LogiSim

Introduction:
LogiSim intends to simulate and visualize output of a logical circuit. The goal is to provide an easy to use simulation environment for beginners to practice and learn circuits. Application shall support common components and connectors that are used to create circuits.

Main Requirements:

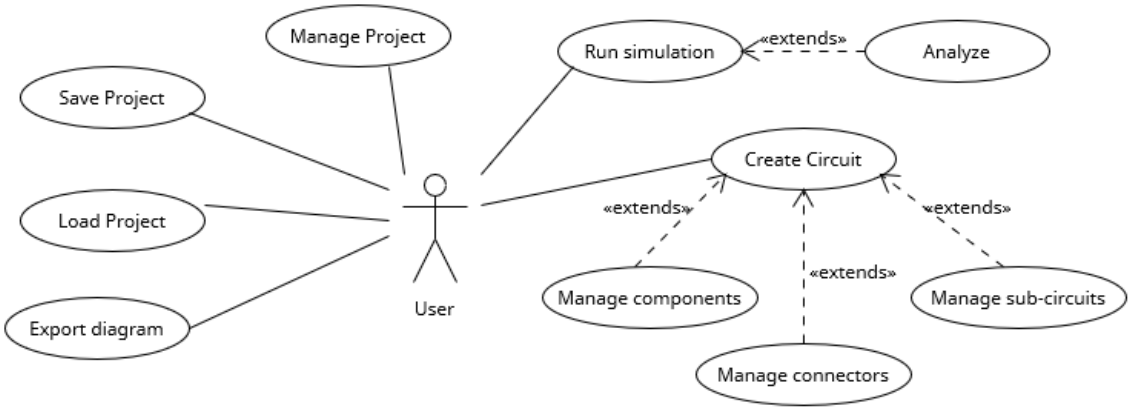
1 Create a project:
- 1.1 User can create circuits using common components (e.g. logic gates, etc.) and connectors (wires).
- 1.2 A project can have multiple circuits, where one circuit can act as a module / component in another circuit also.
- 1.3 Save and load project information, comprising of circuits, components and connectors

2 Provide a circuit design view:
- 2.1 Provide a component palette to select the appropriate component
- 2.2 Manage positioning and layout of components
- 2.3 Component has inputs and outputs
- 2.4 Connector can be used to connect components where output of one component can be connected with the input of other component(s). Different colors can be used to differentiate connectors.
- 2.5 Export circuit diagram to PNG / JPEG format

3 Run a simulation:
- 3.1 Simulate circuit execution by providing the input values and observe the output
- 3.2 Analyze the circuit by generating a complete truth table for the given circuit and optionally work out a boolean expression.

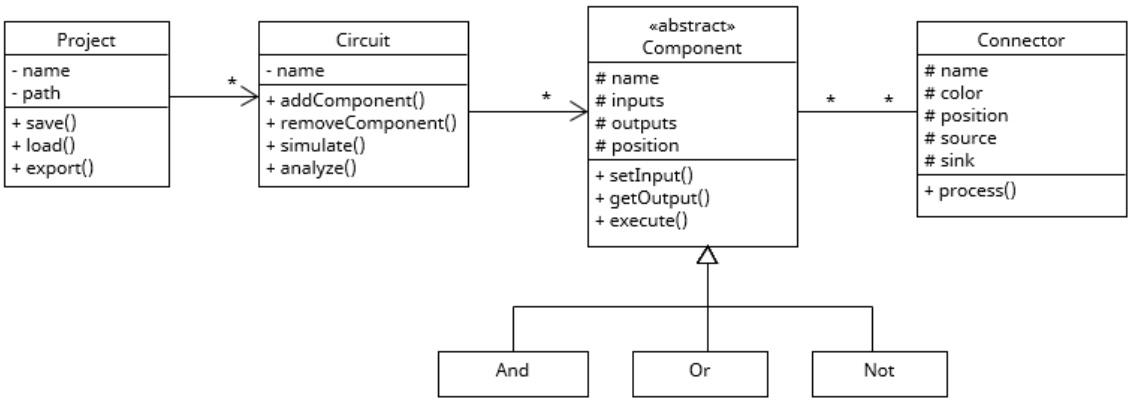
Usecase diagram:

The usecase diagram below shows a basic overview of the system functionality that relates to requirements listed above. Detailed usecase descriptions are left for the developers to work out themselves. Reasonable assumptions can be made and inspiration from existing systems can be drawn while working out the details, considering that scope is not significantly altered.



Class diagram:

The class diagram shows a basic conceptual design for the system, highlighting the key abstractions, their responsibilities and relationships. This includes: Project, Circuit Component hierarchy and Connectors. Each component, when executed is responsible to process the input and generate the output according to its defined behavior. Connectors are responsible to transmit the output of source component to the input of sink component. Logic Gates as well as other necessary components (e.g. switches, voltage sources, LEDs, etc,) can be derived as necessary.



Developers can take this as a starting point and further refine the abstractions, particularly the list of attributes and operations, as well as relationships during the construction phase.

Constraints

The following constraints need to be adhered during development:

- Implement layered architecture with clear separation of UI, Business and Data layers, to ensure a maintainable system
- Utilize relevant design patterns to improve implementation quality

- Handle necessary exceptions and their logging
- Write necessary unit tests and follow TDD approach
- Generate documentation of classes
- Commit code to a Git repository, maintained on GitHub on regular basis.