Embedded Systems

Exercise 1

Introduction

The first stage of this exercise is to familiarise yourself with the STM32CubeIDE development environment and master the basic functionalities necessary to create a new project, compile the program, run it and debug it using the KAmeleon-STM32L4 evaluation board.

As part of the exercise, you should also familiarise yourself with the structure and functionality of the input/output ports (GPIO) of the STM32L496ZGT6 microcontroller. Based on the information presented during the lecture and available in the microcontroller manual, a program that controls the LEDs should be developed following the specifications in the "Requirements for the LED control program" section.

Tasks

- Analyse the wiring diagrams of the KAmeleon-STM32L4 evaluation board
- Identify the connections between the microcontroller and LEDs D1-D8
- Understand how to configure an I/O port to control an LED
- Understand how to control LEDs
- Configure all I/O pins required to implement program logic according to their functionality
- Write an application implementing a given algorithm according to the requirements presented in the manual
- Compile, run and debug the application

D0-D7

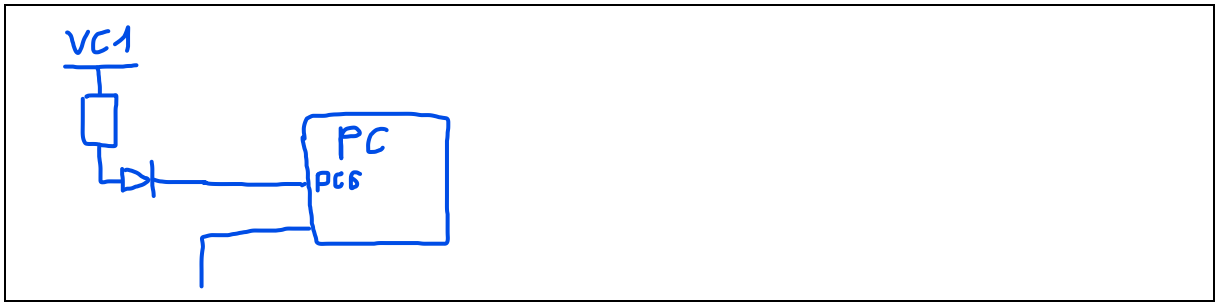
Initial Questions

D8

There are eight single-colour LEDs (D1-D8) and an RGB LED (D9) on the evaluation board. In addition, the board contains five buttons in the form of a joystick. Electrical diagrams showing the connections of individual board components are available on the course website at: https://fiona.dmcs.pl/es/doc_stm/Kameleon_STM32L4-v1-0_Schematics.pdf

As a preparation for writing the program, please answer the following questions:

Draw the connection diagram between the microcontroller and the LED D1
Refer to the evaluation board schematics for information.



Identify the connections between the microcontroller and LEDs

The D1 diode is connected to pin … of the microcontroller.	C6
The D2 diode is connected to pin … of the microcontroller.	C7
The D3 diode is connected to pin … of the microcontroller.	C8
The D4 diode is connected to pin … of the microcontroller.	C9
The D5 diode is connected to pin … of the microcontroller.	E4

The D6 diode is connected to pin … of the microcontroller.	D3
The D7 diode is connected to pin … of the microcontroller.	E5
The D8 diode is connected to pin … of the microcontroller.	E6
The D9 diode is connected to pin … of the microcontroller.	R: D12, G: D13, B: B8

Requirements for the LED control program

- The program should implement the "moving LED" algorithm using diodes D1-D8, i.e.:
  - A given LED turns on for a certain period (default 1 s), then goes off, and another one is turned on (D1 -> D2 -> D3 -> D4 -> …)
  - After reaching the end of the line, the LED can "bounce" and go back (D8 -> D7 -> D6 -> ...) or return to the beginning (D8 -> D1 -> D2 -> ...)
- The program should be written in such a way that the switching speed (on/off time of a single LED) is easily modifiable (e.g. using the #define directives)
- To configure and control input/output ports, the HAL library provided by the manufacturer of the STM microcontroller and available in the STM32CubeIDE environment can be used