CMSC 430, Feb 13th 2020

Dupe

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Our languages so far:

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- We can branch based on computed values, but it's a bit clunky
  - We'd like to a) understand the clunkiness, and b) fix it

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  - By the end of today we'll have integers *and* booleans

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- Our language **`Dupe`** is going to modify *and* extend **`con`**

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  - **`if`** is `hard coded' to dispatch based on **`zero?`** and can do nothing else
- Let's make **`if`** be more like what we experience in other languages
  - It should dispatch on arbitrary boolean expressions!

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  - Thing to think about:
  - Why do we still need **`zero?`** (if at all)

Valley Date

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```
(define (expr? x)
  (match x
    [(? integer?) #t]
    [(? boolean?) #t]
    [`(add1 ,x) (expr? x)]
    [`(sub1 ,x) (expr? x)]
    [`(zero? ,x) (expr? x)]
    [`(if ,x ,y ,z)
     (and (expr? x)
          (expr? y)
          (expr? z))]
    [_ #f]))
```

Some Ant, ick!

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$$\overline{\boldsymbol{D}[\![v,\ v]\!]}$$

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- Let's take a look at **`if`** again, with some helper rules

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$$\frac{}{\text{is-true}[\![\#\text{t}]\!]} \qquad \frac{}{\text{is-false}[\![\#\text{f}]\!]} \qquad \frac{}{\text{is-true}[\![i]\!]}$$

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- What do you expect them to do (i.e. what do the semantics say about them)?

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```
(if (zero? 1) 1 2)
```

```
(if #t 1 2)
```

```
(if #t (add1 #f) 2)
```

Let’s look at the interpreter

We'll do that in the terminal, as it's starting to get a bit too cumbersome

Let's experiment

```
dupe> (require "dupe_interp.rkt")
```

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- Now let's think about generating x86 code
- Clearly, **`#f`** is not the same as **`0`**
  - How do we make sure that the values from the different types don't get mixed up?

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- This is the crux of a *type system*
- Different type systems have different tradeoffs
- We are going to implement a *dynamic* type system
  - What does this imply about how our implementation doesn't get values from different types mixed up?

Tag your int

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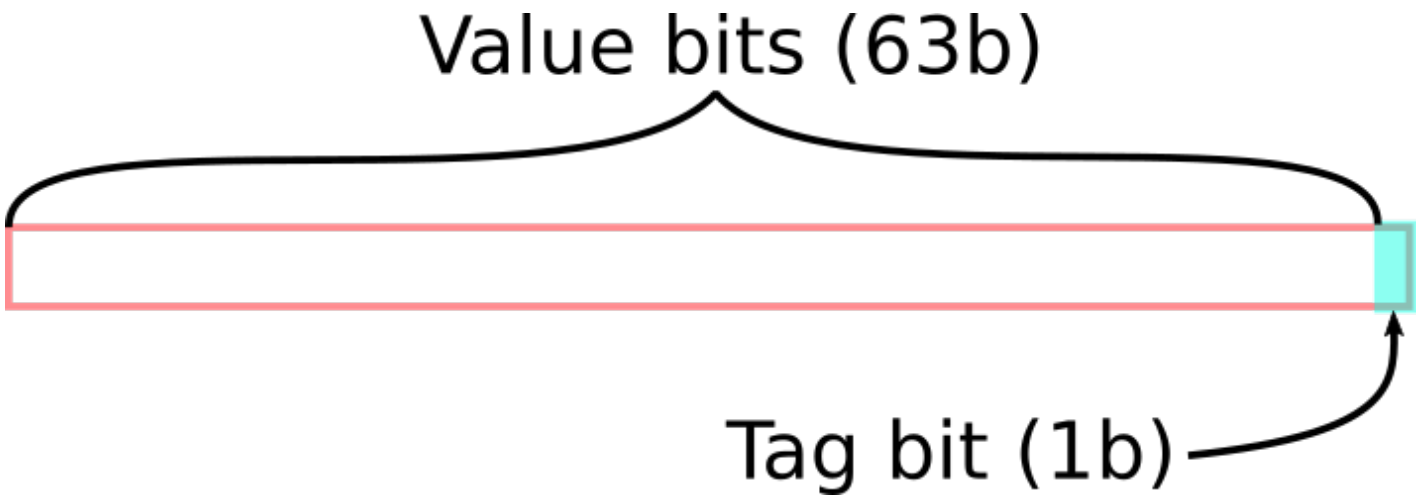

Tag your int

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- We have to choose: which type gets **1**?

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- We have to choose: which type gets **`1`**?
- Either can work, but we'll argue that **`booleans`** should get the **`1`**

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  - Runtime system?

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- What does this imply about our
  - Runtime system?
  - Compiler?

Let’s take a look at the RTS and compiler

Assignment 3

- Will go live tomorrow
  - Please tell your fellow students to check the webpage periodically
  - If there are any issues that might make you unable to do the assignment on time, *talk to me*