

# 18-642:

# Code Style for Humans

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

– Martin Fowler

Carnegie  
Mellon  
University

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*Does it run? Just leave it alone.*



## Writing Code that Nobody Else Can Read

*The Definitive Guide*

**“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

Obfuscated C  
Winner:  
Flight Simulator

```
#include <math.h>
#include <csys/time.h>
#include <X11/Xlib.h>
#include <X11/keysym.h>
double L , o , P
, _=dt, T, Z, D=1, d,
s[999], E, h= 8, I,
J, K, w[999], M, m, O
, n[999], j]=33e-3, i=
1E3, r, t, u, v, M, S=
74.5, l=221, X=7.26,
a, B, A=32.2, c, F, H;
int N, q, C, Y, p, U;
Window z; char f[52]
; GC k; main(){ Display*=
XOpenDisplay( 0); z=RootWindow(e,0); for (XSetForeground(e,k=XCreateGC (e,z,0,0),BlackPixel(e,0))
; scanf("%i%f%i%f",y +n,w,y, y+s)+1; y ++); XSelectInput(e,z= XCreateSimpleWindow(e,z,0,0,400,400,
0,0,WhitePixel(e,0) ),KeyPressMask); for(XMapWindow(e,z); ; T=sin(0)){ struct timeval G={ 0,dt*1e6}
; K= cos(j); N=1e4; M+= H"; Z=D*K; F+= "P; r=E*K; W=cos( 0); m=K*W; H=K*T; O+=D" *F/ K+d*K"E"; B=
sin(j); a=B*T*D-E*H; XClearWindow(e,z); t=T*E+ D*B*W; j+=d" *D- _F*E; P=W*E*B-T*D; for (o=(I-D)*W*E
**B,E*d/K *B+v+B*K*F*D" ); p<y; ){ T=p[s]+1; E=c-p[w]; D=n[p]-L; K=D*m-B*T*H*E; if(p [n][w] [p]+[S
] += 0|K <fabs(W+T*r-I*E +D*P) |fabs(D= T *D *A *E) K|N=1e4; else{ q=w/K *4E2+2e2; C= 2E2+4e2|K
*D; N-1E4&& XDrawLine(e ,z,k,N ,U,q,C); N=q; U=C; } ++; } L+= " (X*t +P*M+m*1); T=X*X+ 1*1*H *M";
XDrawString(e,z,z ,20,380,f,17); D=w/1*15; i+= (B *1*M*r -X*Z)" ; for( ; XPending(e); u =CS1=N){
XEvent z; XNextEvent(e ,&z);
++*((N=XLookupKeysym
(&z ,Xkey,0) )-IT?
N-L? UP-N?E :&
J:& u: &h); --*(
DN -N? N-DT ?N=
RT?&u: & h:&h:&J
); } m=15*F/1;
c+=(I-M/ 1,1*H
+I*H*a*X)" ; H
=A*r+v*X-F*1+(
E=.1+X*4.9/1,t
=T*m/32-I*T/24
)/S; K=F*M+(
h" 1e4/1-(T+
E*5*T*E)/3e2
)/S-X*d-B*A;
a=2.63 /1*d;
X+=( d*1-T/S
*(.19*E +a
+.64+7/1e3
)-M" v +A*
Z)" ; l +=
K * ; W=d;
sprintf(f,
"%5d %3d"
"%7d",p -1
/1.7,(C+9E3+
O*57.3)%0550,(int)i); d+=T*(.45-14/1*
X-a*130-3* .14)"_/125e2+F" *v; P=(T*(47
*I-m 52+E*94 *D-t.38+u*.21*E) /1e2*H*
179*v)/2312; select(p=0,0,0,86); v-=(
W*F-T*(.63*m-I*.086+m*E*19-D*25-.11*u
)/107e2)" ; D=cos(o); E=sin(o); } }
```

## 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%"

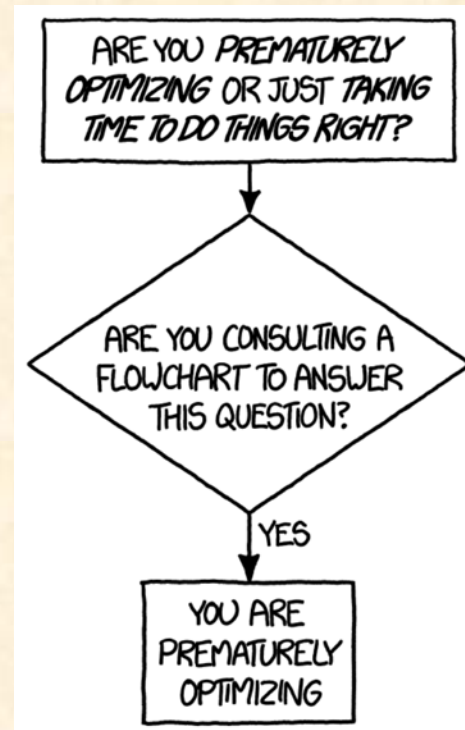
- Donald Knuth (December 1974). "Structured Programming with go to Statements". ACM Journal Computing Surveys 6 (4): 268.

## ■ 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



<https://xkcd.com/1691/>

# 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.**

