How designing an

Arduino Boot Camp!

inspired me to think about code

(it really did!)

Slides prepared for:

GDGPH Hack Fair - December 19, 2015

The Mind Museum Taguig, Manila

Hello! I am Mithi!

Hello! I am Mithi!

I graduated from BS Electronics and Communication Engineering in UP Diliman sometime ago...

I am also one of the co-founders of Nanica.io, a young and small robotics education start-up.

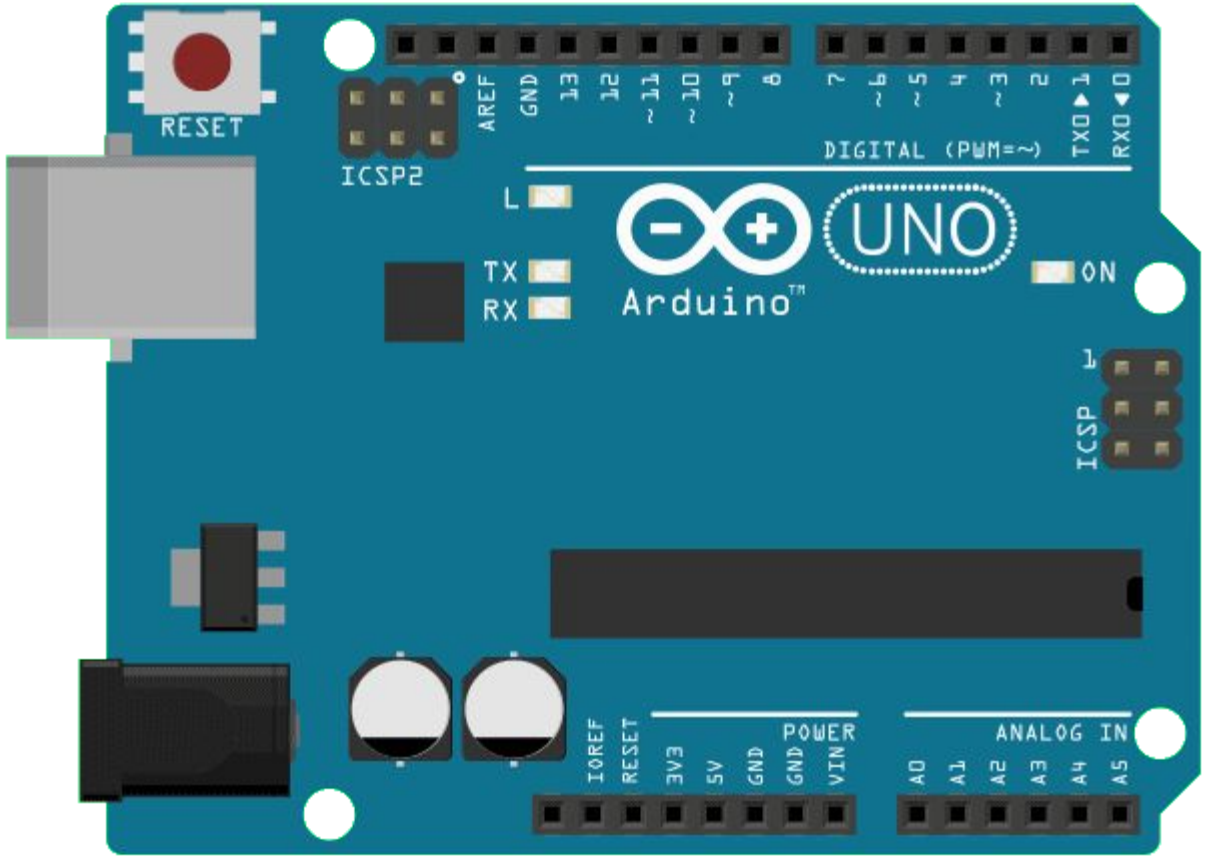
Here are a few things we do at Nanica.io

(it’s video time, guys!)

Our most recent project is

Arduino Boot Camp:

A Different Approach!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A few cool Arduino projects:

turn signal biking jacket

by leahbuechley in Arduino

Show All Items

The EyeWriter is a low-cost eye-tracking apparatus + custom software that allows graffiti writers and artists with paralysis resulting from Amyotrophic Lateral Sclerosis to draw using only their eyes.

WE ASKED FOR IT — AN ARDUINO BOWEL GAUGE

by: James Hobson

50 Comments

March 18, 2014

Well, we asked for it, and [TV Miller] delivered this hilarious and surprisingly accurate bowel gauge.

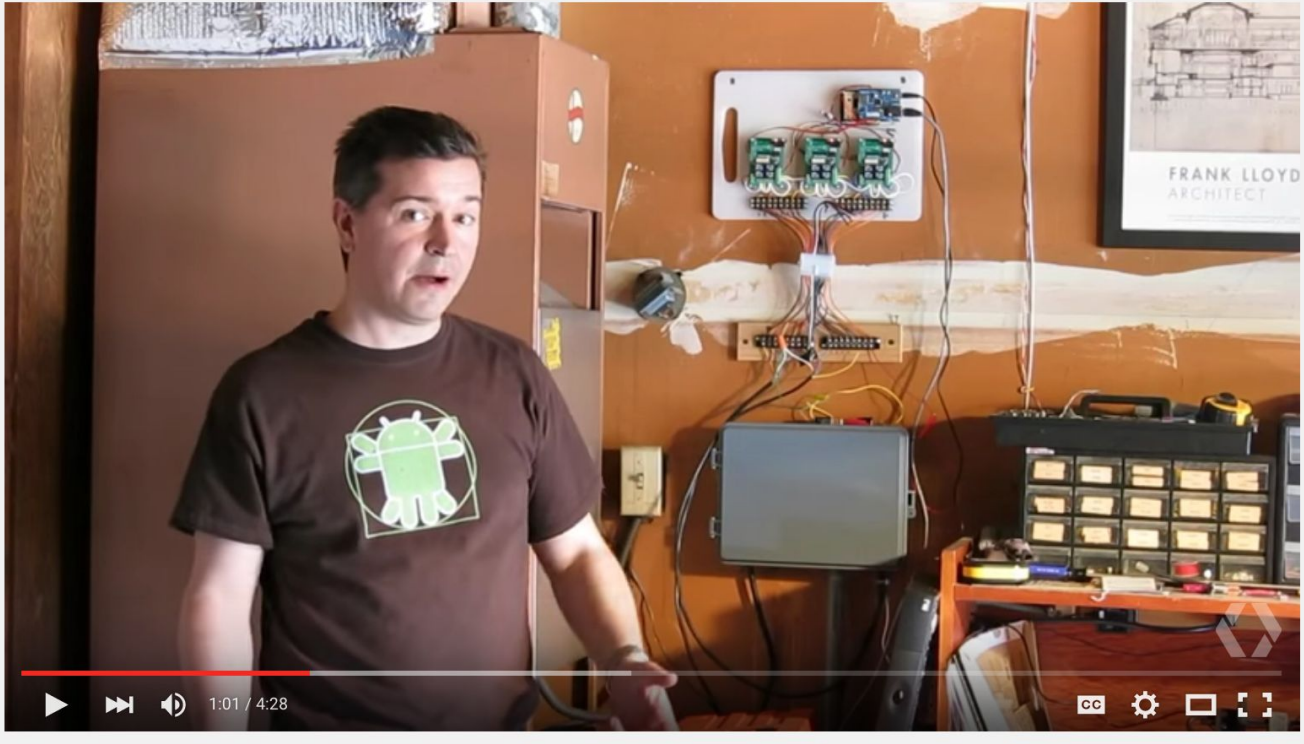
Between our recent Wiping Your Bum with an Arduino feature and how to Measure Poop for a Better Sanitation Service, we guess we should have seen this coming. And you know what? It's pretty awesome.

Giving “sight” to the blind with Arduino *and* the human tongue

Tongueduino.

When a person loses the ability to see, the senses of hearing, touch, and smell are relied on even more to navigate one's surroundings. But the tongue could be used for the same purpose, with the help of an Arduino-fueled contraption called the Tongueduino.

Devised by MIT researcher Gershon Dublon, Tongueduino sends information to a pad that has electrodes spread across a grid. This pad is placed into the user's mouth. "When hooked up to an electronic sensor, the pad converts signals from the sensor into small pulses of electric current across the grid, which the tongue 'reads' as a pattern of tingles," *New Scientist* reported in February.



Irrduino: A Sprinkler System Built Using Arduino, Android, Google App Engine, Python, and Dart

Google Developers

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29,105

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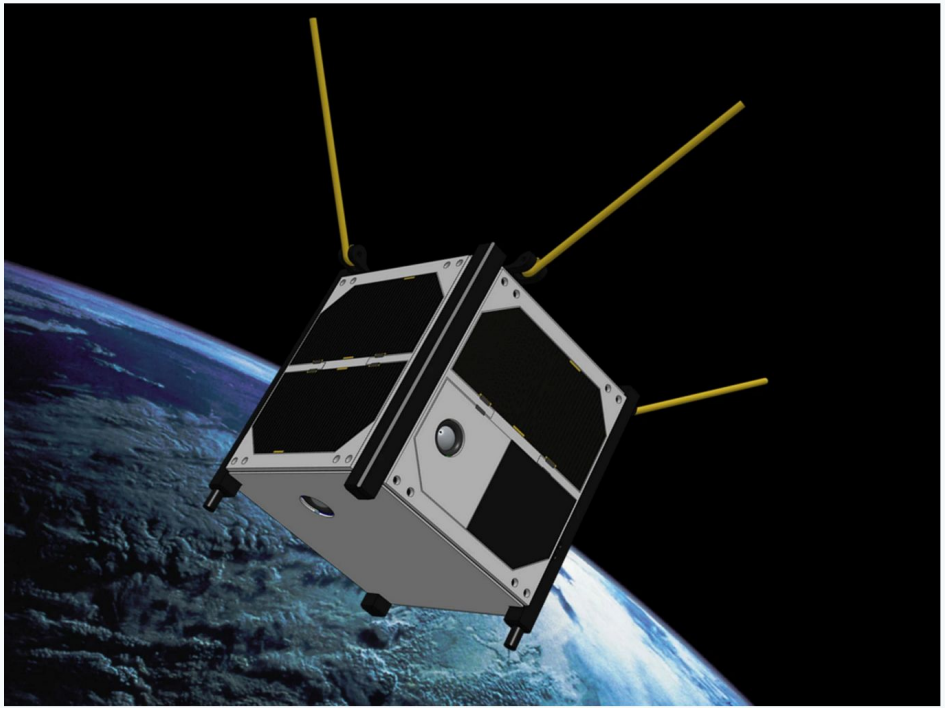
245 4

ArduSat - Your Arduino Experiment in Space



We love Arduino and we love space exploration. So we decided to combine them and let people run their own space experiments!

Created by

ppl4world

676 backers pledged $106,330 to help bring this project to life.

Our most recent project is

Arduino Boot Camp:

A Different Approach!

I designed it with <3 (love)

for beginners and intermediate Arduino users

You can find it at:
http://
ArduinoBootCamp.xyz

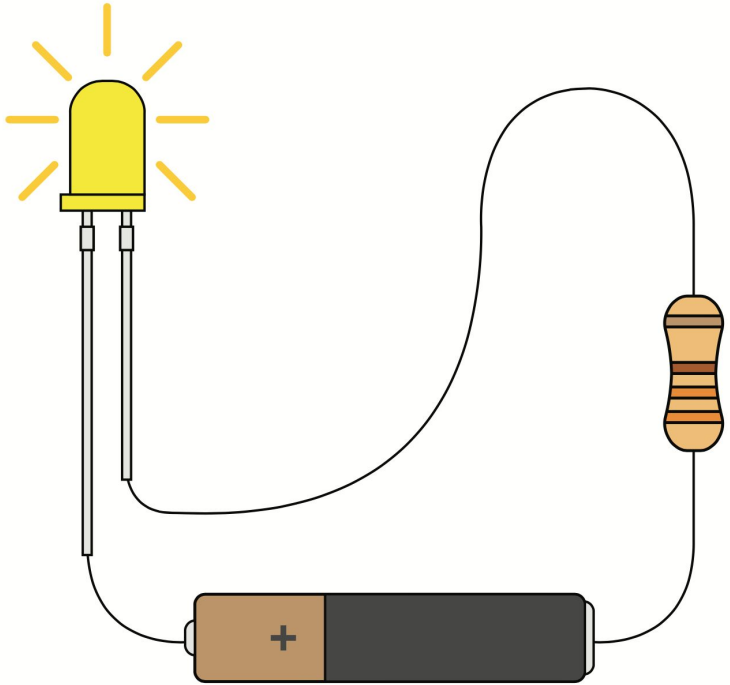
It’s NOT your usual Basic Arduino Workshop >_<

How?

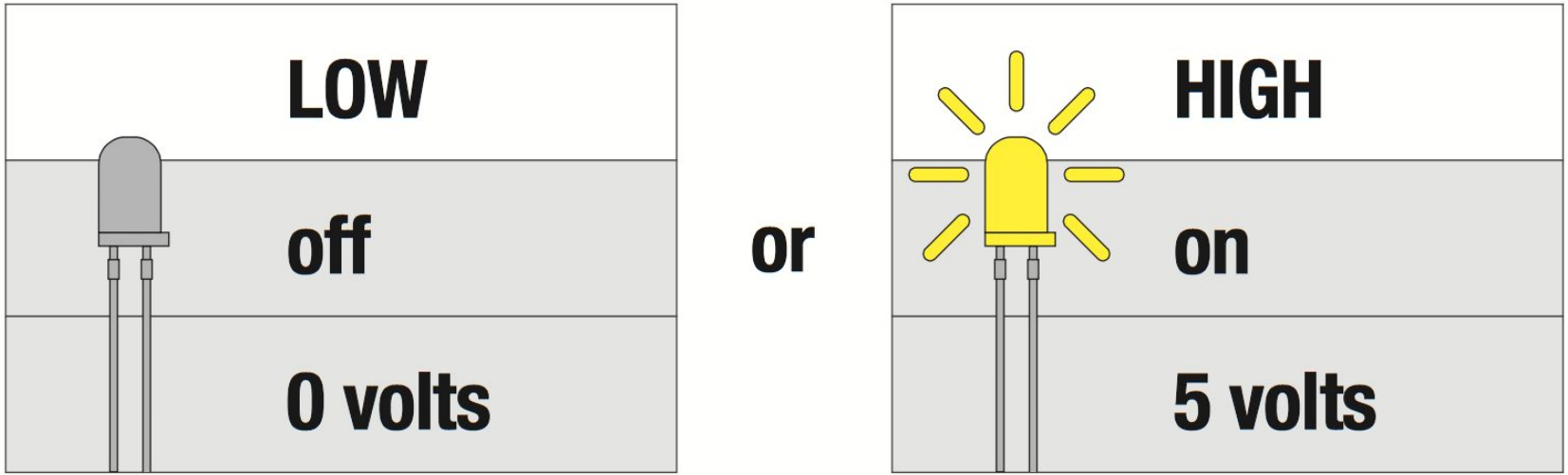
Well, let me give you an example.

Usually, in beginner workshops, you are taught the following:

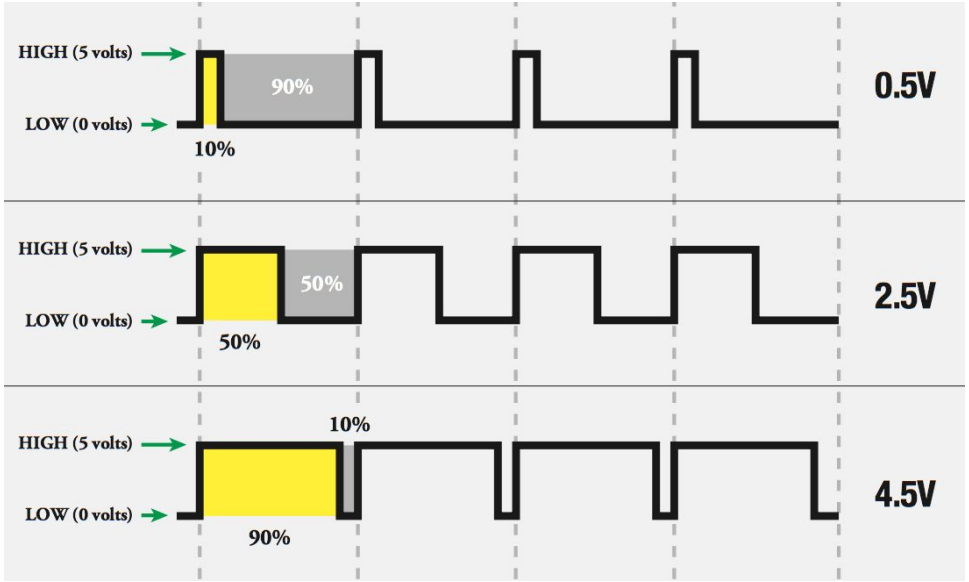
ONE: How to blink an LED



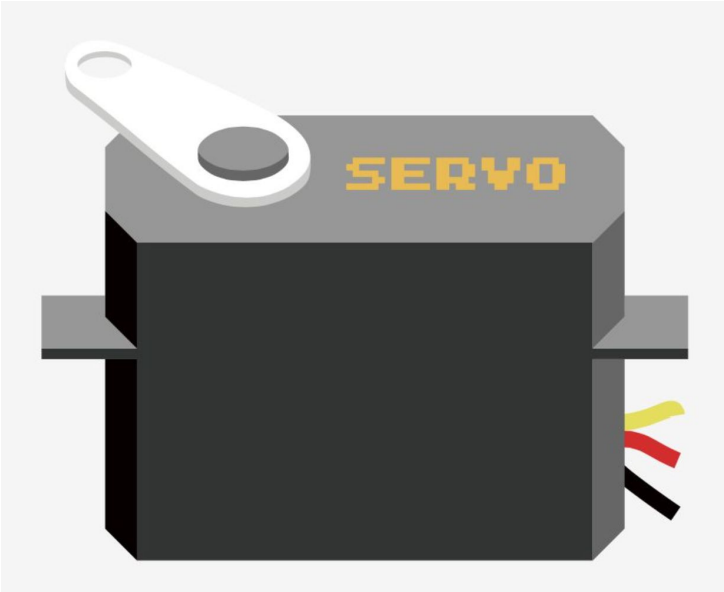
TWO: How to blink an LED without `delay()`



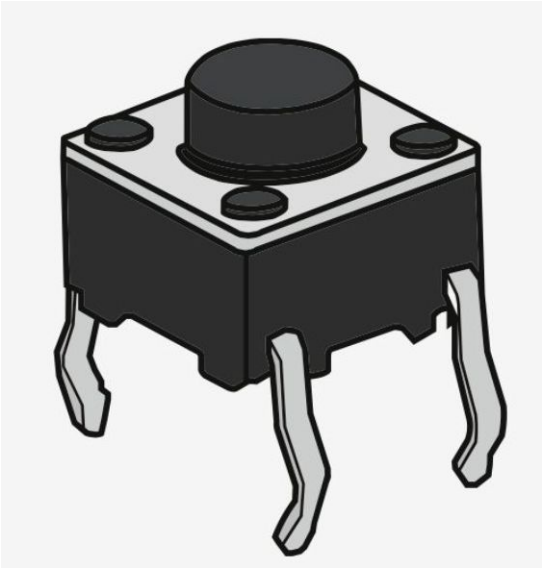
THREE:How to make a breathing LED



FOUR: How to sweep a servo back and forth



FIVE: How to light an LED with a debounced button



This is how the official Arduino website teaches you how to blink an LED...

```
  digitalWrite(13, HIGH);
// turn the LED on (HIGH is the voltage level)
  delay(1000);
// wait for a second
  digitalWrite(13, LOW);
// turn the LED off by making the voltage LOW
  delay(1000);
// wait for a second
```

We prefer to do it like this:

```
led.Toggle();
delay(1000);
```

This is how the official Arduino website teaches you how to blink an LED without `delay()`...

```
unsigned long currentMillis = millis();

if(currentMillis - previousMillis >= interval)
{

    previousMillis = currentMillis;

    if (ledState == LOW)
      ledState = HIGH;
    else
      ledState = LOW;

    digitalWrite(ledPin, ledState);
}
```

We prefer to do it like this:

```
if(metronome.Tick())
  led.Toggle();
```

This is how the official Arduino website teaches you how to make a breathing LED...

```
int fadeValue;

for(fadeValue=0; fadeValue<=255; fadeValue+=5)
{
    analogWrite(ledPin, fadeValue);
    delay(30);
}

for(fadeValue=255; fadeValue>=0; fadeValue-=5)
{
    analogWrite(ledPin, fadeValue);
    delay(30);
}
```

We prefer to do it like this:

```
led.Set(sweeper.Next(metronome.Tick()));
```

```
if (metronome.Tick())
  led.Set(sweeper.Next(1));
```

This is how the official Arduino website teaches you how to sweep a servo...

```
for (pos = 0; pos <= 180; pos += 1) {
  servo.write(pos);
  delay(15);
}

for (pos = 180; pos >= 0; pos -= 1) {
  servo.write(pos);
  delay(15);
}
```

We prefer to do it like this:

```
if (metronome.Tick()):
  servo.write(sweeper.Next(1));
```

```
servo.write(sweeper.Next(metronome.Tick()));
```

This is how the official Arduino website teaches you

how to light an LED with a debounced button...

```
int reading = digitalRead(buttonPin);
if (reading != lastButtonState) {
  lastDebounceTime = millis();
}
if ((millis() - lastDebounceTime) >
debounceDelay) {
  if (reading != buttonState) {
    buttonState = reading;
    if (buttonState == HIGH)
      ledState = !ledState;
  }
}
digitalWrite(ledPin, ledState);
lastButtonState = reading;
```

We prefer to do it like this:

```
button.Pressed() ? led.On() : led.Off();
```

Basically, it's different because it emphasizes the following things immediately:

ONE: CLEAN READABLE CODE

TWO: BASIC OBJECT-ORIENTED DESIGN

THREE: REDUCED USAGE OF `delay()` so you can multi-task anytime.

BUT HOW DO YOU DO THAT????!?

The obvious message here is how you can use the power of OOP design thinking...

... to abstract implementation details...

... so that you can focus at the things you want to do.

You get the beneficial side-effects as well:

Code that is easy to understand.

Code that is easy to debug.

Code that is multi-tasking ready.

Code that is scalable.

Easily add as many buttons and LEDs as the Arduino can allow.

Code that allows more complex behavior.

Add more features and functions without overwhelming yourself.

BUT…
HOW DO YOU DO THAT *EXACTLY* ????!?

The first step is to identify the **OBVIOUS** objects

LED, BUTTON, and SERVO

(the Arduino already has a built-in servo class in one of its libraries)

```
DigitalOutput led;

led.New(int pin);
led.On();
led.Off();
led.Toggle();
led.Set(int brightness);
```

```
Button button;

button.New(pin, debounceTime);
bool state = button.Pressed();
```

The next step is to identify not so obvious objects

```
sweeper.New(x1, x2, inc, type);
sweeper.Next(0/1);

// type = BACKANDFORTH/NORMAL
/* if 0, returns current state
** if 1, updates to and return
** next state */
```

```
metronome.New(milliSeconds)
bool hasTicked= metronome.Tick()
```

You can use sweeper in myriad applications…

not just servos and LEDs…

You can use this to toggle buttons, play tunes, do countdowns...

and even do away with long subroutines because of for-loops.

Using metronome instead of `delay()`, you get a more readable code that's even multi-tasking ready.

You can even sweep multiple servos….

...blink and sweep multiple LEDs...

...(simultaneously, and at different rates)...

...while catching as many buttons as you wish...

...without making your code a nightmare.

You can even sweep multiple servos, blink and sweep multiple LEDs, (simultaneously, at different rates) while catching as many buttons as you wish, without making your code a nightmare.

Awesome right?!!

But wait...

...what about performance?

Only sacrifice readability for performance if you have measured that your code is too slow for its intended use.

Premature optimization is the root of all evil.

-Sir Tony Hoare

Programs must be written for people to read, and only incidentally for machines to execute.

-Harold Abelson

Structure and Interpretation of Computer Programs

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

-Martin Fowler

Refactoring: Improving the Design of Existing Code

If the computer doesn't run it, it's broken. If people can't read it, it will be broken. Soon.

-Some Random Guy (or girl?) in Stack Overflow

Correct.
Beautiful.
Fast.
(in that order)
-Elliot Rusty Harold

I hope to dispel the myth that fast code must be illegible ugly code...

-Elliot Rusty Harold

...improvement in beauty can also lead to improvement in speed.

-Elliot Rusty Harold

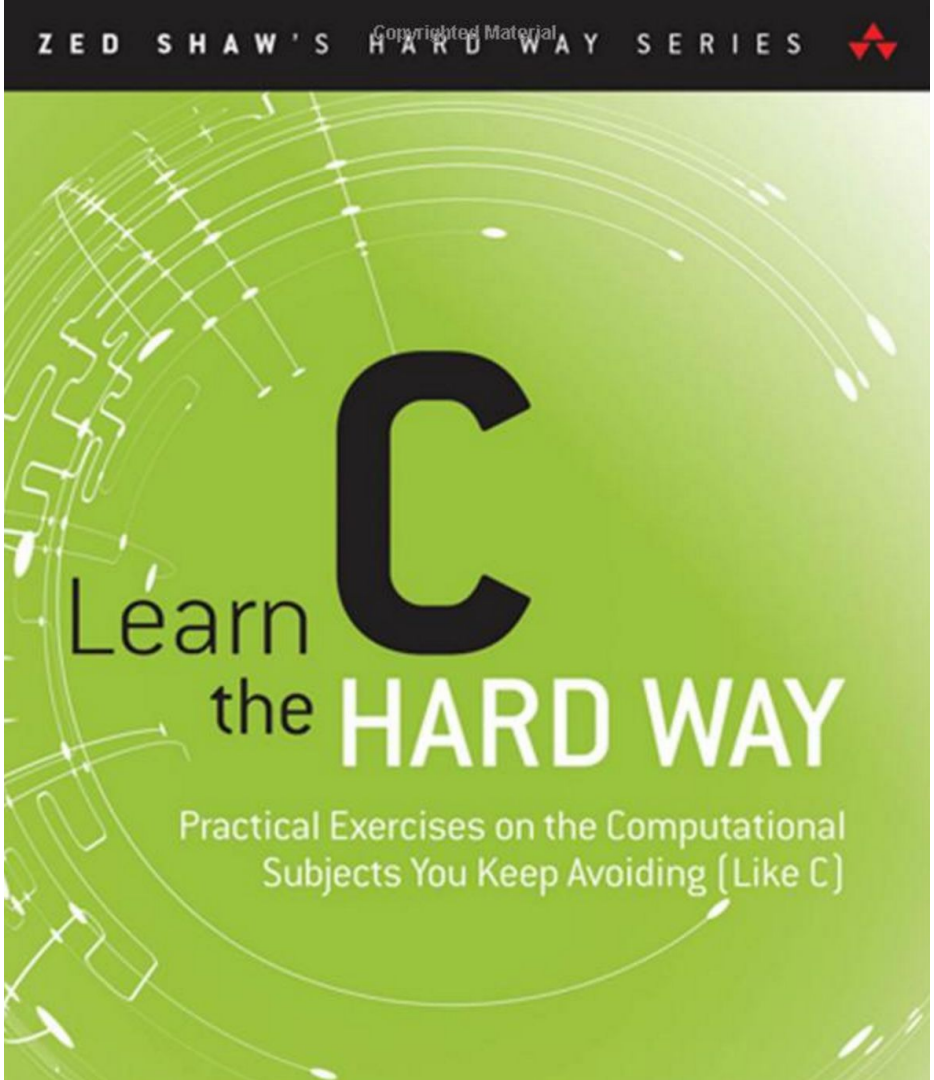
One more thing though...

No code is God ;)

C PROGRAMMING LANGUAGE

BRIAN W. KERNIGHAN
DENNIS M. RITCHIE

ZED SHAW'S HARD WAY SERIES



Learn C the HARD WAY

Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)

Tim Hentenaar's Blog

Jan 29, 2015 14:45

Don't Learn C the Wrong Way

Taking Down Tim Hentenaar

There is a blog post by Tim Hentenaar that says that people should not read my book, Learn C The Hard Way. It has the title “Don’t Learn C The

Teach Yourself Programming in Ten Years

Peter Norvig

Why is everyone in such a rush?

Walk into any bookstore, and you'll see how to *Teach Yourself Java in 24 Hours* alongside endless variations offering to teach C, SQL, Ruby, Algorithms, and so on in a few days or hours. The Amazon advanced search for [title: teach, yourself, hours, since: 2000 and found 512 such books. Of the top ten, nine are programming books (the other is about bookkeeping). Similar results come from replacing "teach yourself" with "learn" or "hours" with "days."

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CODING HORROR
programming and human factors

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21 Jul 2009

Nobody Hates Software More Than Software Developers

In short, I hate software – most of all and *especially* my own – because **I know how hard it is to get it right**. It may sound strange, but it's a natural and healthy attitude for a software developer. It's a bond, a rite of passage that you'll find all competent programmers share.

the clever tricks in our books to make the code fit into less physical space. **I'm talking about practical, sensible strategies to reduce the volume of code an individual programmer has to read to understand how a program works.** Here's a trivial little example of what I'm talking about:

```
if (s == String.Empty)
if (s == "")
```

It seems obvious to me that the latter case is better because it's just plain *smaller*. And yet I'm virtually guaranteed to encounter developers who will fight me, almost literally to the death, because they're absolutely convinced that the verbosity of String.Empty is somehow friendlier to the compiler. As if I care about that. As if *anyone* cared about that!

David Parnas explained in an interview:

> Q: What is the most often-overlooked risk in software engineering?
>
> A: Incompetent programmers. There are estimates that the number of programmers needed in the U.S. exceeds 200,000. This is entirely misleading. It is not a quantity problem; we have a quality problem. One bad programmer can easily create two new jobs a year. Hiring more bad programmers will just increase our perceived need for them. If we had more good programmers, and could easily identify them, we would need fewer, not more.

If there’s anything I hope you take home from this talk...

Two things!

First thing...

I hope it reminds you to design your code not only to *work* but also to be *easily understood* by others…
(and yourself!)

Second thing...

Second thing...
(and more important thing!)

I hope you tell your friends about

http://

ArduinoBootCamp.xyz!

hehehehe :)))

Thank you
for listening!
:)