Electrical & Computer ENGINEERING

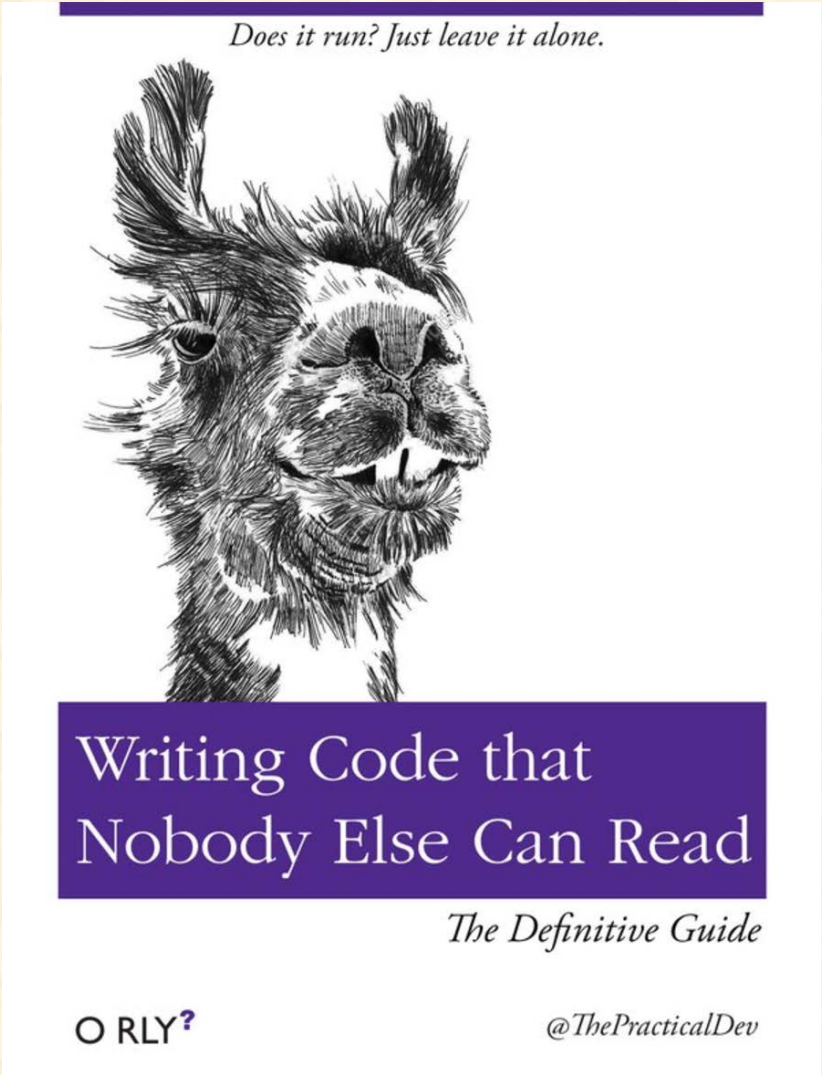
18-642:
Code Style for Humans

2/5/2018

Any fool can write code that a computer can understand. Good programmers write code that humans can understand.

– Martin Fowler

Carnegie Mellon University



“Always code as if the guy who ends up maintaining your code will be a *violent psychopath* who knows where you live.

Code for readability.”

(Author unclear)

Coding Style: Understandability

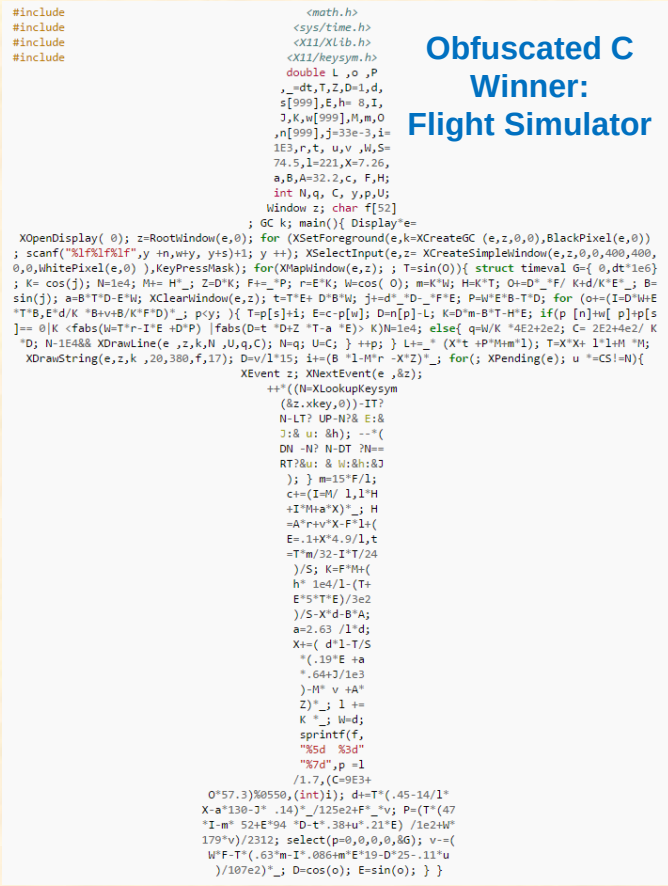
- **Anti-Patterns:**
  - **"Style doesn't matter; it passes all the tests"**
  - **Code that is clever instead of clear**

> "There are two ways of constructing a software design: one way is to make it so simple that there are **obviously no deficiencies** and the other way is to make it so complicated that there are **no obvious deficiencies**."
>
> — C.A.R. (Tony) Hoare, 1980 Turing Award Talk

- **Other people must understand your code**
  - Peer reviews won't work if nobody can read your code
    - Write code so that others can tell it is obviously correct
  - If others can't understand it, they will inject bugs
  - If you have to think about whether it's right, then it's wrong

Make Code Easy To Read

- **Consistent formatting**
  - Consistent indentation, braces
  - Templated headers for files and functions
  - Spaces and “()” to avoid precedence confusion
  - Use space instead of tab
- **Comments**
  - Explain what & why, not just code paraphrase
  - Comments are not a design
- **Naming**
  - Descriptive, consistent naming conventions
    - E.g., variables are nouns; functions are verbs
- **Avoid magic numbers (use const)**
  - Avoid macros (use inline)



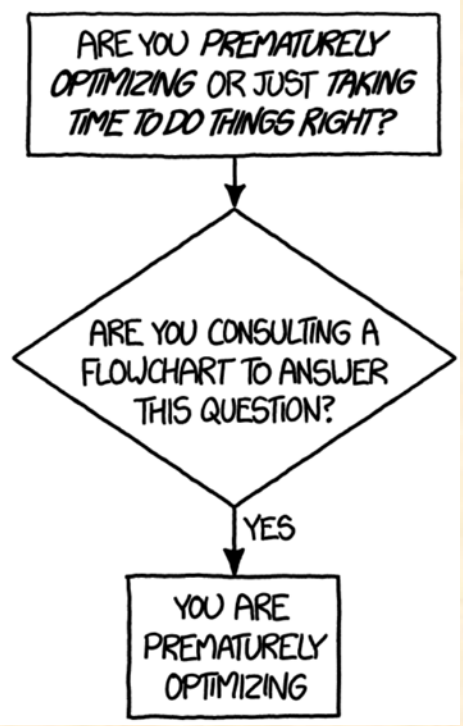
Good Code Hygiene

- **Modularity**
  - Many smaller .c/.cpp files (one per class)
  - Externally visible declarations into .h file
- **Conditional Statements**
  - Boolean conditional expression results; no assignments
  - All switch statements have a default (usually error trap)
  - Limited nesting (see also cyclomatic complexity)
- **Variables**
  - Descriptive names that differ significantly
  - Smallest practicable scope for variables; initialize at point of definition
  - Use typedefs to define narrow types (also use uint32_t, use enum, etc.)
  - Range checks & bounds checks (e.g., buffer overflow)
- **Handle errors returned by called functions**

Optimization

"We should forget about small efficiencies, say about 97% of the time: premature optimization is the root of all evil. Yet we should not pass up our opportunities in that critical 3%"

- Donald Knuth (December 1974). "Structured Programming with go to Statements". ACM Journal Computing Surveys 6 (4): 268.



https://xkcd.com/1691/

- **Don't optimize unless you have performance data**
  - Most code doesn't matter for speed
  - Use little or no assembly language. Get a better compiler.
- **Optimization makes it hard to know your code is right**
  - Do you want correct code or tricky code?
    - (Pick one. Which one is safer?)
  - Buy a bigger CPU if you have to

Coding Understandability Best Practices

- **Pick a coding style and follow it**
  - Use tool support for language formatting
  - Evaluate naming as part of peer review
  - Comments are there to explain implementation
- **The point of good style is to avoid bugs**
  - Make it hard for a reviewer to miss a problem
    - Even better, make it easy for a tool to find problem
  - Also need to have a good technical style
- **Coding style pitfalls:**
  - Optimizing for the author instead of the reviewer
  - Making it too easy to deviate from style rules

Great style depends upon point of view.