Hot topics, round 1

...

~spicy~

News flash

- Hackers Hijack Google's DoubleClick Advertisement System On YouTube For Cryptocurrency Mining (link)
- Microsoft issues emergency Windows patch to disable Intel's buggy Spectre fix (link)
- Trump administration is considering nationalizing 5G mobile network (link)
- Mac kernel bug (lobste.rs) (HN)
- Strava heatmap can be used to locate military bases (link)
- The Register (as a site) (link)

Compilers

and Programming Languages

What is a programming language?

- “A programming language is a **formal language** that specifies a **set of instructions** that can be used to produce **various kinds of output**.” — Wikipedia
- Many different styles (procedural, imperative, object-oriented, array-based, functional, logic)
- Different goals and guarantees

Why are there so many languages?

- FORTRAN (1954)
- IPL (1954) -> LISP (1958) -> Scheme (1975) -> Common Lisp (1984)
- APL (1962) -> KDB/K -> Q -> J
- BASIC (1964)
- BCPL (1967) -> B (1969) -> C (1972) -> C++ (1980) -> Objective C (1986) -> Go
- Pascal (1970)
- Forth (1970)
- Smalltalk (1972) -> Ruby (1995)
- Prolog (1972)
- ML (1973) -> OCaml -> F# -> Haskell (1990)
- SQL (1978)
- Perl (1987)
- Coq (1989)
- Python (1991)
- Java (1995) -> C# (2000)
- JavaScript (1995)
- PHP (1995)
- D (2001)
- Scala (2003)
- Rust (2010)

Where do they come from?

- Single developer (Python, Ruby)
- Company requirements (C, C#, F#, Go, Reason)
- Research labs (Scala, Haskell, Racket, OCaml)
- France, for some reason

What is a compiler? Why do we need them?

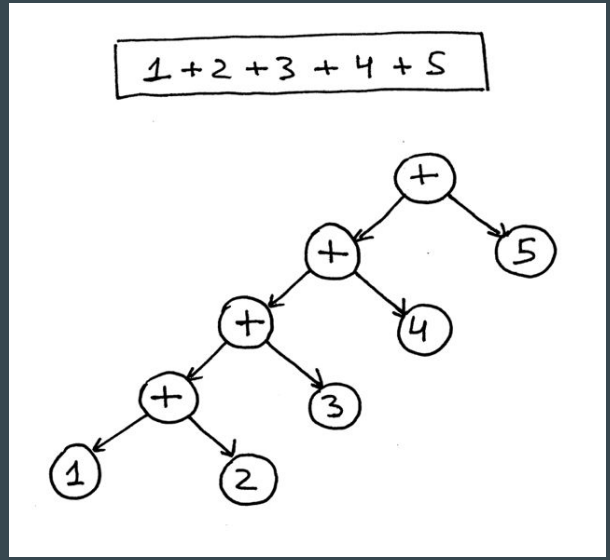
- Translates a program from one language (A) into another (B)
  - “transpiler” is just another term for “compiler”
- Generally involves some amount of “lowering”
- How the hell does a computer that only knows about numbers do everything else?

Why are they so goddamn cool?

- Create your own little world with rules
- All programming languages are awful
- You can finally fix that itch you've been wanting to scratch

The compilation process

1. Text
2. Abstract Syntax Tree
3. [various intermediate trees]
4. Assembly code
5. Machine code



Day to day

1. Walk into work
2. Check work email
3. Check if there are any new GitHub issues
4. Try and remember what I was doing yesterday because I was halfway through writing a variable name
5. Spend 6-8 hours trying to figure out why my compiler won't compile
    a. Eat lunch somewhere in there
6. Go home having accomplished one small incremental thing

Domain-Specific Languages

- Sometimes, people need a language for their particular field
- People who need to do a lot of stats made R
- People who write a lot of code for moving large machine arms use Gcode
- People who write compilers use StandardML/OCaml/Haskell
    - Or C, if they hate themselves

Research topics

- Formal verification
  - How can I prove that my program does what I think it does?
- Better static analysis
  - Types
  - Algorithmic complexity (???)
- New architectures (Tensors, etc)

- Coding Machines (link)

Web Programming

Overview

- Most marketable computer science skill
- “The New Blue Collar”
- Many resources online
- Rapidly growing, just like many other disciplines
- Opportunity to work with a wide breadth of technologies

Lots of different areas

- Front-end
- Back-end
- Databases

Key Players

- HTML
- CSS
- JavaScript
- Web Frameworks
- Databases

HTML

The language for building web pages

LEARN HTML | HTML REFERENCE

HTML Example:

```
<!DOCTYPE html>
<html>
<title>HTML Tutorial</title>
<body>

<h1>This is a heading</h1>
<p>This is a paragraph.</p>

</body>
</html>
```

Try it Yourself »

CSS Example:

```
body {
    background-color: lightblue;
}
h1 {
    color: white;
    text-align: center;
}
p {
    font-family: verdana;
    font-size: 20px;
}
```

Try it Yourself »

CSS

The language for styling web pages

LEARN CSS | CSS REFERENCE

JavaScript

The language for programming web pages

LEARN JAVASCRIPT | JAVASCRIPT REFERENCE

JavaScript Example:

```
<script>
function myFunction() {
    var x = document.getElementById("demo");
    x.style.fontSize = "25px";
    x.style.color = "red";
}
</script>

<button onclick="myFunction()">Click Me!</button>
```

Try it Yourself »

Resources

- Mozilla Developer Network for looking up syntax and tutorials
- GitHub Pages for hosting your websites with just a GitHub repository.
- Gist for links to anything web dev-related.