# Microcontroller Lab

Stefan Henkler

E-Mail: stefan.henkler@hshl.de

# Semester Project

## Traffic Light System

- First scenario
  - One line and one traffic light
  - Control the lights with respect to timing
    - Use time events like t20 for 20 time units (passing)

Task 1

- Model the traffic light system with the following diagrams
  - Structure: a class diagram that represents the main structural elements
  - State machine diagram for each class
    - What are the possible states, transitions, events, …?
- Develop a realistic traffic light control system.
  - Use leds as traffic light
  - Use an Arduino as µC
  - Map the state machine model to code (via switch state pattern)
  - Develop a circuit for leds.
    - Determine the required voltage, current and resistant of the series resistor
    - For the circuit design you can use MultiSim
- Deadline:
  - Submit solution to git one day before lab (next week)

# Task 2

Prerequisite

- Personal realization of task 1 uploaded to git
  - Deadline 21.11.21 for group B and C, eob
  - Deadline 23.11.21 for group A, eob
- Extend the (car) traffic light system of the first sprint by a pedestrian light
  - Extend a button for the pedestrian. If pressed, the pedestrian lights switches as fast as possible to green.
  - Guarantee that
    - The pedestrian lights signal is red if the traffic light signal is green
    - If the pedestrian lights signal is green the traffic light is red
    - At least the green traffic light is required to stay for 10 time units in green and 5 time units in yellow.
- First, model your solution
  - Extend the class diagram
  - Add a sequence diagram for showing the interaction with a pedestrian pressing a button including the switching of the lights
  - Update the state machine model accordingly
  - Map the state machine model according to the switch case pattern to Arduino code
  - Extend the tinkercad simulation by
    - A pedestrian button
    - Green and red light for the pedestrian light
- Upload your personal solution to
  - <gitrep>/lab/<yourname>
- Deadline
  - Group B, C: 28.11.21 eob
  - Group A: 30.11.21 eob

# Task 3

- Realize the pedestrian light in concurrent to the traffic light
  - Update your solution on model level in form of using concurrent regions
  - Update the code in form of using a shared variable for communication
- Upload your personal solution to
  - <gitrep>/lab/<yourname>
- Deadline
  - Group B, C: 5.12.21 eob
  - Group A: 7.12.21 eob