Purpose

A *zikr* is used for counting from 1 up to a certain number. It uses a counter that can either be incremented or reset to zero. The counter is persistent: it keeps its value until the reset button is pressed, even if the screen goes into sleep mode.

Conception

An zickr is composed of the following elements:

- A battery to power the electronic circuit
- An LCD screen to display a counter
- Two buttons:
    - One to increment the counter
    - Another to reset the counter
    - Both buttons are implemented using piezoelectric sensors
- A CPU, encapsulated in resin for protection. This is called potting.

Figure 1 : Electronic components of a zikr

Reverse Engineering

Using Arduino, the reverse-engineered design would be as follows:

- Piezoelectric sensors are replaced with voltage detection; a short circuit to GND is interpreted as a button press.
- The operator's computer is used both as the power supply and as the display device. This is possible on Arduino using the UART serial interface.
- Counter handling is implemented in the Arduino CPU using a sketch. To ensure persistence, we store the counter in EEPROM, so it retains its value even when the Arduino board is powered off. We chose EEPROM over flash memory, since in this case speed is not a critical factor. Flash would only be relevant if higher read/write performance were required.

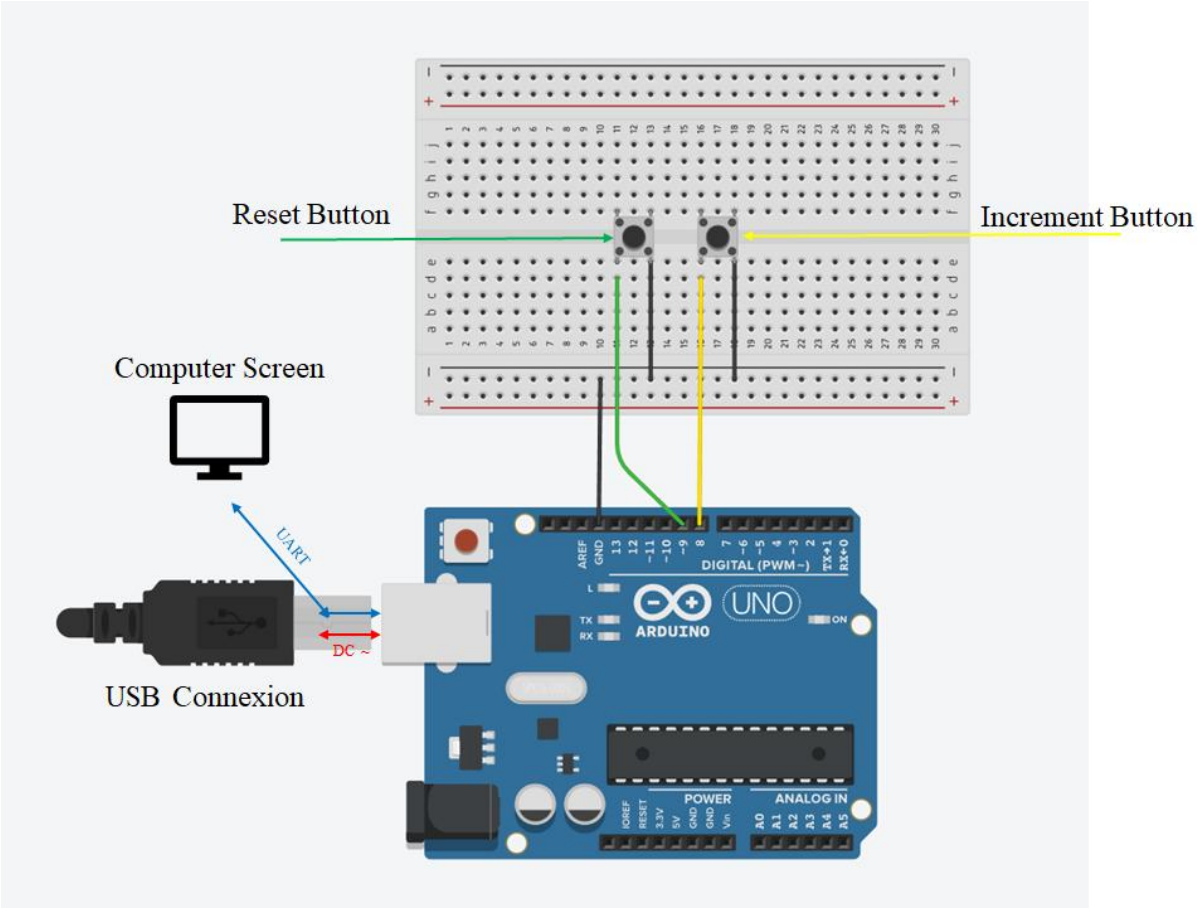

Figure 2 : Reverse-engineered design using Arduino board