

How to use the Application

This application requires the Google Chrome browser and a webcam connected to the computer.

Click on "Go to the Application" to get access to the application. Press the 'Allow' button to use the webcam.

Place the printed marker under the webcam field of view avoiding any type of obstruction.

Use the horizontal slider "Threshold" at the top of the page to adjust the lighting so that the marker and its white frame are displayed as shown in the figure below. The white frame around the marker needs to be completely visible and the user must avoid hiding it even partially when handling it.

Adjust the lighting with the horizontal slider "Threshold" in order to clearly observe orange lines (conductors) and red dots appearing in the image. The red dots indicate where the "circuit components markers" can be placed (light bulb - L, motor - M, battery – B and switch – I).

To use the application, the "electrical circuit" should be at the center of the image and the components must be placed in the empty slots, represented by red dots. When placing a marker in a slot, the red dot will turn green. The marker must stay during 1.5 seconds in the slot so that the component is recognized; at that moment the green dot disappears and the component takes its place.

The components can be placed anywhere, but in a given circuit topology each marker must be used only once. For instance, if two light bulbs are used, they must be represented by different "Light markers".

The "switch" and the "battery" markers have an extra functionality. If the switch is already inserted in the circuit, by covering and uncovering the "switch" marker the user will change its state, turning it on and off. The battery poles must be aligned with

the wire and can be rotated by 180° . Both the switch and the battery markers should remain in the circuit in order to permit this interactivity.

To change the circuit topology, the "circuit marker" has to be hidden for around 3s.