LIST OF STM32 PROJECTS

1. Let's start

(a) Objective of this project is to switch on the green LED on Nucleo board (LD2), every time the blue pushbutton is pressed. A polling operation will be used to monitor the state of the pushbutton.

(b) Objective of this project is to switch on an LED every time the blue pushbutton is pressed, and to switch it off when the pushbutton is released. The LED input will be used in interrupt mode.

(c) Objective of this project is to blink the NUCLEO board green LED at 1 Hz with 50% DC, using a PWM.

2. Play a song

Every time that you snap your fingers (o produce another sound), make the speaker to play a simple jingle that you like.

Use the microphone as an interrupt for the microcontroller to detect the sound, and connect the speaker to a PWM in order to produce the music.

Some hints:

(1) Use the "Microcontroller hands-on labs" and the "NUCLEO board manual" to find out how the mic and the speaker are connected to the microcontroller.

(2) For each note of the jingle find the value to provide in the ARR to have the correct frequency.

(3) In your code define a structure "note" which contain all the information (frequency and duration) to generate the correct note and define an array of such a structure with all the notes of your jingle.

(4) In order to modify the PWM frequency use the code generated automatically by CUBE as snippet code.

3. ADC preliminary exercises

a) Objective of the project is to acquire the voltage of the potentiometer on the POLIMI board, **starting the conversion by software** and then send the value to PC on a remote terminal.

- **Polling mode, single acquisition (Project 3a-I)**
  Acquire the voltage of the potentiometer every 1 second and send this value to a remote terminal. The ADC will be used in polling mode.
- **Interrupt mode, single acquisition (Project 3a-II)**
  Acquire the voltage of the potentiometer and send this value to a remote terminal every 1 s. The ADC will be used in interrupt mode.

b) Objective of the project is to acquire the potentiometer voltage using a timer to trigger a conversion at a regular conversion rate of 1 Hz.

4. Light Dependent Resistor readout

Objective of the project is to acquire the signal from the LDR (by Sunrom technology) on the POLIMI board. Convert one value every 1 ms and store 1,000 values using the DMA.
Every 1 s, display on a remote terminal the average light power (expressed in lux) of the previous second.

5. Temperature Sensor

Objective of the project is to read the temperature measured by the LM75 and send it to a remote terminal every 1 second.

6. Quadrature Encoder

Objective of the project is to readout a quadrature encoder, using the specific modality of STM32 timers, in order to provide the rotation frequency (expressed in rps) and direction ("+" for clockwise and "-" for counterclockwise). The result must be displayed using the remote terminal.

7. MEMS accelerometer

Acquire the x, y, z acceleration and send the 3 values to a remote terminal, about every 2 seconds.
The value of acceleration must be expressed in *g*, with a precision of *0.01 g* and the correct sign.
The full-scale range must be *+/- 2 g*.
The output format of the data must be like the one in the example:

X: + 0.05 g
Y: - 0.22 g
Z: + 1.00 g