Eliminate useless catch tables and nops from lambdas

This patch frees catch tables on iseqs that don't use the catch tables. It also eliminates nop instructions from lambdas that don't need them.

Before this patch, lambdas have a "prelude nop" that is used for catch table entries:

```
$ ruby --dump=insn -e '1.times { |x| puts x }'
== disasm: #<ISeq:<main>@-e:1 (1,0)-(1,22)> (catch: FALSE)
   -- catch table
| catch type: break st: 0000 ed: 0004 sp: 0000 cont: 0004
   -- disasm: #<ISeq:block in <main>@-e:1 (1,8)-(1,22)> (catch: FALSE)
   -- catch table
| catch type: redo st: 0001 ed: 0006 sp: 0000 cont: 0001
| catch type: next st: 0001 ed: 0006 sp: 0000 cont: 0006
|------------------------------------------------------------------------
| local table (size: 1, argc: 1 [opts: 0, rest: -1, post: 0, block: -1, kw: -1@-1, kwrest: -1])
| [ 1] x@0<Arg>
| 0000 nop ( 1)[Bc]
| 0001 putself [Li]
| 0002 getlocal_WC_0 x@0
| 0004 opt_send_without_block <calldata!mid:puts, argc:1, FCALL|ARGS_SIMPLE>
| 0006 leave [Br]
|------------------------------------------------------------------------
0000 putobject_INT2FIX_1_ ( 1)[Li]
0001 send <calldata!mid:times, argc:0>, block in <main>
0004 leave
```

But since this particular lambda doesn't use the catch tables, there is no reason to keep the catch table or the nop instruction. This patch eliminates the nop instructions as well as the unused catch tables:

```
> ruby --dump=insn -e '1.times { |x| puts x }'
== disasm: #<ISeq:<main>@-e:1 (1,0)-(1,22)> (catch: FALSE)
0000 putobject_INT2FIX_1_ ( 1)[Li]
0001 send <calldata!mid:times, argc:0>, block in <main>
0004 leave

== disasm: #<ISeq:block in <main>@-e:1 (1,8)-(1,22)> (catch: FALSE)
local table (size: 1, argc: 1 [opts: 0, rest: -1, post: 0, block: -1, kw: -1@-1, kwrest: -1])
[ 1] x@0<Arg>
| 0000 putself ( 1)[LiBc]
| 0001 getlocal_WC_0 x@0
| 0003 opt_send_without_block <calldata!mid:puts, argc:1, FCALL|ARGS_SIMPLE>
| 0005 leave
```

It's not huge, but this frees about 600kb of catch tables on RailsBench. Here is a histogram of the catch tables and sizes freed for RailsBench:

![Histogram of catch tables and sizes freed](107269241-2d723080-69fe-11eb-9bf7-64f102251df7.png)

The X axis is the catch table size, so the actually malloc'd size for 2 would be approximately 2 * sizeof(struct iseq_catch_table_entry).

So if we have 5 tables of size 2, that would be about 5 * 2 * sizeof(struct iseq_catch_table_entry).

The size of iseq_catch_table_entry is 32:

```
(1ldb) p sizeof(struct iseq_catch_table_entry)
(unsigned long) $0 = 32
```
The total catch tables freed in RailsBench is 18275, so this frees about 18275 * 32 bytes, or about 584kb:

```r
> sum(freed_table_sizes$V1)
[1] 18275
> sum(freed_table_sizes$V1) * 32
[1] 584800
```

Instruction Sequence size is also reduced due to nop elimination, but I didn’t measure it.

Finally, this patch reduces nop calls on RailsBench from 6868813 (2.1%) to 2467772 (0.8%).

nop instructions on the master branch (265c002239):

```r
[RUBY_INSNS_COUNTER] nop 6868813 (2.1%)
```

nop instructions with this patch applied:

```r
[RUBY_INSNS_COUNTER] nop 2467772 (0.8%)
```

Pull request is [here](#).

**Related issues:**

- Related to Ruby master - Bug #18474: 938e027c seems to have caused a regressi... Open
- Related to Ruby master - Bug #18475: Yielding an element for Enumerator in an... Closed

**Associated revisions**

Revision 938e027c - 02/16/2021 10:00 PM - tenderlovementaking (Aaron Patterson)

Eliminate useless catch tables and nops from lambdas

Before this commit:

```ruby
$ ruby --dump=insn -e '1.times { |x| puts x }'
== disasm: #$<ISeq:<main>@-e:1 (1,0)-(1,22)> (catch: FALSE)
== catch table
| catch type: break st: 0000 ed: 0004 sp: 0000 cont: 0004
|== disasm: #$<ISeq:block in <main>@-e:1 (1,8)-(1,22)> (catch: FALSE)
| | catch type: redo st: 0001 ed: 0006 sp: 0000 cont: 0001
| | catch type: next st: 0001 ed: 0006 sp: 0000 cont: 0006
|------------------------------------------------------------------------
| local table (size: 1, argc: 1 [opts: 0, rest: -1, post: 0, block: -1, kw: -10-1, kwrest: -1])
| | [ 1] x@0<Arg>
| | 0000 nop (1)[Bc]
| | 0001 putself [Li]
| | 0002 getlocal_WC_0 x80
| | 0004 opt_send_without_block <calldata!mid:puts, argc:1, FCALL|ARGS_SIMPLE>
| | 0006 leave [Br]
|------------------------------------------------------------------------
0000 putobject_INT2FIX_1_ (1)[Li]
0001 send <calldata!mid:times, argc:0>, block in <main>
0004 leave
```

After this commit:

```ruby
> ruby --dump=insn -e '1.times { |x| puts x }'
== disasm: #$<ISeq:<main>@-e:1 (1,0)-(1,22)> (catch: FALSE)
0000 putobject_INT2FIX_1_ (1)[Li]
0001 send <calldata!mid:times, argc:0>, block in <main>
0004 leave
```

```ruby
== disasm: #$<ISeq:block in <main>@-e:1 (1,8)-(1,22)> (catch: FALSE)
local table (size: 1, argc: 1 [opts: 0, rest: -1, post: 0, block: -1, kw: -10-1, kwrest: -1])
| [ 1] x@0<Arg>
| 0000 putself (1)[LiBc]
| 0001 getlocal_WC_0 x80
| 0003 opt_send_without_block <calldata!mid:puts, argc:1, FCALL|ARGS_SIMPLE>
| 0005 leave
```

Fixes [ruby-core:102418] [Feature #17613]

Co-Authored-By: Alan Wu XrXr@users.noreply.github.com
Eliminate useless catch tables and nops from lambdas

Before this commit:

```
$ ruby --dump=insn -e '1.times { |x| puts x }'
== disasm: #<ISeq:<main>@-e:1 (1,0)-(1,22)> (catch: FALSE)
  | | catch type: break st: 0000 ed: 0004 sp: 0000 cont: 0004
  | | catch type: redo   st: 0001 ed: 0006 sp: 0000 cont: 0001
  | | catch type: next   st: 0001 ed: 0006 sp: 0000 cont: 0006
  | |------------------------------------------------------------------------
  | | local table (size: 1, argc: 1 [opts: 0, rest: -1, post: 0, block: -1, kw: -1@-1, kwrest: -1])
  | |   [ 1] x@0<Arg>
  | |------------------------------------------------------------------------
  | 0000 nop             ( 1)Bc
  | 0001 putself          [Li]
  | 0002 getlocal_WC_0    x80
  | 0004 opt_send_without_block  <calldata!mid:puts, argc:1, FCALL|ARGS_SIMPLE>
  | 0006 leave            [Br]
  |------------------------------------------------------------------------
 0000 putobject_INT2FIX_1_  ( 1)Li
 0001 send  <calldata!mid:times, argc:0>, block in <main>
 0004 leave
```

After this commit:

```
> ruby --dump=insn -e '1.times { |x| puts x }'
== disasm: #<ISeq:<main>@-e:1 (1,0)-(1,22)> (catch: FALSE)
0000 putobject_INT2FIX_1_  ( 1)Li
0001 send  <calldata!mid:times, argc:0>, block in <main>
0004 leave

== disasm: #<ISeq:block in <main>@-e:1 (1,8)-(1,22)> (catch: FALSE)
  local table (size: 1, argc: 1 [opts: 0, rest: -1, post: 0, block: -1, kw: -1@-1, kwrest: -1])
  [ 1] x@0<Arg>
0000 putself             ( 1)LiBc
0001 getlocal_WC_0       x80
0003 opt_send_without_block  <calldata!mid:puts, argc:1, FCALL|ARGS_SIMPLE>
0005 leave
```

Fixes [ruby-core:102418] [Feature #17613]
Co-Authored-By: Alan Wu XrXr@users.noreply.github.com

#2 - 01/11/2022 04:45 PM - mame (Yusuke Endoh)
- Related to Bug #18474: 938e027c seems to have caused a regression in yield handling with concurrent-ruby added

#3 - 01/12/2022 02:36 AM - mame (Yusuke Endoh)
- Related to Bug #18475: Yielding an element for Enumerator in another thread dumps core added

Files

- 0001-Eliminate-useless-catch-tables-and-nops-from-lambdas.patch  4.02 KB  02/08/2021  tenderlovemaking (Aaron Patterson)