CRYSTAL

CodeCamp | SF2017

Macros

Manipulating the AST

Motivation

- Reduce boilerplate
- Metaprogramming
- Add syntax sugar
- DSLs

To macro or not to macro

- Macros may subvert syntax
- Obscure the intent of the code
- Try to find a solution which doesn’t involve macros first
- Resort to macros to overcome limitations from compiled nature

Limitations

- Compile-time only
- Receive AST nodes as arguments
- Must produce valid AST nodes, ie. “atomically” parseable code
- Expansion order
- Macro language is a different language
- Macro language is interpreted

Macro syntax

The `macro` expression, interpolation

```
macro repeat(n)
  {% for i in (1..n).to_a %}
    {{yield}}
  {% end %}
end

repeat 5 do
  puts "hello world"
end
```

Macro syntax

The `macro` expression, interpolation

```
macro repeat(n, &block)
  {% for i in (1..n).to_a %}
    {{block.body}}
  {% end %}
end

repeat 5 do
  puts "hello world"
end
```

Macro syntax

Fresh variables

```
macro profile(&block)
  %start = Time.now
  {{block.body}}
  %elapsed = Time.now - %start
  puts "Elapsed time: #{%elapsed}"
end

profile do
  # expensive op
end
```

General useful methods

- `id`, `name`
- `stringify`, `symbolize`
- `class_name`
- `filename`, `line_number`, `column_number`
- `raise`
- `system`
- https://crystal-lang.org/api/0.22.0/Crystal/Macros/ASTNode.html

Type introspection

- The `TypeNode` class and the `@type` special variable
- `subclasses` and `all_subclasses`
- `instance_vars`
- `methods` and `overrides?`

Type introspection

```
def inspect(io : IO)
  io << "#<" << {{@type.name.id.stringify}} << ":0x"
  object_id.to_s(16, io)

  {% for ivar, i in @type.instance_vars %}
    {% if i > 0 %} io << "," {% end %}
    io << " @{{ivar.id}}="
    @{{ivar.id}}.inspect io
  {% end %}
  io << ">"
end
```

Hooks

When the macro is expanded

- `inherited`
- `included`
- `extended`
- `method_missing`
- `finished`

Example exercises

- CSV mappings
- Extend JSON mappings to construct from a JSON::Any

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