Type System for Metaprogramming

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Metaprogramming

The art of generating, manipulating, and analyzing code

`box(2 + 3)`	A code fragment for code `2 + 3`
`let box(C) = box(2 + 3) in C`	Execution of C to get 5

```
nth n =
  if n <= 0 then
    box(head xs)
  else
    let box(C) = nth (n - 1) in
    box(let xs = tail xs in C)
```

Untyped Metaprogram to get nth item in a list with no type/scope checking

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Typed Metaprogramming

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```
nth : Int -> □ (List Int -> Int)
nth n =
  if n <= 0 then
    box(fun xs => head Int xs)
  else
    let box(C) = nth (n - 1) in
    box(fun xs => C (tail Int xs))
```

Typed Metaprogram to get nth item in an int list

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Problem 1 — Well-typed Open Code Fragments

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Problem 2 — Polymorphism

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```
nth : (a' : Type) -> Int -> □ (List 'a -> 'a)
nth a' n =
  if n <= 0 then
    box(fun xs => head a' xs)
  else
    let box(C) = nth a' (n - 1) in
    box(fun xs => C (tail a' xs))
```

Ill-typed Metaprogram to get nth item in a list

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Problem 3 — Pattern Matching on Code Fragments

Some text

Modal Logic

Some text

Contextual Modality

Some text

Levels (Opt)

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Levels in Polymorphism

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Levels in Pattern Matching

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References

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