The University of Western Australia
School of Engineering
Prof. Thomas Bräunl

Embedded Systems
ELEC3020

Semester Group Project **Autonomous Boat** **weeks 6-12**

GROUPS: Teams of 4 students

EQUIPMENT: Purchase your own equipment,
up to $50 will be reimbursed (receipts required)

GET STARTED
- Form a group of **4** students
- Register your group members with your lab demonstrator,
  who will give you a **group number**.
  Display this number prominently on your **boat** and one the cover page of your **report**.

IMPLEMENTATION
- Design and build a model boat with any propulsion system you like
  (e.g. dual propeller or single propeller plus rudder).
  Either use your own design or modify a model boat.
- Use the TTGO microcontroller you already have to interface to the boat,
  actuating propeller(s) and steering.
- Note: this works best for a model boat with dedicated servo for steering and separate motor controller. However, you can also reverse-engineer combined control electronics, which is often encountered in cheaper models.

TASK
(1) Connect your embedded controller to your model boat.
(2) Implement “drive-by-wire” from the controller for steering and drive system
(3) Connect a camera sensor to your TTGO.
Write software to detect a red color blob for the boat to follow.
(4) Implement a distance sensor (infrared or sonar) at the front of the boat (bow). Use the sensor to avoid any forward collision of the boat.
(5) Demonstrate your boat design on the water by:
   a. Driving straight towards a red blob (if none is visible, stop the motors).
   b. Avoid any forward collision by reading the sensor and stopping in time.

PRESENTATION
Videos will be viewed and marked on Mon. of week 12

DEMONSTRATION
All groups will show the practical performance of their vehicles on Thu. of week 12.
This includes answering questions from the lab demonstrators.

SUBMISSION

1. One-minute video of your project journey
To be submitted no later than **Sunday evening before week 12.**

2. Submit the following documentation **before your project demonstration** as a single PDF document via LMS incl. signed cover sheet by all team members, **plus a printed and stapled copy**:

a. Project design report (*pdf*, max 10 pages), which includes
   - Report on which person did what
   - Hardware circuit diagram with explanations
   - Software design description and diagram
   - Do not include: code, table of contents, half-empty pages

b. Project budget (*Excel)* with "bill of material":
   - Part number
   - Part name
   - Part quantity
   - Price per part
   - Source (link where purchased)

c. User Manual as if it was sold to a customer (max 2 pages, no title page)

d. Marketing and sales document (1 page slide or web-format)
   Incl. photo and brief system description as if selling it on *eBay*

Make sure to attach your group number as a sticker onto your project build!

MARKING

65% Functional Performance
10% Video
10% Project Design Report
5% User Manual
5% Budget
5% Marketing Document

GROUP NO: _____

Name1 _____ Name2 _____

Name3 _____ Name4 _____

LAB DEMONSTRATOR **SIGN OFF** Design (wk7): _____