Lecture 2

Compiling

- We can run our source code in two ways:
  - Compiling:
    ```
    clang -o hello hello.c
    ./hello
    ```
  - Interpreting:
    ```
    python3 hello.py
    ```
- We compiled C with `clang`. Using the `-o` option to tell the compiler what name we want for the executable program with `clang`.
- When it compiled our program into a machine language, it saved it in a file called `hello` in `~/Desktop/`.
- Then we ran our program by typing `./hello`, telling the terminal to run the program `hello` in the current directory.
- Compiling C is a two-step process:
  - Compiling our source code into machine code, and saving it into a file called `hello`.
  - Linking: C programs can use functions from other libraries, such as `printf` from `stdio`. The linker combines the `hello` program with the `stdio` library to create a single executable file `hello`.
- Compiling Python is a single step:
  - Interpreting: Python's interpreter reads in our source code `hello.py` and immediately starts running it.
- Compiling C is more complicated than interpreting Python, but it's also much faster. Because compiling C creates a machine language version of our program, our computer can run our program without any more translation. Plus, compiling automatically finds certain kinds of bugs in our code for us, but only some kinds of bugs. Interpreting Python is more forgiving, but it's also slower.
- Compiling C also allows us to use more libraries and more of the OS's features.
- Compiling C also allows us to use other languages than just Python, such as Rust, Go, and Swift.
- Compiling C also allows us to use more powerful versions of Python, such as Cython.
- Compiling C also allows us to use other features of our computer, such as:
  - Multi-core processors
  - Graphics processing units (GPUs)
  - Networks
  - Sensors
  - Other peripherals
- Compiling C also allows us to write our own libraries for others to use.
- Compiling C also allows us to write our own interpreters for other languages, such as Python, Ruby, and PHP.
- Compiling C also allows us to write our own compilers for other languages, such as Rust, Go, and Swift.
- Compiling C also allows us to write our own operating systems, such as Linux, macOS, and Windows.
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