

Is there life
after code?



BALL STATE
UNIVERSITY

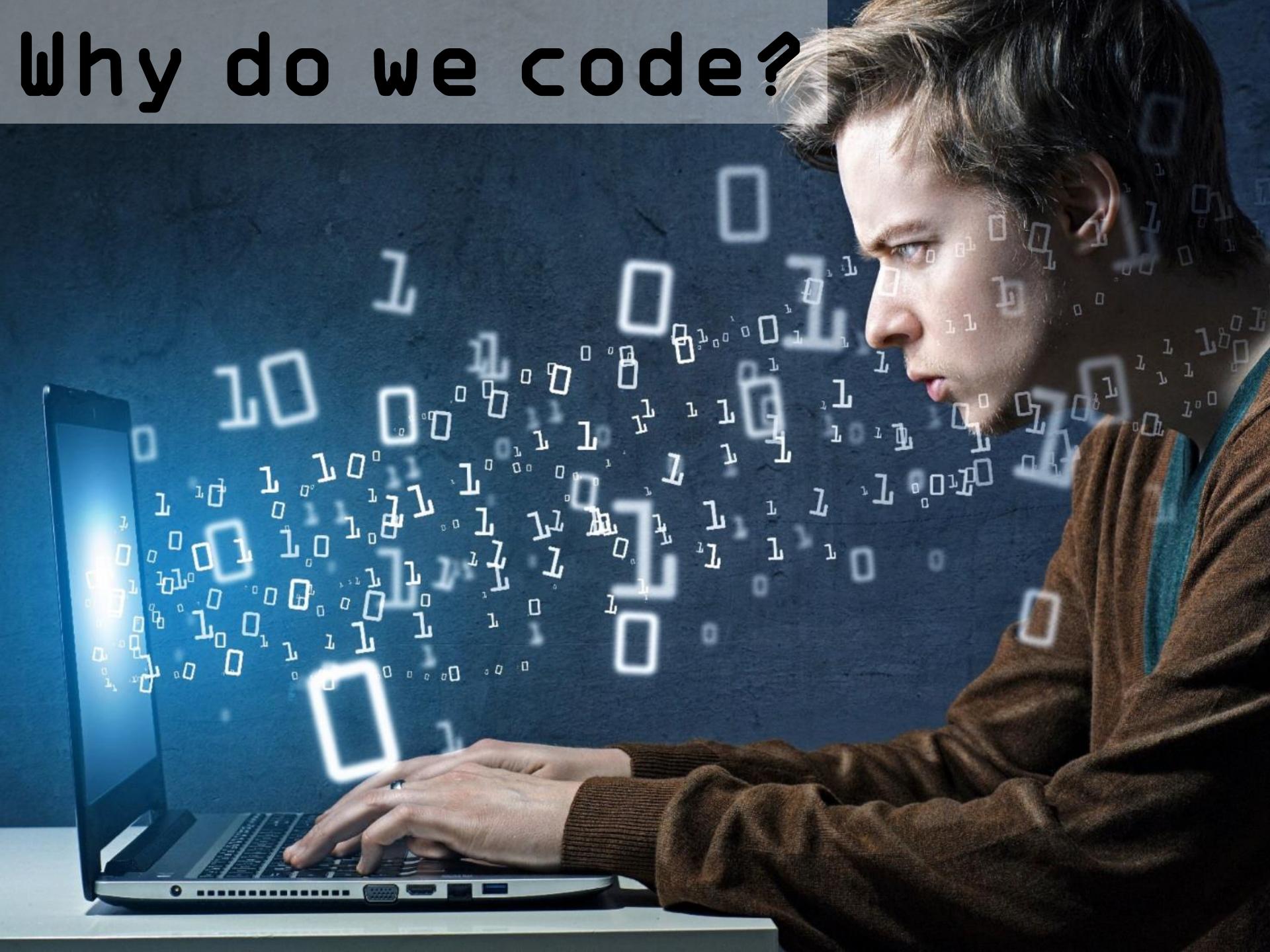
Computer Science Colloquium Series 2017-18:
Huseyin Ergin, PhD

What is code?

A close-up photograph of a computer monitor displaying a large amount of programming code. The code is written in a script-like language, possibly JavaScript, and is color-coded for syntax highlighting. The visible text includes various functions, variables, and operators. The background is dark, and the colors of the code (red, blue, green, yellow) are sharp against the dark background, while the individual lines of text are blurred due to the shallow depth of field.

```
function use_array(a, b) {  
    var c = -1, d = 0;  
    for (var e = 0; e < a.length; e++) {  
        if (a[e] === b) {  
            c++;  
            d++;  
        }  
    }  
    return c / d;  
}  
function sort(a) {  
    var b = a.length;  
    if (b > 1) {  
        var c = Math.floor(b / 2);  
        var d = a.slice(0, c);  
        var e = a.slice(c);  
        d = sort(d);  
        e = sort(e);  
        a = merge(d, e);  
    }  
    return a;  
}  
function merge(d, e) {  
    var f = d.length + e.length;  
    var g = new Array(f);  
    var h = 0, i = 0, j = 0;  
    while (h < f) {  
        if (i < d.length & j < e.length) {  
            if (d[i] < e[j]) {  
                g[h] = d[i];  
                i++;  
            } else {  
                g[h] = e[j];  
                j++;  
            }  
        } else if (i < d.length) {  
            g[h] = d[i];  
            i++;  
        } else {  
            g[h] = e[j];  
            j++;  
        }  
        h++;  
    }  
    return g;  
}  
function keyword(a, b) {  
    var c = a.length;  
    var d = a.indexOf(b);  
    if (d > -1) {  
        return true;  
    }  
    return false;  
}  
function keyword(a, b) {  
    var c = a.length;  
    var d = a.indexOf(b);  
    if (d > -1) {  
        return true;  
    }  
    return false;  
}
```

Why do we code?



We want to change the world!

An aerial photograph of a coastal city at night. The city's lights are reflected in the dark blue water of the sea or bay. The lights are concentrated in several distinct areas along the coastline, with some smaller clusters further inland. The overall scene is dark, with the lights providing the primary illumination.





NETFLIX



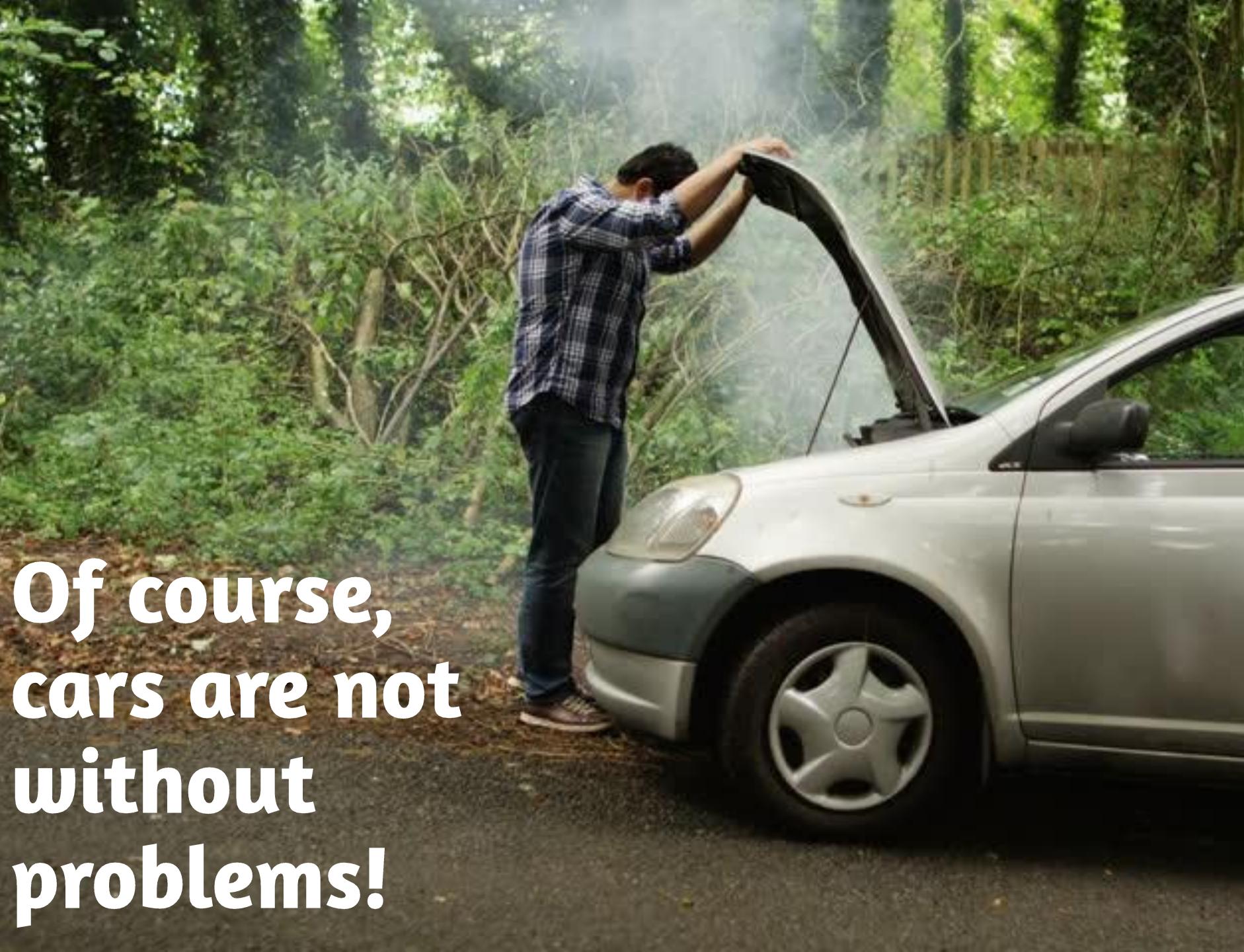
Spotify®







**Of course,
cars are not
without
problems!**



Also, planes have their
own problems, too.



Accidental

vs

ESSENTIAL

P

;

Tab



PAGE
UP



PAGE
DOWN

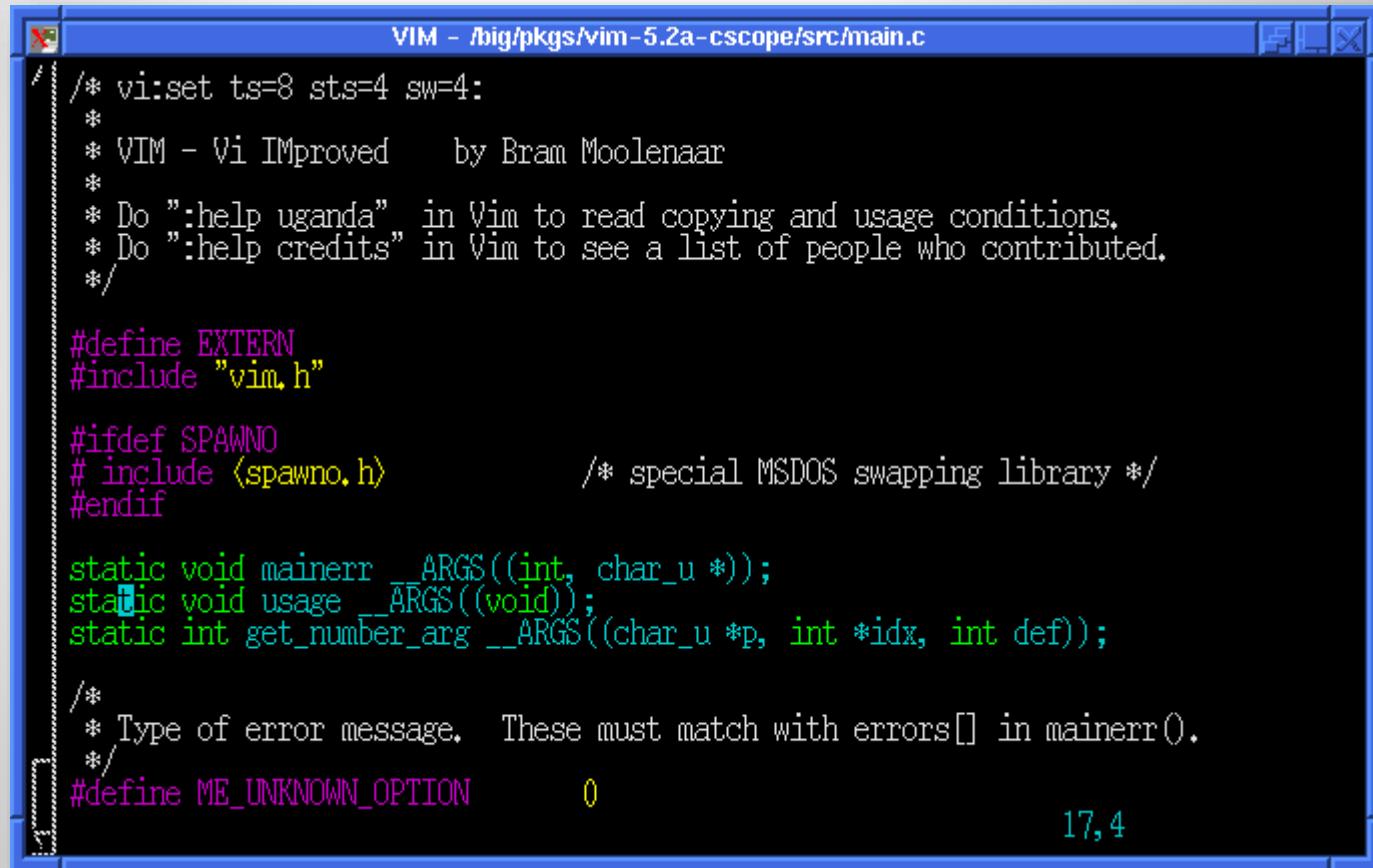




Some people, when confronted with a problem, think "I know, I'll use regular expressions." Now they have two problems.



Coding in 80s & 90s



VIM - /big/pkgs/vim-5.2a-cscope/src/main.c

```
/* vi:set ts=8 sts=4 sw=4:
 *
 * VIM - Vi IMproved      by Bram Moolenaar
 *
 * Do ":help uganda" in Vim to read copying and usage conditions.
 * Do ":help credits" in Vim to see a list of people who contributed.
 */

#define EXTERN
#include "vim.h"

#ifndef SPAWNO
#define include <spawno.h>           /* special MSDOS swapping library */
#endif

static void mainerr __ARGS((int, char_u *));
static void usage __ARGS((void));
static int get_number_arg __ARGS((char_u *p, int *idx, int def));

/*
 * Type of error message. These must match with errors[] in mainerr().
 */
#define ME_UNKNOWN_OPTION      0
```

17, 4

CODING TODAY

The screenshot shows an IDE interface with the following details:

- Project Structure:** The project is named "spring-boot-sample-websocket-tomcat". The `src/main/java` package contains `samples.websocket`, `client`, and `echo`. The `echo` package contains `DefaultEchoService`, `EchoService`, and `EchoWebSocketHandler`. The `resources/static` folder contains `echo.html`, `index.html`, `reverse.html`, and `snake.html`.
- Code Editor:** The file `EchoWebSocketHandler.java` is open. It contains Java code for a WebSocket handler. A breakpoint is set at the line `String echoMessage = this.echoService.getMessage(message.getPayload());`. The code includes annotations like `@Autowired`, `@Override`, and `@Log`. The line where the breakpoint is set has a tooltip: `echoMessage: "Did you say "Here is a message!"?"`.
- Debugger View:** The bottom half of the screen shows the debugger interface. The stack trace shows the current frame is `handleTextMessage@51, Echo!`. The variables pane lists local variables: `this`, `session`, `message`, `echoMessage`, `logger`, and `this.echoService`. The `echoMessage` variable is highlighted and shows the value `"Did you say "Here is a message!"?"`. The `logger` variable is a `Logger` object.
- Status Bar:** The status bar at the bottom right shows the time as 51:1, the encoding as UTF-8, and the git status as master.

Hardware skyrocketed...





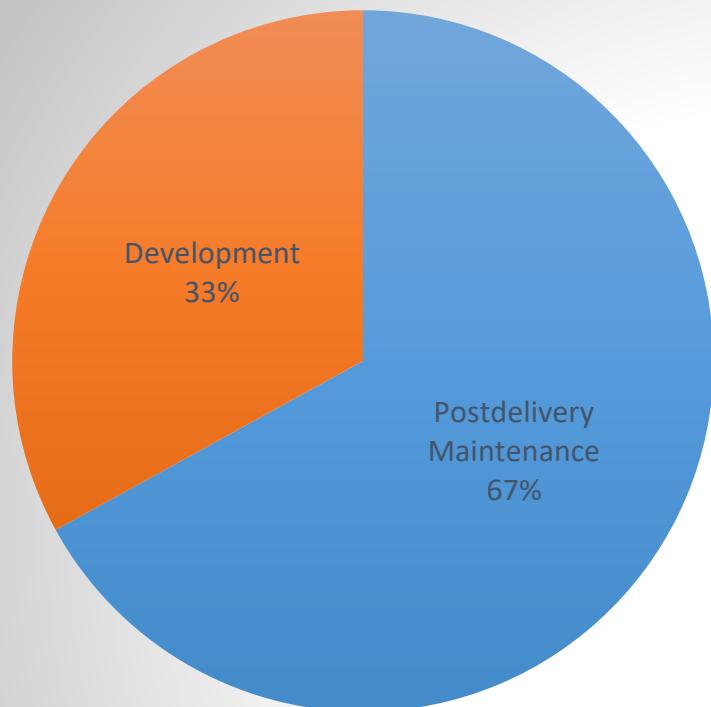
But software, not so much...

stop coding

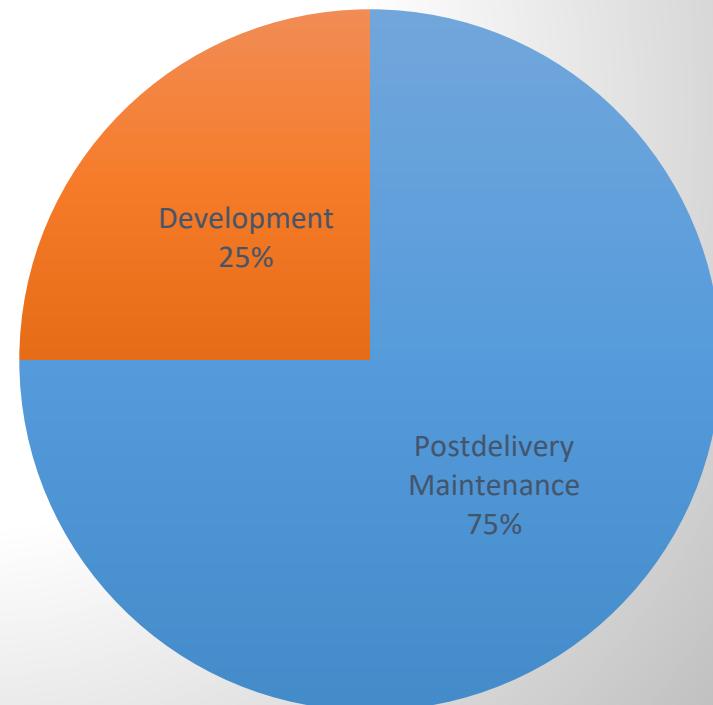
(phrasal verb)

a mystical action that would
stop all kinds of programming
errors at once and for good.

Between 1976-1981



Between 1992-1998



Costs* ...



Software aging...

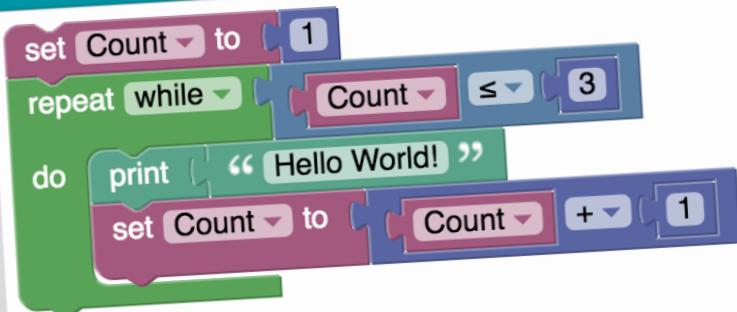
Signs are saying us something...





We have options.

- Logic
- Loops
- Math
- Text
- Lists
- Color
- Variables
- Functions



Language: JavaScript ▾

```
var Count;
```

```
Count = 1;  
while (Count <= 3) {  
    window.alert('Hello World!');  
    Count = Count + 1;  
}
```

Block-based languages

DynamicsAX7Project3 - Microsoft Visual Studio (Administrator)

File Edit View Project Build Debug Team Format Report Tools Architecture Test Dynamics 'AX 7' Analyze Window Help

FMRentalsByCustomer.rdlc [Design] FMRentalsByCustomer

Rentals By Customer

«Expr» [First(GroupDesc)]

«Expr» [Email]
«Expr» [CellPhone]
«Expr» [DriverLicense]

Last rental: [First(EndDate)] History

Model: [First(Description)]
Color: [First(ColorLabel)]
Fuel: [First(FuelTypeLabel)]

[Sum(VehicleRate)] «Expr» Charges

«Expr» «Expr» [ExtendedAmount]

[Sum(VehicleRateTotal)] «Expr» RateTotal

Row Groups: (DriverLicense_0), (RentalId_0)

Column Groups:

Solution Explorer

Search Solution Explorer (Ctrl+.)

Solution 'DynamicsAX7Project3' (1 project)

DynamicsAX7Project3 (ISV) [Fleet Manager]

- References
 - FMRentalsByCustContract
 - FMRentalsByCustController
 - FMRentalsByCustDP
 - FMRentalsByCustomer
 - FMRentalsByCustReport
 - FMRentalsByCustUIBuilder

Properties

Report

InitialPageName

Page

- BackgroundColor: Automatic
- BackgroundImage
- BorderColor: Black
- BorderStyle: None
- BorderWidth: 1pt
- Columns
- InteractiveSize: 0.5in, 0.5in, 0.5in
- Margins: 8.5in, 11in
- PageSize: 8.5in, 11in

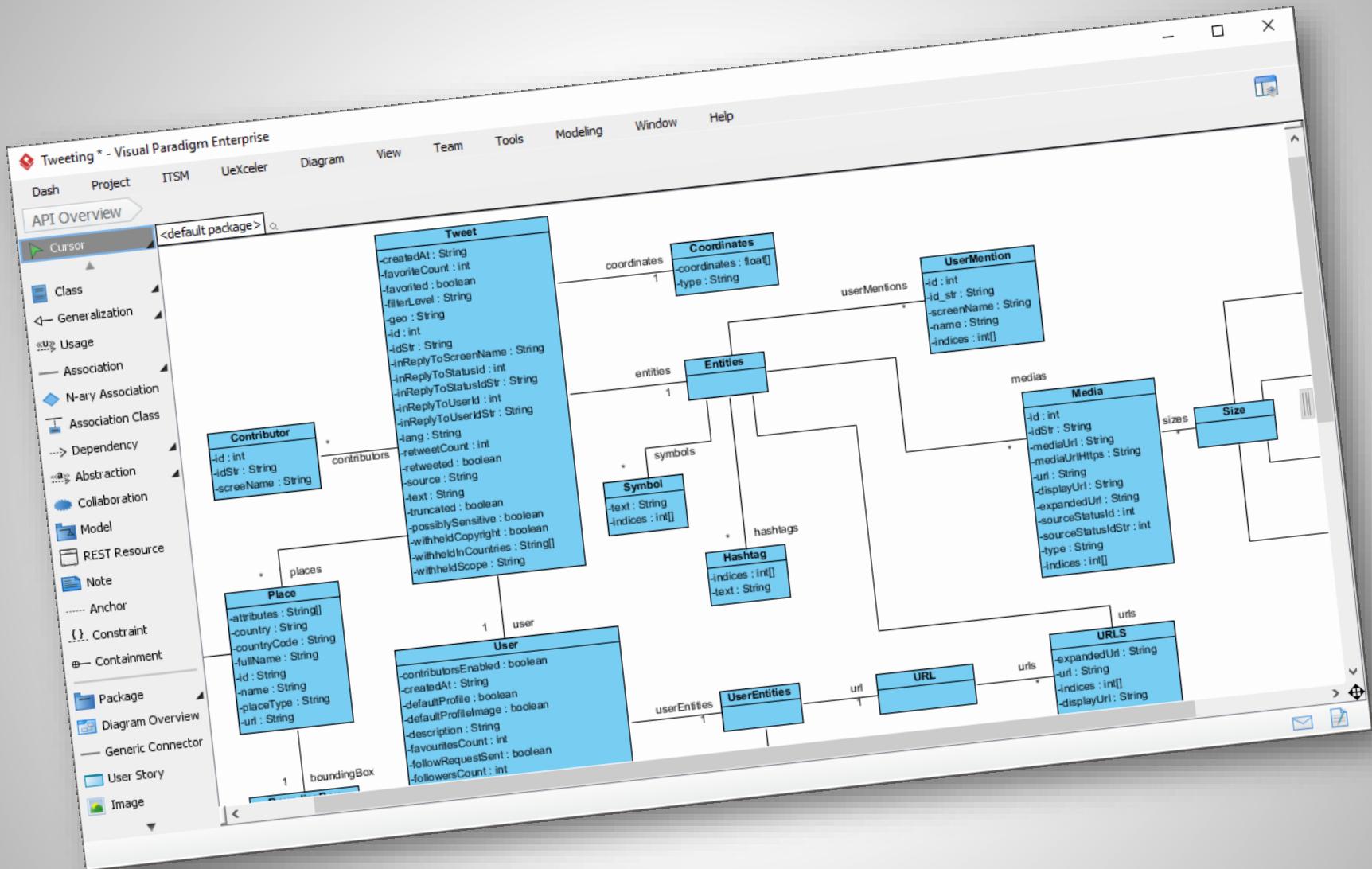
References

- Assemblies
- Classes

Assemblies

Specifies the assemblies that the report references.

Visual Editors



Unified Modeling Language

What is beyond code?





**Accomplishing its intended
purpose successfully!**



Can be useless according to the domain!

The right tool
for this domain...





Time to
think

```
SELECT      EmployeeID, FirstName, LastName, HireDate  
FROM        Employees  
WHERE       HireDate BETWEEN '1-june-2012' AND '15-d
```

```
SELECT EmployeeID, FirstName, LastName, HireDate,  
WHERE City IN ('Seattle', 'Tacoma', 'Redmond')
```

```
SELECT      EmployeeID, FirstName, LastName, HireDate  
FROM        Employees  
WHERE       HireDate NOT BETWEEN '1-june-2012' AND '
```

```
<!DOCTYPE HTML PUBLIC "-//IWF3C//EN">
<html>
  <head>
    <title>Untitled Page</title>
    <meta http-equiv="content-type" content="text/html; charset=iso-8859-1"/>
    <meta http-equiv="content-script-type" content="text/javascript"/>
    <script type="text/javascript" language="JavaScript">
      function getSequence()
      {
        var sequence = [];
        var i = 0;
        while (true)
        {
          sequence[i] = document.getElementById("outerDiv").innerHTML;
          if (sequence[i] == null)
            break;
          i++;
        }
        return sequence;
      }
    
  </head>
  <body onLoad="onLoadFunction()>
    <div class="outerDiv">
      <div class="content">
        <script type="text/javascript" language="JavaScript">
          var sequence = getSequence();
          for (var i = 0; i < sequence.length; i++)
            document.write(sequence[i]);
        </script>
      </div>
    </div>
  </body>

```

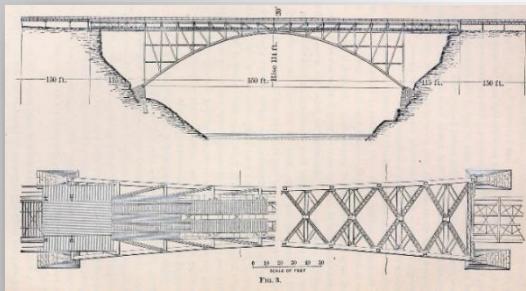
A black and white photograph of a man in a suit looking down at a model airplane. The man is wearing a dark suit jacket, a light-colored shirt, and a patterned tie. He has a name tag pinned to his lapel that reads "JOHN F. KENNEDY".

485004

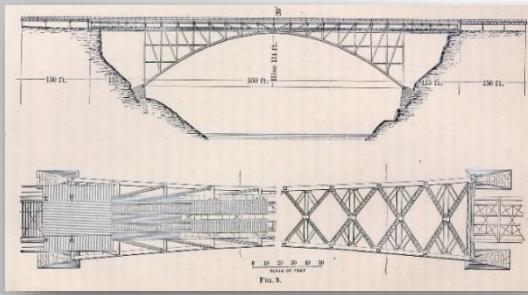
21



To build a bridge...



We first build models.



Why do we model?



Wouldn't
it be nice?



And end up with
the original product?



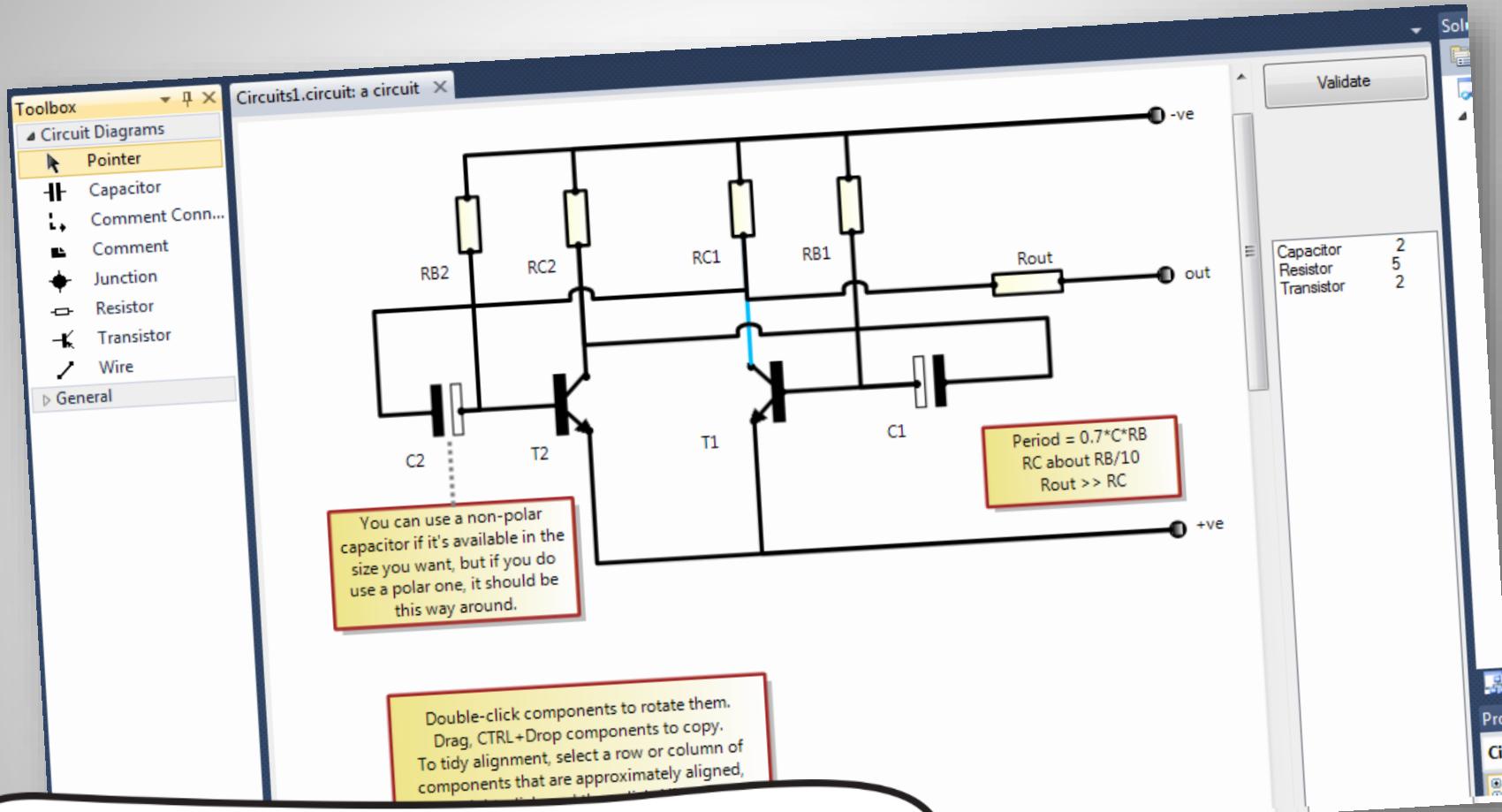
*Software has the property that
allows us to directly evolve
models into full-fledged
implementations without
changing the engineering
medium, tools, or methods!*



Bran Selic

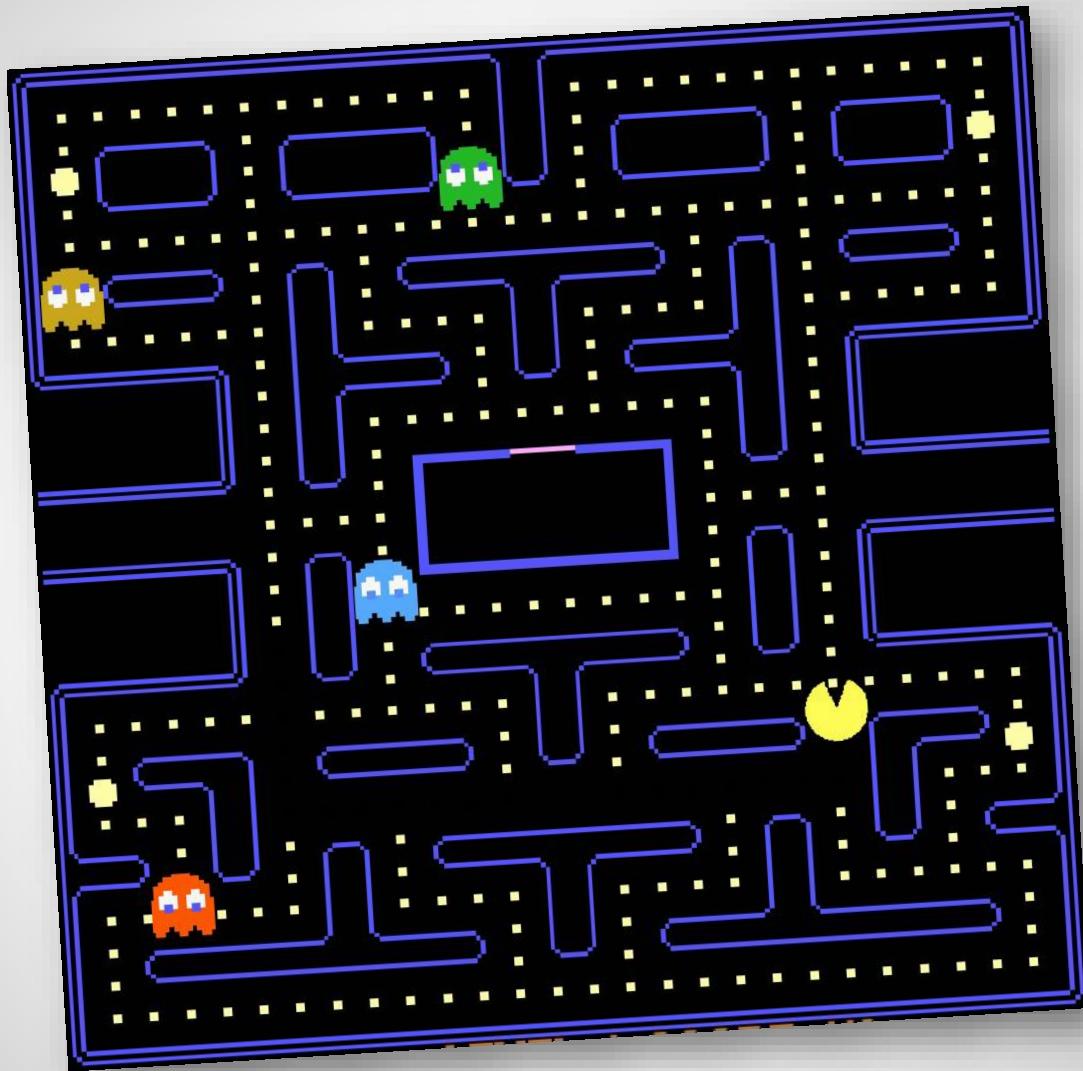
How does this help?

**Give me a modeling environment with
resistors, capacitors, transistors, wires...**

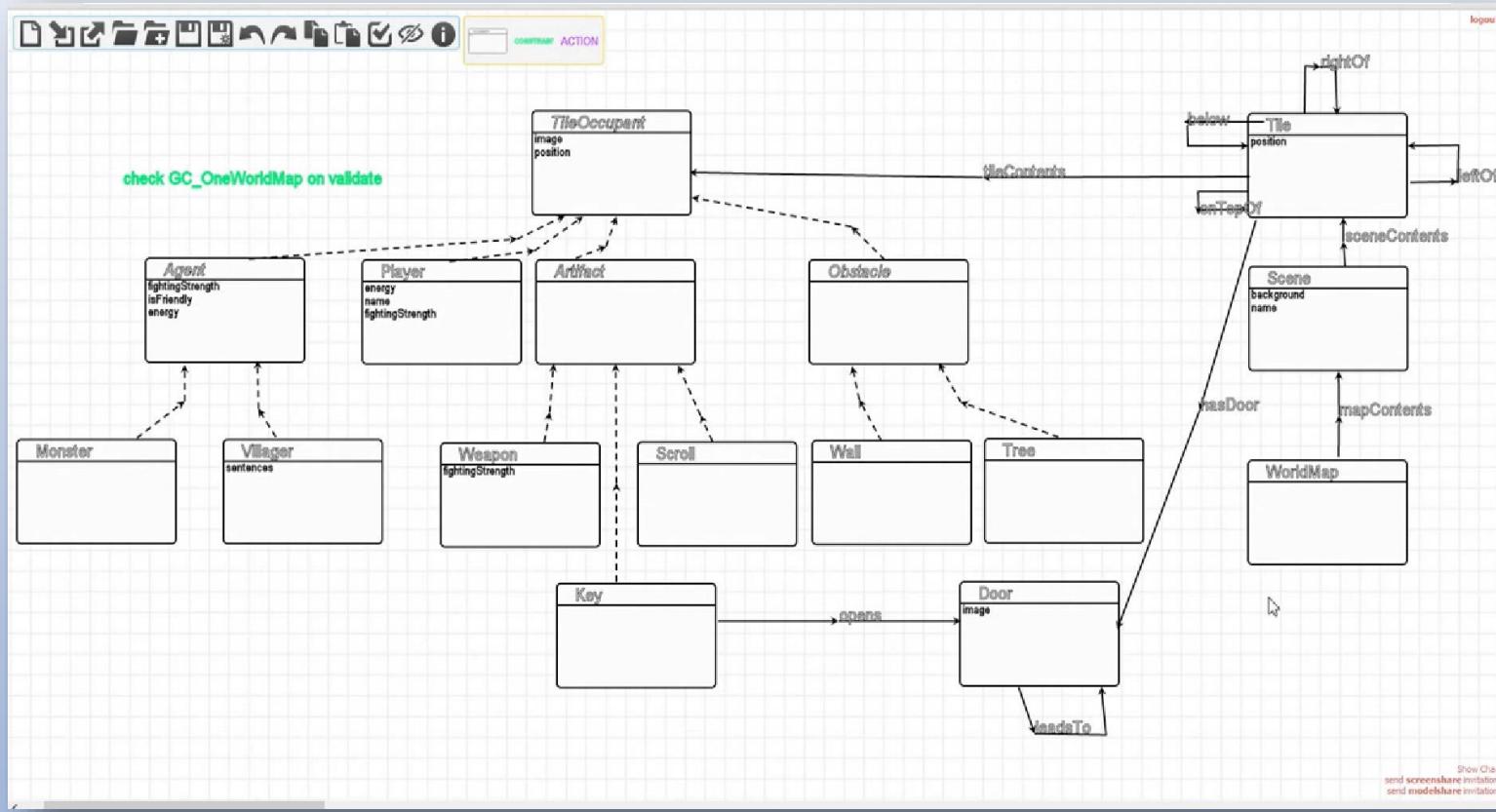


Give me a PACMAN environment with a pacman, dots (foods), ghosts, walls...

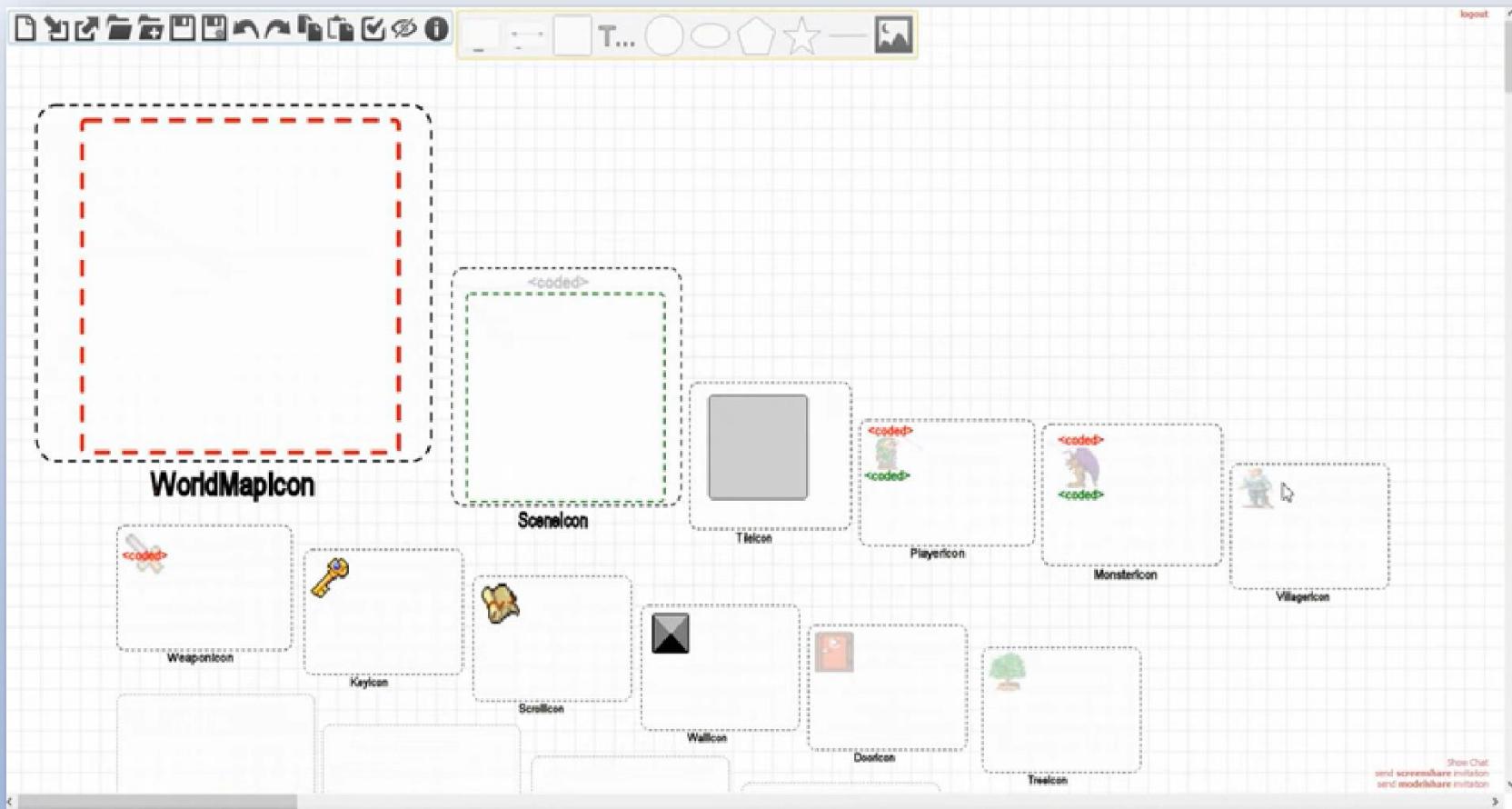
Electrical circuit environment



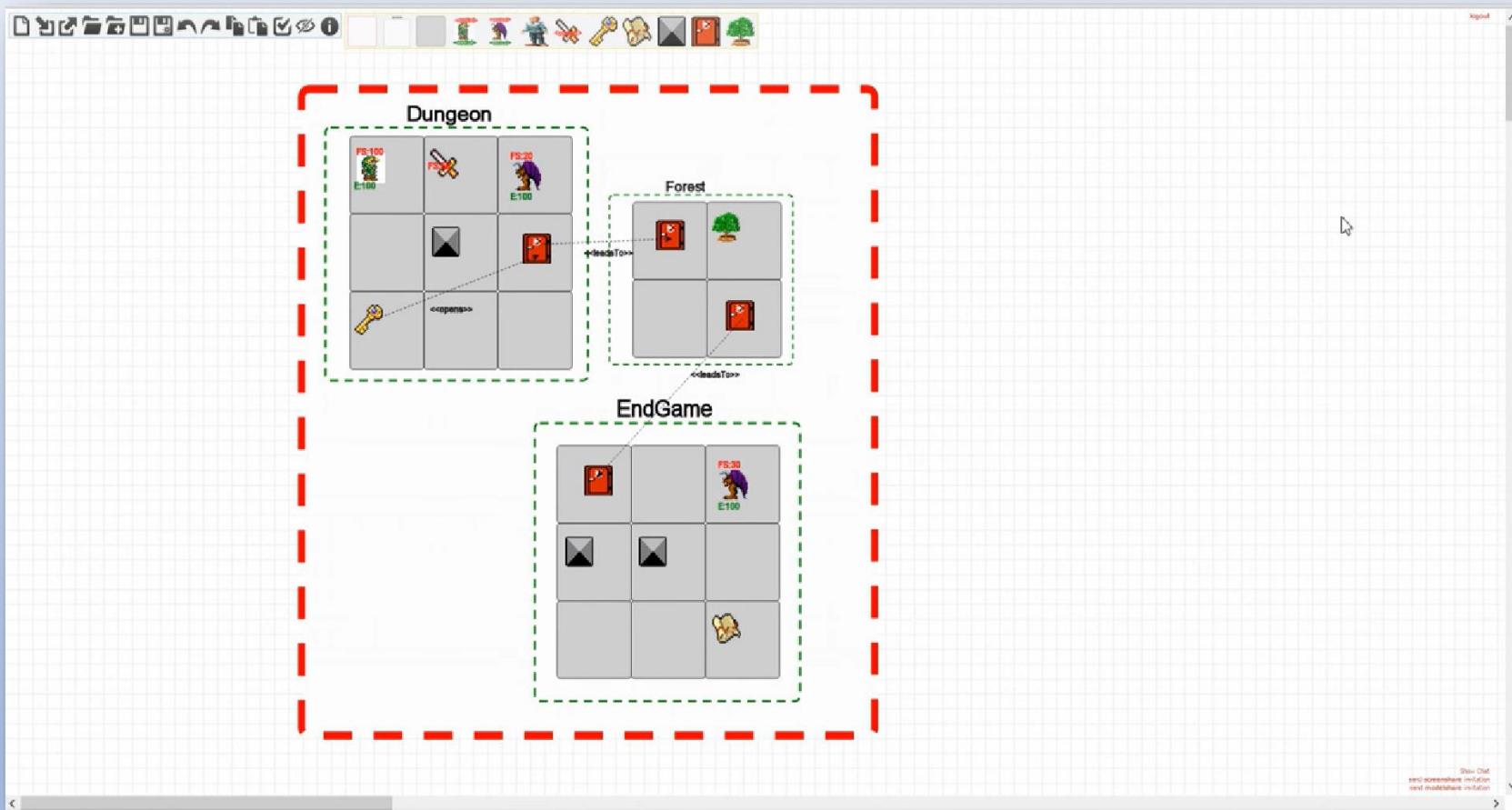
PACMAN environment



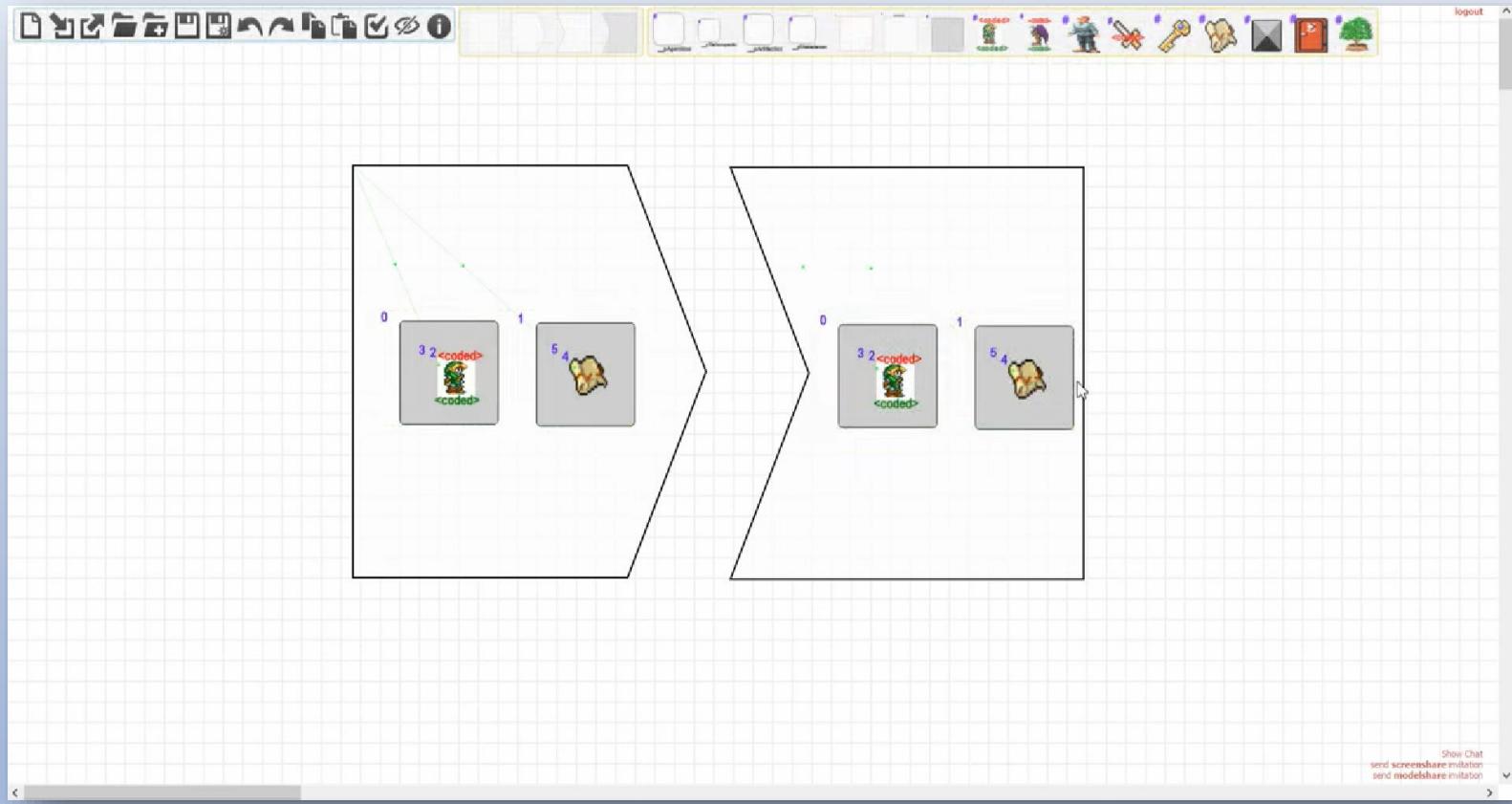
Define elements



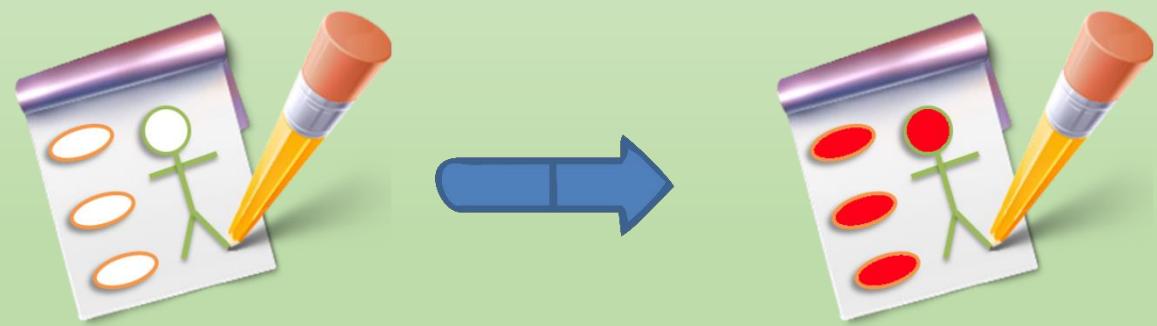
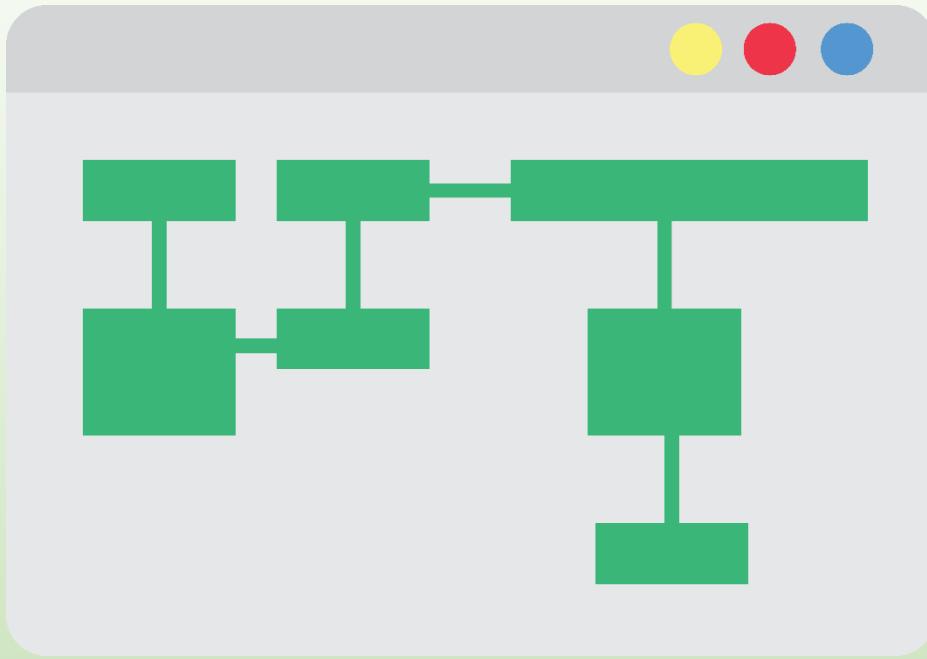
Design how they look like



Your game environment is ready...



Behavior using model transformation...



A generic modeling environment...



**Again,
how does this help?**





They know their domain better than any developer!



CONCLUSIONS

A

B

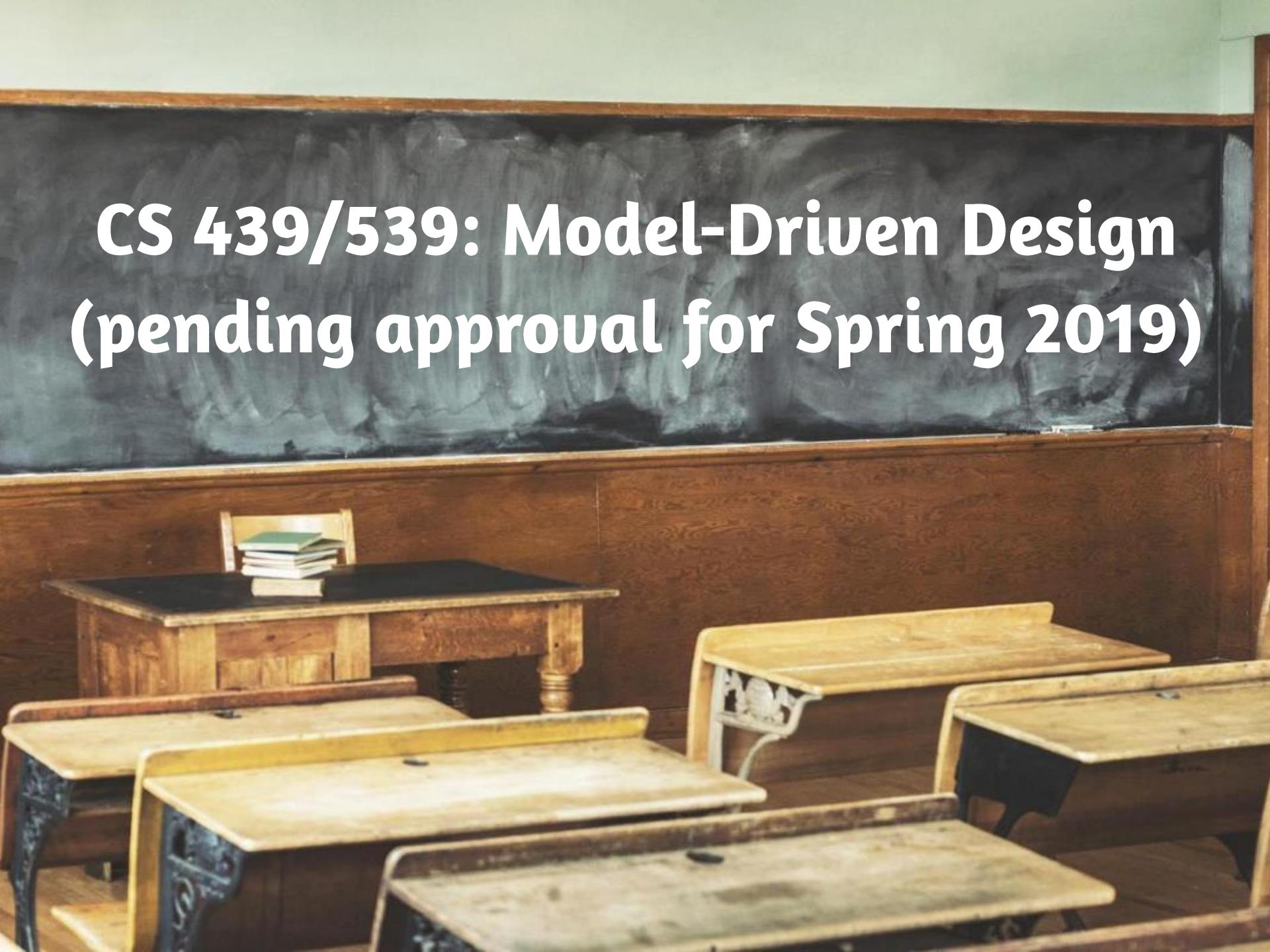
C.

Accidental

vs

ESSENTIAL



A photograph of a classroom interior. In the foreground, several wooden desks and chairs are arranged in rows, facing towards the front of the room. The desks are light-colored wood. In the background, a large chalkboard covers the wall, showing some faint, illegible markings. The overall atmosphere is that of a traditional classroom.

**CS 439/539: Model-Driven Design
(pending approval for Spring 2019)**