

QCPDTool User Manual

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The main use case to be carried out with QCPDTool is the processing and showing the results after the user has entered a quantum circuit serialization. In this document, the typical procedure for accomplishing this task will be describe aiming to help the user with it.

Step 1: Enter Your Circuit

Initially, when accessing the tool, it will show only two of the five sections (check Figure 1) it is composed of: the input and the visualization section. The user will write the circuit in string format according to the JSON-based described in [QPainter](#).

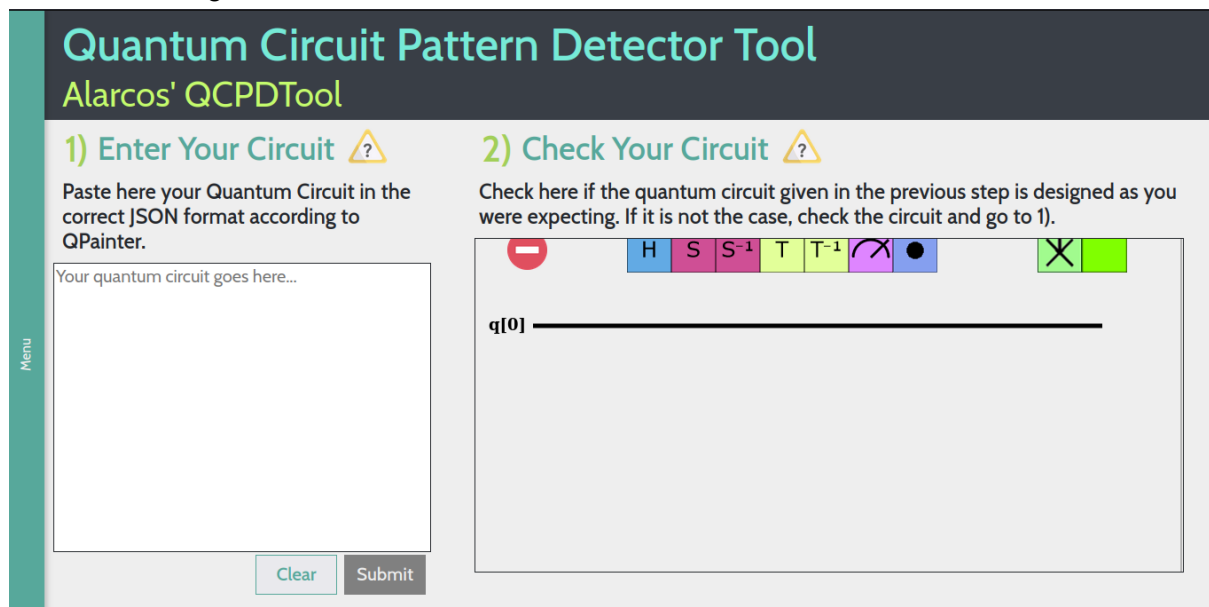


Figure 1: Initial QCPDTool screen

Make sure it follows this format, otherwise, an error description will be shown in the visualization section (see Figure 2). In this sense, the most recommended action is to copy the serialization from QPainter and paste it into the available text box in the input section, so that any mistake is avoided.

Once the circuit is ready click on the "Submit" button or, if the circuit needs to be discarded, for clearing the text box click on the "Clear" button.

If the input circuit contains at least one oracle or any rotation gate (Rx, Ry, Rz, R1), the corresponding warnings will be announced for the user to know that the detection and interpretation of the uncompute pattern must not be taken into account due to implementation limitations.

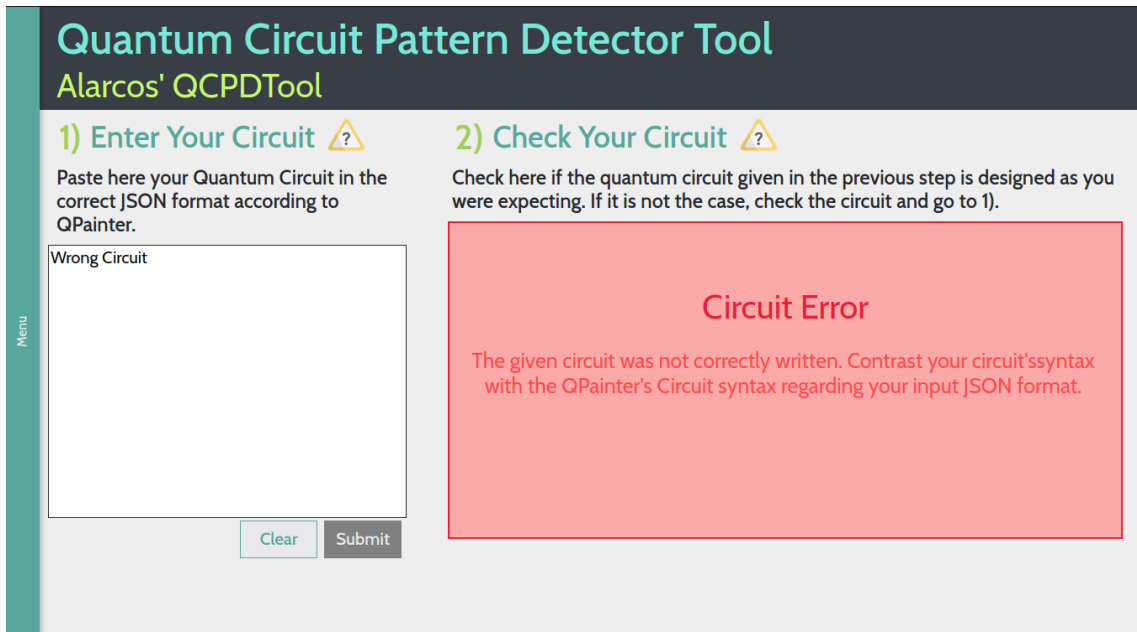


Figure 2: Error UI Example

Step 2: Check Your Circuit

If the "Submit" button was clicked, if the string was correct, the iframe in the visualization section will render the given circuit (by means of the painting section from QPainter). Note that, apart from the visualization section, the remaining two sections will be rendered too. But this section will be focused only on the visualization.

At this moment, the user can give a quick check to the plotted circuit to make sure that the circuit that the tool received is actually the desired one. If it is not the case, go back to Step 1 and repeat the process. Otherwise, the results can be checked.

Step 3: Results

Now, the user can check the results given by the tool after analyzing the circuit looking for pattern matches (check Figure 3). The results are shown by means of two elements: a table with the pattern type, identifier, and location; and a slide show with more iframes for each match.

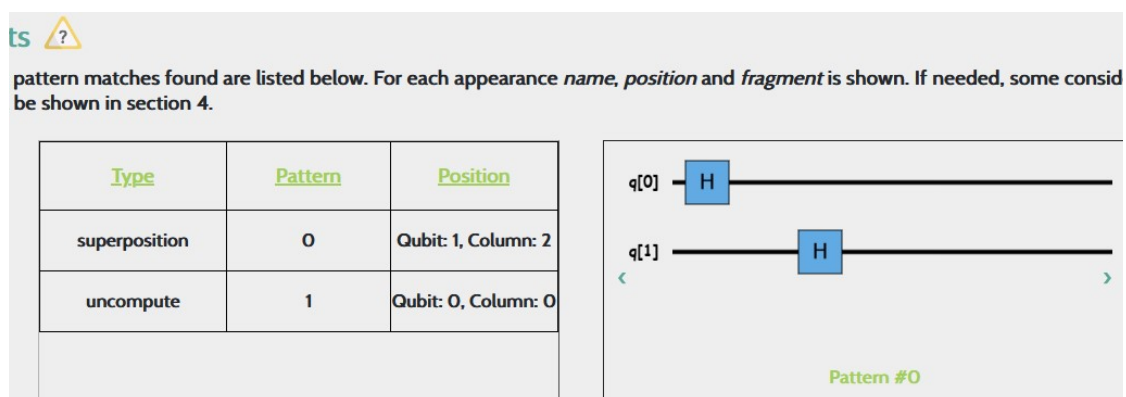


Figure 3: Result Section

In the slide show, note how the matches' iframes are named with the identifier shown in the left table. For browsing the matches, click the buttons placed at the left and right of the slide show for going back or ahead in one position regarding the identifier in a circular way.

Step 4: Feedback

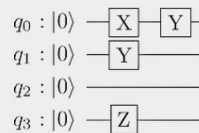
Once the results have been studied in the previous section, the user might be interested in checking some recommendations given by the tool regarding the patterns of usage (check Figure 4).

4) Feedback

Once the results have been exposed and identified, some recommendations and warnings found in the circuit will be shown. Please note that these are just some comments, they must not be interpreted as errors to be corrected, just considerations.

• Initialization

The Initialization pattern is used mainly for encoding the input of a quantum algorithm in qubits for further computations. In the given circuit Initialization was not used. Make sure you actually don't need it for your problem.



• Superposition

The Superposition pattern is one of the main advantages of quantum circuit model. It allows superposing in the state all the possible values. In your circuit *only the 50.00 percent of the qubits are superposed. Is this proportion enough for your problem?*

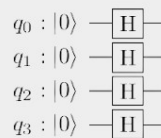


Figure 4: Feedback Section

Please understand that the aim of this section is **not** to correct the user's intentions or highlight the mistakes in the circuit. In this sense, any quantum circuit is wrong, depending on the goal to be accomplished with it and the tool does not interfere with that.

Each piece of advice shows how a pattern should be applied for found cases in which the pattern is not complete (some gates are missing, for example) so that the user might consider the usage of that pattern. If it is not the case, just ignore the recommendation.