debug hard

```ruby
require 'test/unit'
require_relative '../introduction'

class IntroductionTest < Test::Unit::TestCase

  def test_introduction
    assert_equal('Welcome to NYC.rb', Introduction.new.method)
  end

end
```

```
test/introduction_test.rb:2:in `require_relative':
cannot load such file —
/Users/vishalchandnani/Technical-Talks/idea_1
/introduction/introduction (LoadError)
from test/introduction_test.rb:2:in `<main>'
```

```ruby
class Introduction

  def method
    'Welcome to NYC.rb'
  end

end
```

```
Finished in 0.000394 seconds.
1 tests, 1 assertions, 0 failures, 0 errors
0 pendings, 0 omissions, 0 notifications
100% passed
```

```ruby
def method
  'Welcome to NYC.rb'
end
```

no bugs were harmed in the making of this talk

once upon a time

0800 Arctan started

1000 " stopped - arctan ✓ { 1.2700 9.037 847 025
9.037 846 ?95 correct

~~1.9821647000~~ ~~2.13047645 15 (-3)~~ 4.615925059(-2)

13"UC (032) MP - MC

(033) PRO 2 2.13047645

correct 2.13067645

Relays 6-2 in 033 failed special speed test

in relay " 11.00 test.

Relays changed

Relay 2145
Relay 3370

1100 Started Cosine Tape (Sine check)

1525 Started Mult + Adder Test.

1545 

Relay #70 Panel F
(moth) in relay.

First actual case of bug being found.

~~1545~~ 1630 Arctangent started.

1700 closed down.


COMO HOPPE


C
Statement
variables
function
POINTER
array
return
PROGRAM
TYPE
define
int
char
CHARACTER
USED
operator
declaration
structure
String
specifier


vbox

https://www.ruby-lang.org/en/documentation/installation/

https://www.ruby-lang.org/en/downloads/

Ruby Version: 2.5.1

ruby.c

#1
grep

```
$ grep -r rb_str_reverse *
```

string.c


NAT COMEN PRESENTS FOR EMI FILM DISTRIBUTORS LTD. A JOHN BRABOURNE-RICHARD GOODWIN PRODUCTION
AGATHA CHRISTIE'S
MURDER ON THE ORIENT EXPRESS
A
ALBERT FINNEY
LAUREN BACALL
MARTIN BALSAM
INGRID BERGMAN
JACQUELINE BISSET
JEAN-PIERRE CASSEL
SEAN CONNERY
JOHN GIELGUD
WENDY HILLER
ANTHONY PERKINS
VANESSA REDGRAVE
RACHEL ROBERTS
RICHARD WIDMARK
MICHAEL YORK

```
File: test/ruby/test_string.rb
require 'test/unit'

class TestString < Test::Unit::TestCase
  def test_reverse
    assert_equal(S("beta"), S("ateb").reverse)
    assert_equal(S("madamImadam"), S("madamImadam").reverse)

    a=S("beta")
    assert_equal(S("ateb"), a.reverse)
    assert_equal(S("beta"), a)
  end
end
```

```
File: string.c
/*
 *  call-seq:
 *    str.reverse. -> new_str
 *  Returns a new string with the characters from <i>str</i>
 *  in reverse order.
 *  “stressed”.reverse  #=> "desserts"
 */
static VALUE
rb_str_reverse(VALUE str)
{
  . . .
}
```

all you need to do

3 days later

debugger.rb

Raphaël


adidas
Fly
Emirates

ïeahpaR

#2
chars

```
“Raphaël”.chars
```

```
[“R”, “a”, “p”, “h”, “a”, “e”, ¨”, “l”]
```

ë

unicode

Twelve terrorists. One cop.
The odds are against John McClane…
That's just the way he likes it.

BRUCE WILLIS

DIE HARD

#3
codepoints

```
“Raphaël”.codepoints do |c|
  puts “#{c} : 0x#{c.to_s(16)}”
end
```

```
“R” : 82  (0x52)
“a” : 97  (0x61)
“p” : 112 (0x70)
“h” : 104 (0x68)
“a” : 97  (0x61)
“e” : 101 (0x65)
¨”  : 776 (0x308)
“l” : 108 (0x6c)
```

#4
each_byte

```
"Raphaël".each_byte do |c|
  puts "#{c} : 0x#{c.to_s(16)}"
end
```

```
“R”  : 82  (0x52)
“a”  : 97  (0x61)
“p”  : 112 (0x70)
“h”  : 104 (0x68)
“a”  : 97  (0x61)
“e”  : 101 (0x65)
¨”   : 204 (0xcc) and 136 (0x88)
“l”  : 108 (0x6c)
```

pointers

```c
#include <stdio.h>
#include <string.h>

int main ( void ) {
  char str[25] = "hello world";
  char *ptr;

  for(ptr = str; *ptr != '\0'; ptr++) {
    printf("%c", *ptr);
  }
}
```

#5
printf

```
printf(“\n length: %d”, length);
```

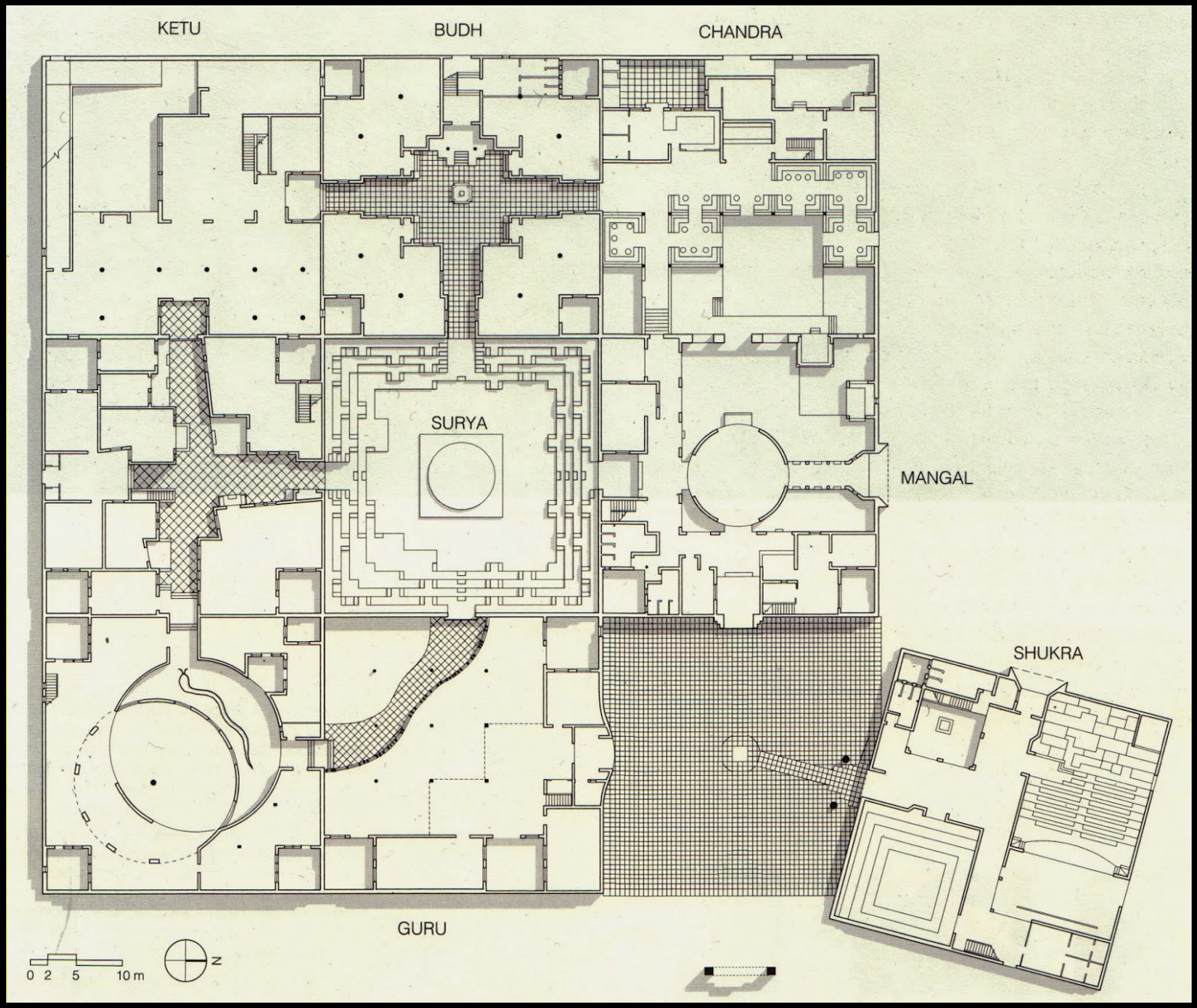
```
static VALUE
rb_str_reverse(VALUE str)
{
  . . .
  while (s < e) {
    int clen = rb_enc_fast_mbclen(s, e, enc);
    printf("\nclen: %d", clen);
    p -= clen;
    memcpy(p, s, clen);
    s += clen;
  }
  . . .
}
```


WHITNEY
2015
WHITNEY BIENNIAL
2015
MADISON AV

#6
gdb

```
$ gdb ruby
(gdb) break string.c:5575
(gdb) run -Ilib debugger.rb
(gdb) s
```

```
$ gdb ruby
(gdb) break string.c:5575
(gdb) break regenc:62
(gdb) run -Ilib debugger.rb
(gdb) s
```


KETU
BUDH
CHANDRA
SURYA
MANGAL
SHUKRA
GURU
0 2 5 10 m
N

```
File: enc/utf_8.c
static int
mbc_enc_len(
const UChar* p,
const UChar* e,
OnigEncoding enc ARG_UNUSED) {
  . . .
  . . .
}
```

```
s: R 82 52
  clen: 1
s: a 97 61
  clen: 1
s: p 112 70
  clen: 1
s: h 104 68
  clen: 1
s: a 97 61
  clen: 1
s: e 101 65
  clen: 1
s: X -52 ffffffcc
  clen: 2
s: l 108 6c
  clen: 1
```

```
if(c1 == 'e') {
  vptr = s;
  *vptr = 0xc3;
  vptr++;
  *vptr = 0xab;
  vptr++;
  *vptr = 'l';
  vptr++;
  *vptr = '\0';
}
```

```
s: R 82 52
  clen: 1
s: a 97 61
  clen: 1
s: p 112 70
  clen: 1
s: h 104 68
  clen: 1
s: a 97 61
  clen: 1
s: e 101 65
  hack
  clen: 2
s: l 108 6c
  clen: 1
```

lëahpaR

unicode_normalize

Canonical Composition

```
irb> vc = “e\u0308”.unicode_normalize
=> “ë”
irb> vc.chars
=> [“ë”]
irb> vc.size
=> 1
```

Canonical Decomposition

```
irb> vc = “e\u0308”.unicode_normalize
=> “ë”
irb> vc.unicode_normalize(:nfd).chars
=> [“e”, “̈”]
irb> vc.unicode_normalize(:nfd).chars.size
=> 2
```

chars before	chars after
“R”	“R”
“a”	“a”
“p”	“p”
“h”	“h”
“a”	“a”
“e”	“ë”
¨”	“l”
“l”	

```
code_points
before

“R” : 82
“a” : 97
“p” : 112
“h” : 104
“a” : 97
“e” : 101
¨” : 776
“l” : 108
```

```
code_points
after

“R” : 82
“a” : 97
“p” : 112
“h” : 104
“a” : 97
“ë” : 235
“l” : 108
```

```
each_byte
before

“R”  : 82  (0x52)
“a”  : 97  (0x61)
“p”  : 112 (0x70)
“h”  : 104 (0x68)
“a”  : 97  (0x61)
“e”  : 101 (0x65)
¨”   : 204 (0xcc) and 136 (0x88)
“l”  : 108 (0x6c)
```

```
each_byte
after

“R” : 82  (0x52)
“a” : 97  (0x61)
“p” : 112 (0x70)
“h” : 104 (0x68)
“a” : 97. (0x61)
“ë” : 195 (0xc3) and 171(0xab)
“l” : 108 (0x6c)
```

```
File: lib/unicode_normalize/normalize.rb

  def self.normalize(string, form = :nfc)
    . . .
    . . .
    case form
      when :nfc then
        string.gsub REGEXP_C, NF_HASH_C
      . . .
    . . .
  end
```

```
m1 = string[REGEXP_C]
regex match: “ë”
chars: [“e”, “¨”]
codepoints: [101, 776]
each byte iteration
101:0x65 | 204:0xcc | 136:0x88
```

```
m2 = NF_HASH_C[m1]
hash value: “ë”
chars: [“ë”]
codepoints: [235]
each byte iteration
195:0xc3 | 171:0xab
```

Raphaël

lëahpaR

```
def debug_hard
  grep
  chars
  code_points
  each_byte
  printf
  gdb
end
```

Email: vishal@defmethod.com

GitHub: https://github.com/vchandnani

LinkedIn: https://www.linkedin.com/in/vchandnani/