Computing Write Up

# Analysis

## The problem

The person I designed the program for is myself as an Electronics student. As such, there was no particular communication between programmer and client. I wished to practice my programming, and a topic that caught my interest was logic circuit simulations – I had the start of an idea of how I would design it, and so I began to program it. I am advanced enough in my programming and was sufficiently progressed through the project, that when it came time to focus on the coursework, I decided to keep going with the circuit sim.

## The current system

As an Electronics student, we use ISIS for our circuit simulations, to design circuits before, or in lieu of, building them in real life. ISIS has a large library of existing components, as well as supporting analogue signals. However, it does not support custom components.

### Problems

1. ISIS does not support custom components. There is no way to create a component that can be placed and reused like any other unless it is already within the library, possibly excluding writing code to control it.
2. ISIS has very little customisability of components. Only components such as resistors and capacitors have any form of customisability.
3. I have no understanding of ISIS under the hood. I merely know how to use it as any consumer would. This is not a true problem with the program, but a source of my original motivation to create an alternative.

## Objectives

1. A way to design and simulate a circuit.
2. A way to create a circuit, then later reuse it as a single component.
3. A way to customise components.

# Design

## Namespaces

* CircuitMaker is the namespace for the whole program.
  + Basics contains the basic classes such as Pin, Pos, Board, and others, and also contains the interfaces implemented by the Components.
  + Components contains all my predefined components.
  + GUI contains all the GUI code, including GUIForm, ComponentSelectionForm, and RenameBoardForm
    - Settings contains the whole component settings system, including the GUI, found in SettingsForm.
    - ExtApp contains the whole GUI for editing the external appearance of a board, found in ExtAppEditorForm.

## Forms

### GUIForm

### ComponentSelectionForm

### ExtAppEditorForm

### RenameBoardForm

### SettingsForm

## Classes

Demonstrate the inheritance of all the components, the relationship between Board and all the BoardContainerComponents, and other significant systems.

## File Save

Files are written straight to binary. The encoding is as follows:

### File

* Top level Board.
* Sub-Boards (4-bit length followed by boards end to end).

### Board

* Name (string: 1 bit length followed by characters).
* External Size (two 4-bit numbers, width then height).
* Components (4-bit length followed by components end to end).
* Wires (4-bit length followed by wires end to end).

### Component

* ID (string).
* Details (string).
* Position.
* Rotation (member of Rotation enumeration converted into string format and stored as such)

### Wire

* Position of one end.
* Position of the other end.

### Position

* X value (4-bit integer).
* Y value (4-bit integer).

# Testing

Any feature was tested before fully moving on to any other feature. Several bugs are likely to still exist.

# Evaluation

1. Custom components can be created as a board, saved, and reused in any board by selecting the file.
2. Programmed components can be customised through the use of the SettingsForm.

There are features of C# I was not aware of when beginning the project that I would have used, but in order to identify them I would have to start over, as it is likely some design decisions would be different.

Thinking about it as an Electronics student instead of the programmer, I see it as fully functional for my purposes.

# Code

<https://github.com/LastedApple3/CircuitMaker/tree/master/CircuitMakerBasics>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/Basics.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/ComponentSelectionForm.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/ComponentSelectionForm.Designer.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/Components.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/ExtAppEditor.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/ExtAppEditor.Designer.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/ExtAppEditorForm.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/ExtAppEditorForm.Designer.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/GUIForm.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/GUIForm.Designer.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/Program.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/RenameBoardForm.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/RenameBoardForm.Designer.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/SettingsForm.cs>

<https://github.com/LastedApple3/CircuitMaker/blob/master/CircuitMakerBasics/SettingsForm.Designer.cs>