\u2006\u2007\u2008\u2009\u200a \u2028\u2029\u2028\u2029\u202f\u205f\u3000]`
- \S as none of previous spaces, neither others
  - `[^ \f\n\r\t\v\u00A0\u1680\u180e\u2000\u2001\u2002 \u2003\u2004\u2005\u2006\u2007\u2008\u2009\u200a \u2028\u2029\u2028\u2029\u202f\u205f\u3000]`

Spaces and JSON

- JSON.stringify(obj) is mostly broken
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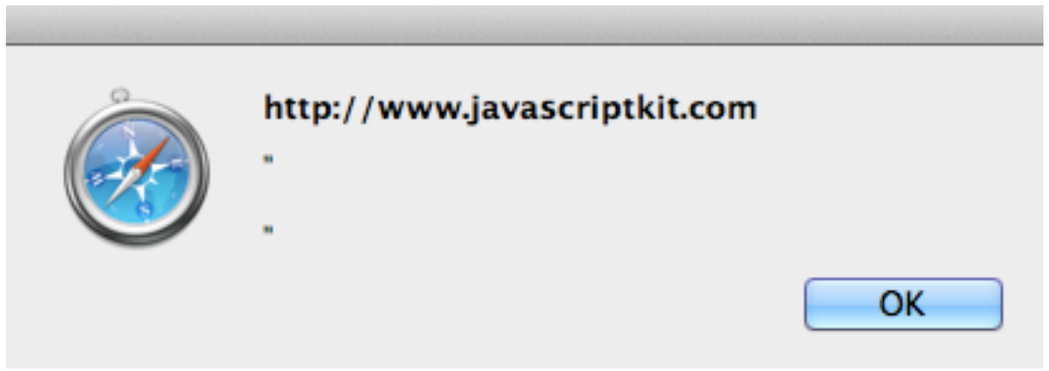

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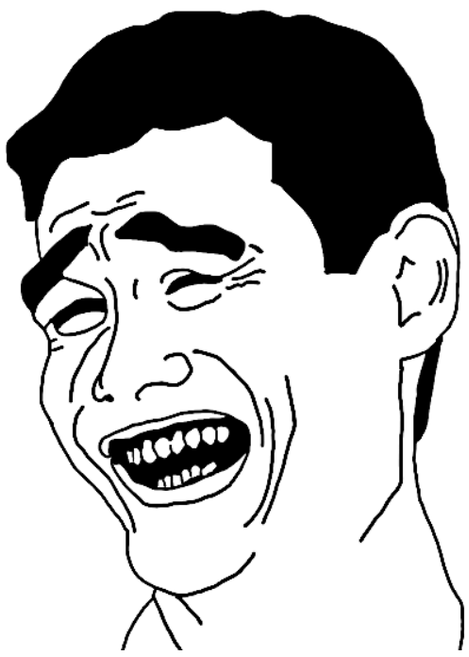

Spaces and JSON

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- `alert(JSON.stringify("\u2028\u2029"));`

Spaces and JSON

```
// fix it via RegExp and feature detection
if (JSON.stringify("\u2028") == '"\u2028"') {
  JSON.stringify = function (stringify) {
    function place(m) {
      return "\\u202" + (m == "\u2028" ? "8" : "9");
    }
    var re = /\u2028|\u2029/g;
    return function fixed(data) {
      return stringify(data).replace(re, place);
    };
  }(JSON.stringify);
}
```

More Special Characters

- \x00 to \xff for extended ASCII characters
- \u0000 to \uffff for unicode characters
  - `/\x00/.test(someString)`
  - `/\u0000/.test("\x00"); // true`
- **both available for ranges**
  - `/[\u0000-\u0002]/.test("\u0001"); // true`
  - `/^[\x00-\xFF]*$/.test(ASCIIOnly); // true`

More Special Characters

- \cX for control characters
  - `/\cM/.test(control_M); // true`
  - `/\cA/.test("\x01")     // true`
- \0 as NUL character
  - `/\0/.test("\x00"); // true`

More Special Characters

- \cX for control characters
- `/\cM/.test(command_M); // true`
- \0 as NUL character
- `/\0/.test("\x00"); // true`

  Yeah! We've got the NUL character

More Special Characters

- . as any character (except some space!)
- `/./.test("whatever"); // true`
- `/./.test("\n");  // false`
- remember the NUL character ?
- `/[^\0]+/.test("\n");  // true`

When Is RegExp Constructor Useful

- access .test() results
- runtime creation (i.e. remove a class from a generic DOM node)
  - `replace(RegExp("(?:^| )"+className+"(?: |$)", "g"))`
- markdown from js1k

String.prototype And RegExp

- str.match(re) similar to re.exec(str)
- str.search(re) as enriched str.indexOf(s)
- str.split(re:RegExp|s:String)
- `str.split("a") similar to str.split(/a/)`

String.prototype And RegExp

- str.replace(re, **f:Function**|s:String)

```
• "abcd".replace(/(b)c(d)/, function (
•     found, // "bcd" aka match[0]
•     m1,    // "b" aka match[1]
•     m2,    // "c" aka match[2]
•     index, // 1 aka match.index
•     input  // "abcd" aka match.input
•   ) {
•     return "whatever";
•   }); // "awhatever"
```

String.prototype And RegExp

- str.replace(re, **f:Function**|s:String)

```
• "abcd".replace(/bcd/, function (
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•     input  // "abcd" aka match.input
•   ) {
•     return "whatever";
•   }); // "awhatever"
```

String.prototype And RegExp

- str.replace(re, f:Function|**s:String**)
  - `"abcd".replace(/(b)c(d)/, "$2c$1"); // "adcb"`
- the content in the string is like accessing through the RegExp properties

Some Handy RegExp

- markup boundaries
- `var re = /(<\s*\b([a-z]+)\b.*?>)(.*)<\/\2\s*>/ig`
- `document.body.innerHTML.replace(re, cb);`
- `// cb("<p>a<p>b</p>c</p>", "p", "a<p>b</p>c", ...)`

Some Handy RegExp

- double or single quoted strings
- `/(“|’)(?:(?=(\\?))\2.)*?\1/g`
- lat and long on maps input field
- `/^(-?\d+(?:\.\d{1,}))[° ]?[,;]\s*(-?\d+(?:\.\d{1,}))°?/`

WSG84 Map Coords RegExp

```
var WGS84ToObject = (function (RegExp) {

    // (C) Andrea Giammarchi - WTFPL License ( http://sam.zoy.org/wtfpl/ )
    // 338 bytes once minified and gzipped


    // paranoic approach not implemented yet
    function isValidLatitude(latitude) {
        // return Math.abs(longitude) < 181
        return latitude != null;
    }

    function isValidLongitude(longitude) {
        // return Math.abs(longitude) < 87
        return longitude != null;
    }

    function deg2latlon(deg, min, sec) {
        return f(deg) + (f(min) * 60 + f(sec)) / 3600;
    }

    var
        // shortcuts
        f = parseFloat,
        // 37° 46′ 45.48″ N, 122° 25′ 9.12″ W or 37 46 45.48 N, 122 25 9.12 W or 37° 46' 45.48" N, 122° 25' 9.12" W
        degrees = /^(-?\d+(?:\.\d+)?[° ]+)(\d+(?:\.\d+)?['′' ]+)?(\d+(?:\.\d+)?["″" ]+)?(N|S)\s*(?:,|;)\s*(-?\d+(?:\.\d+)?[° ]+)(\d+(?:\.\d+)?['′' ]+)?(\d+(?:\.\d+)?["″" ]+)?(W|E)$/i,
        // 50.345, 10.123 or 50.345°, 10.123°
        decimals = /^(-?\d+(?:\.\d{1,}))[° ]?(?:,|;)\s*(-?\d+(?:\.\d{1,}))°?$/,
        // simple trim, no need for the "enciclopedia ready" algo
        trim = /^\s+|\s+$/g
    ;

    return function WGS84ToObject(string) {
        var latitude, longitude;
        string = string.replace(trim, "");
        switch(true) {
            case decimals.test(string):
                latitude = f(RegExp.$1);
                longitude = f(RegExp.$2);
                break;
            case degrees.test(string):
                latitude = deg2latlon(RegExp.$1, RegExp.$2 || 0, RegExp.$3 || 0) * (RegExp.$4 == "N" ? 1 : -1);
                longitude = deg2latlon(RegExp.$5, RegExp.$6 || 0, RegExp.$7 || 0) * (RegExp.$8 == "E" ? 1 : -1);
                break;
        }
        return isValidLatitude(latitude) && isValidLongitude(longitude) && {
            latitude: latitude,
            longitude: longitude
        };
    };

}(RegExp));
```

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    function deg2latlon(deg, min, sec) {
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        degrees = /^(-?\d+(?:\.\d+)?[° ]+)(\d+(?:\.\d+)?['′ ]+)?(\d+(?:\.\d+)?["″ ]+)?(N|S)\s*(?:,|;)\s*(-?\d+(?:\.\d+)?[° ]+)(\d+(?:\.\d+)?['′ ]+)?(\d+(?:\.\d+)?["″ ]+)?(W|E)$/i,
        // 50.345, 10.123 or 50.345°, 10.123°
        decimals = /^(-?\d+(?:\.\d{1,}))[° ]?(?:,|;)\s*(-?\d+(?:\.\d{1,}))°?$/,
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        trim = /^\s+|\s+$/g
    ;

    return function WGS84ToObject(string) {
        var latitude, longitude;
        string = string.replace(trim, "");
        switch(true) {
            case decimals.test(string):
                latitude = f(RegExp.$1);
                longitude = f(RegExp.$2);
                break;
            case degrees.test(string):
                latitude = deg2latlon(RegExp.$1, RegExp.$2 || 0, RegExp.$3 || 0) * (RegExp.$4 == "N" ? 1 : -1);
                longitude = deg2latlon(RegExp.$5, RegExp.$6 || 0, RegExp.$7 || 0) * (RegExp.$8 == "E" ? 1 : -1);
                break;
        }
        return isValidLatitude(latitude) && isValidLongitude(longitude) && {
            latitude: latitude,
            longitude: longitude
        };
    };

}(RegExp));
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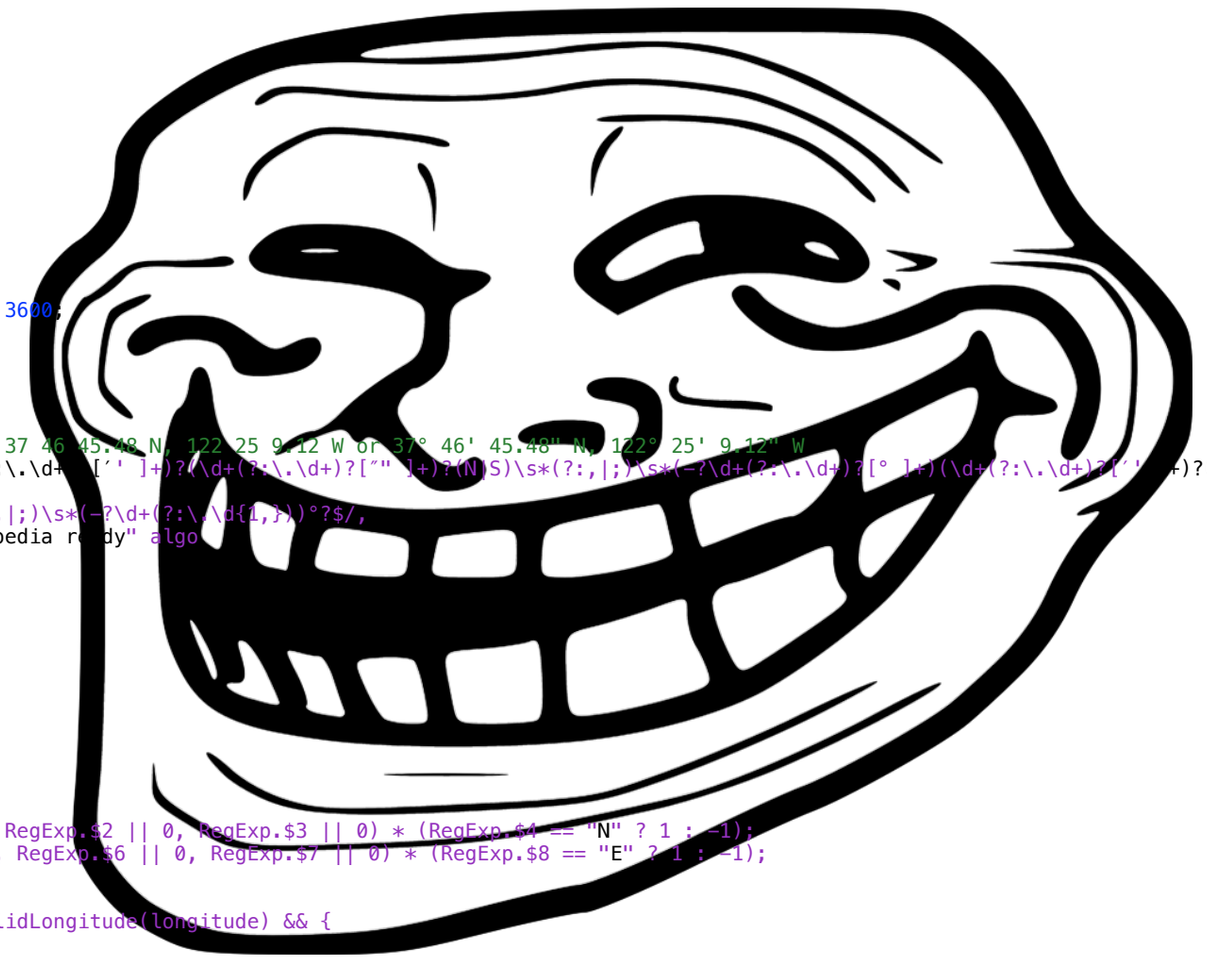

JavaScript RegExp

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- MDN RegExp
- ragefac.es
- "cool story bro"