

Template Week 2 – Logic

Student number: 586377

Assignment 2.1: Parking lot

Which gates do you need?

Een AND-poort met 3 ingangen, Omdat het bord vol moet aangeven alleen als parkeerplaats 1 en 2 en 3 bezet zijn.

Complete this table

Parking lot 1	Parking lot 2	Parking lot 3	Result (full)
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Assignment 2.2: Android or iPhone

Which gates do you need?

Een XOR-Poort, Omdat een XOR-poort geeft alleen 1 (waar) als precies een van de twee ingangen 1 is.
Dus: Android of iPhone, maar niet allebei.

Complete this table

Android phone	iPhone	Result (Phone in possession)
0	0	0
0	1	1
1	0	1
1	1	0

Assignment 2.3: Four NAND gates

Complete this table

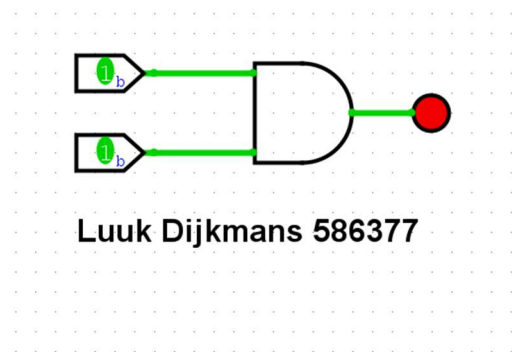
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	0

How can the design be simplified?

De schakeling gebruikt vier NAND-poorten om een XOR-functie te bouwen. Maar in de praktijk kun je dit veel makkelijker doen door direct een XOR-poort te gebruiken in plaats van vier NAND-poorten. Dit bespaart ruimte op de chip en maakt het ontwerp overzichtelijker.

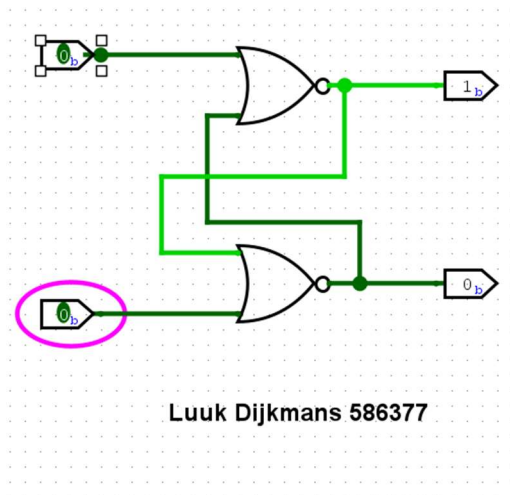
Assignment 2.4: Getting to know Logisim evolution

Screenshot of the design with your name and student number in it:



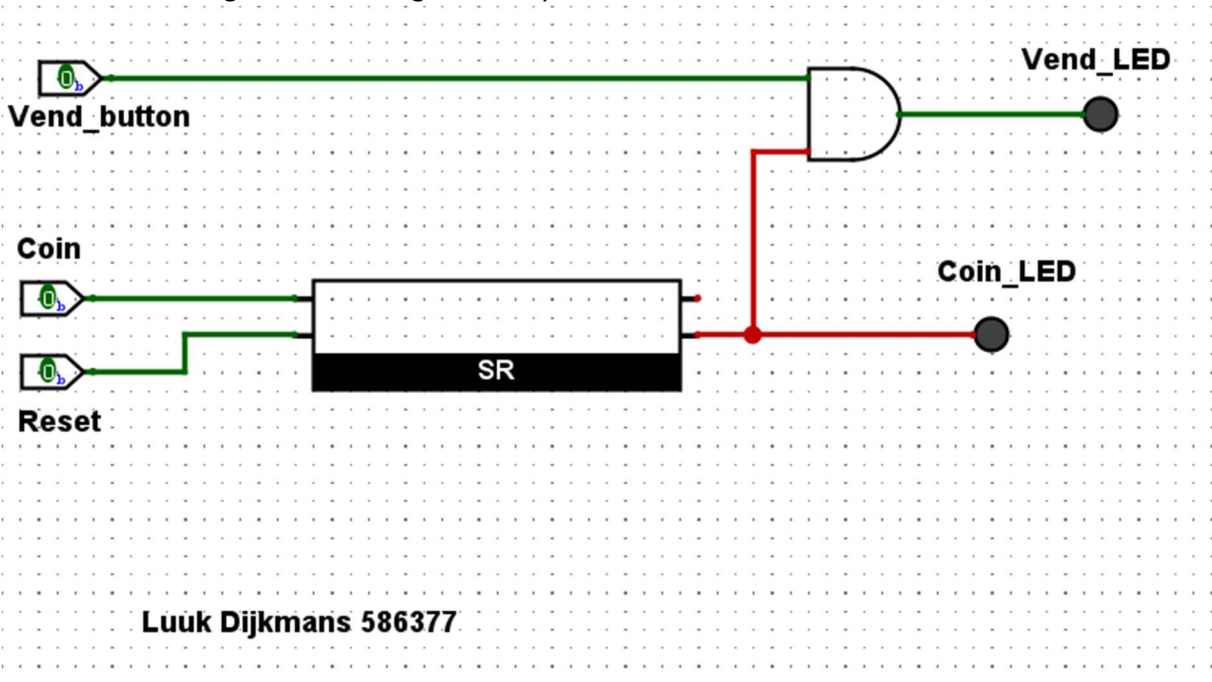
Assignment 2.5: SR Latch

Screenshot SR Latch in Logisim with your name and student number:



Assignment 2.6: Vending Machine

Screenshot Vending Machine in Logisim with your name and student number:



Assignment 2.7: Bitwise operators

Complete the java source code for bitwise operators. Put the source code here.

1

```
public class Main {  
    public static void main(String[] args) {  
        int number = 5;  
        if((number & 1) == 1) System.out.println("number is odd");  
        else System.out.println("number is even");  
    }  
}
```

2

```
public class Main {  
    public static void main(String[] args) {  
        int number = 4;  
        if((number > 0) && ((number & (number - 1)) == 0)) System.out.println("number is a power of  
2");  
        else System.out.println("number isnt a power of 2");  
    }  
}
```

3

```
public class Main {  
    public static void main(String[] args) {  
        final int READ = 4;  
        final int WRITE = 2;  
        final int EXECUTE = 1;  
        int userPermissions = 7;  
        if((userPermissions & READ) == READ) System.out.println("User has read permissions");  
        else System.out.println("User can't read. No permissions.");  
    }  
}
```

4

```
public class Main {  
    public static void main(String[] args) {  
        final int READ = 4;  
        final int WRITE = 2;  
        final int EXECUTE = 1;  
        int userPermissions = READ | EXECUTE;  
        System.out.println("User permissions: "+userPermissions);  
    }  
}
```

5

```
public class Main {  
    public static void main(String[] args) {  
        final int READ = 4;  
        final int WRITE = 2;  
        final int EXECUTE = 1;  
        int userPermissions = 6;  
        userPermissions = userPermissions ^ WRITE;  
        System.out.println("User permissions: "+userPermissions);  
    }  
}
```

6

```
public class Main {  
    public static void main(String[] args) {  
        int number = 5;  
        System.out.println("Original number: " + number);  
  
        number = ~number + 1;  
        System.out.println("After two's complement (negative): " + number);  
  
        number = ~number + 1;  
        System.out.println("After two's complement again (positive): " + number);  
    }  
}
```

Assignment 2.8: Java Application Bit Calculations

Create a java program that accepts user input and presents a menu with options.

1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?

Implement the methods by using the bitwise operators you have just learned.

Organize your source code in a readable manner with the use of control flow and methods.

Keep this application because you need to expand it in week 6 for calculating network segments.

Paste source code here, with a screenshot of a working application.

import java.util.Scanner;

```
public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        int choice = 0;

        System.out.println("=== Bitwise Operations Program ===\n");

        while (choice != 4) {
            System.out.println("Menu:");
            System.out.println("1. Is number odd?");
            System.out.println("2. Is number a power of 2?");
            System.out.println("3. Two's complement of number?");
            System.out.println("4. Exit");
            System.out.print("Enter your choice (1-4): ");
            choice = scanner.nextInt();

            if (choice >= 1 && choice <= 3) {
                System.out.print("Enter a number: ");
                int number = scanner.nextInt();

                if (choice == 1) {
                    checkIfOdd(number);
                } else if (choice == 2) {
                    checkIfPowerOfTwo(number);
                } else if (choice == 3) {
                    showTwosComplement(number);
                }
                System.out.println();
            } else if (choice == 4) {
                System.out.println("Exiting program. Goodbye!");
            }
        }
    }
}
```

```

        } else {
            System.out.println("Invalid choice. Please try again.\n");
        }
    }

    scanner.close();
}

private static void checkIfOdd(int number) {
    if ((number & 1) == 1) {
        System.out.println(number + " is ODD");
    } else {
        System.out.println(number + " is EVEN");
    }
}

private static void checkIfPowerOfTwo(int number) {
    if (number > 0 && (number & (number - 1)) == 0) {
        System.out.println(number + " is a POWER OF 2");
    } else {
        System.out.println(number + " is NOT a power of 2");
    }
}

private static void showTwosComplement(int number) {
    int twosComplement = ~number + 1;
    System.out.println("Original number: " + number);
    System.out.println("Two's complement: " + twosComplement);
}
}

```

```

Menu:
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?
4. Exit
Enter your choice (1-4): 1
Enter a number: 32
32 is EVEN

```

Ready? Then save this file and export it as a pdf file with the name: [week2.pdf](#)

