System layers:

- Mcal (microcontroller abstraction layer): This layer interfaces with the Microcontroller peripherals and registers.
- Hwal (Hardware abstraction layer): This abstracts the Application from the connected hardware, so it interfaces with the Mcal and provides APIs to control the hardware, like LEDs and buttons.
- App(application): This layer has the main functionality and logic of the system.

System Drivers:

- DIO: digital input output driver
- Timers
- External interrupts
- LEDs
- Buttons

MCAL Layer will have: DIO, Timers. External interrupts drivers

Hwal will have: LEDs, Buttons Drivers

APIs:

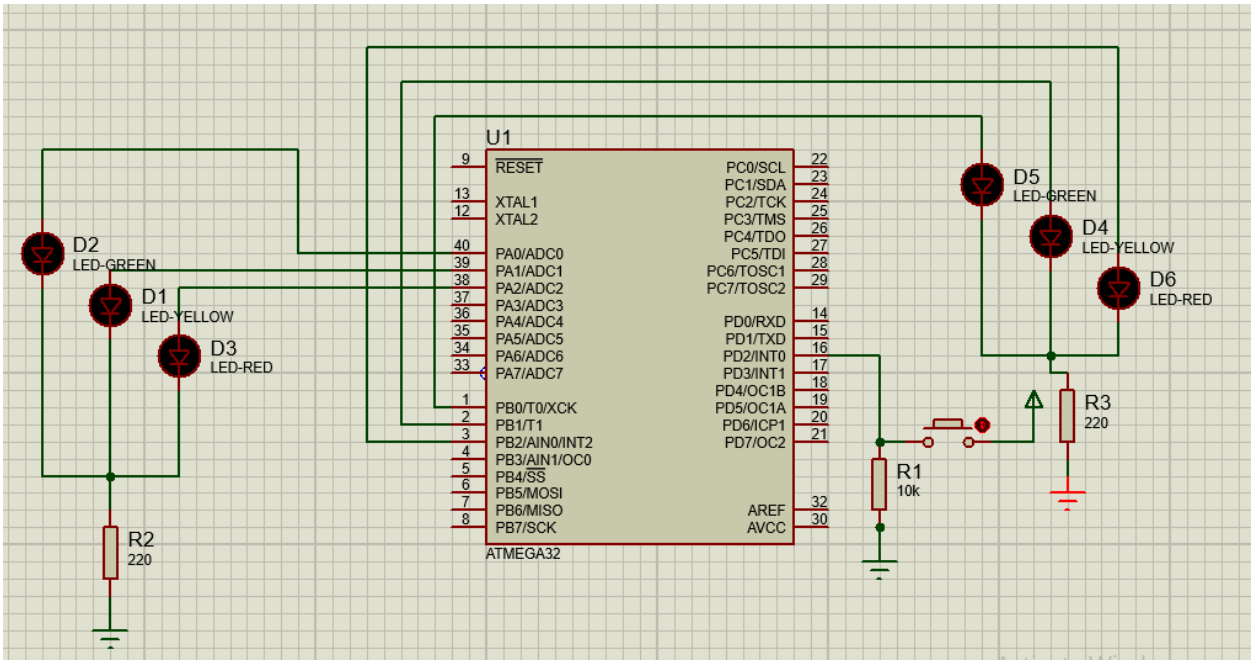
- **DIO:**
  - DIO_InitPin: Initialize the direction of the pin (input or output)
  - DIO_WritePin: writes to the pin
  - DIO_TogglePin: toggles pin value
  - DIO_ReadPin: returns pin value
- **Interrupts:**
  - Interrupts_EnableGlobalInterrupts: enables global interrupts
  - Interrupts_DisableGlobalInterrupts: disables global interrupts
  - Interrupts_EnableExtInterrupt: enable external interrupt (0,1,2)
  - Interrupts_DisableExtInterrupt: disables external interrupt
  - Interrupts_ConfigExtInterrupt: configures interrupt sensitivity
  - Interrupts_RegisterCallbackExtInt0: registers callback function to Ext_int0
  - Interrupts_RegisterCallbackExtInt1: registers callback function to Ext_int1
  - Interrupts_RegisterCallbackExtInt2: registers callback function to Ext_int2
- **Timers:**
  - Timer_StartCountingTimer0: it acts as a start for a stopwatch
  - Timer_StopCountingTimer0: it acts as a stop for a stopwatch
  - Timer_GetCounterTimeTimer0: this gets the time between the stop and start

    - Timer_BusyDelaymsTimer0: this takes time in ms and makes a busy delay with it
- **LED:**
    - LED_InitLEDs: initialize the pins that control the LEDs
    - LED_TurnOnLED: Turns on LEDs
    - LED_TurnOffLED: turns off LEDs
    - LED_ToggleLED: Toggles LEDs
- **Buttons:**
    - Buttons_Init: initialize the pins that control the button
    - Buttons_Start: enables interrupt for that pin and assigns callback function
- **App:**
    - AppInit: initialize the App
    - AppRun: the main function that will run periodically

system description:

The system works as traffic lights system. With two traffic lights with, one for the cars and one for the pedestrians. The system has 2 modes of operation, Normal mode, in which the lights change every 5 seconds from green to yellow to red to yellow then it repeats again, and pedestrian mode, in which we move directly to yellow if we are in green and stay in yellow if we were already in yellow, and the next state will be red so that the pedestrians can pass, the pedestrian mode will not change anything if we were already in red. The system has 6 LEDs and a button that facilitates the switch between the modes.

system design:



system flow chart: