MEE303 Sensor Systems 2017-18

Lab Assignment #1: Design a simple apparatus for logging circular motion in plane

- Design a revolute - prismatic joint pair equipped with a rotary and linear (translational) pots
- Determine theoretically the sensitivity, offset, resolution and input output ranges of pots and verify them experimentally
- Determine the workplane of your sensing device.
- Design an appropriate interface for arduino. Your setup should log planar motion of pivot of linear pot in natural and Cartesian coordinates.
- Analyze the whole set up and describe possible sources of measurement error.

Bonus: The groups with ability of offline plotting the logged data will be rewarded with extra 10 points

Due to 12.10.2017

Lab Assignment #2: Design an automatic door opening system

- Design a small scale prototype of a garage or slide door. The system should equipped with limit switches to control the motion of the door opening motor
- Design a sensor based set up to initiate opening process (you should use a sensor with analog output)
- Design a digital logic circuit to implement control algorithm of the door**(*)**
- Implement the developed control logic on arduino
- Analyze the whole set up and discuss the sensitivity of the system

Bonus: when defining objectives of the setup, one issue left as unknown. The group that finds out the issue and offers a working solution will be rewarded with extra 10 points

Due to 02.11.2017

Lab Assignment #3: Design and manufacture a prototype of a simple differential drive mobile robot

- Design a simple differential drive mobile platform. Two wheels of platform should be motorized (DC Motors) and at least one Wheel should be a caster.
- Add an H bridge setup (you may use ready mate modules) for each module to control Wheel motors.
- Add necessary modules like battery and make necessary modification on chassis concerning proceeding tasks.
- Test maneuvering capabilities of your mobile robot.

Due to 16.11.2017

Lab Assignment #4: Add an illumination dependent speed control module to your mobile robot

- design an illumination sensing circuit. Calibrate its output. **(*)**
- Define three state for light intensity to set mobile robot velocity.
- Integrate your light sensing module to mobile robot
- Create a time based log file for acquired light intensity, state of light intensity and vehicle velocity

Due to 30.11.2017

Lab Assignment #5: Add an obstacle detection and avoidance module to your mobile robot

- Design an obstacle detection algorithm. The obstacles will be prismatic and they will be randomly placed.
- Build a sensor setup compatible with your algorithm and add necessary electrical components
- Validate functionality of your obstacle detection setup experimentally. **(*)**
- Integrate your module with mobile robot
- Design an obstacle avoidance algorithm and test it with your mobile robot.

Bonus: The immunity of obstacle avoidance algorithm to any sensor fault will be graded with 10 points

Due to 21.12.2017

Lab Assignment #6: Add an Human Machine Interface to remote control your mobile robot via motion of your body parts

- Whole system design, verification and experimentation will be on responsibility of students.

Due to 29.12.2017

Evaluation:

Your designs will be evaluated in following manner

- Experimental verification of design steps. Groups should demonstrate **(*)** marked design procedures in the lab (before final setup).
- Groups will prepare a report in given format
- On given dates (or before but not late), the groups will demonstrate functionality of their designs.
- If all previous steps are fullfilled, the group participants will be taken to oral exam.

Grading for lab assignments

Your laboratory grade for this term will be weighted average of your score from each assignment. The weights are as following.

	Weights
Lab Assignment #1	0.1
Lab Assignment #2	0.2
Lab Assignment #3	0.1
Lab Assignment #4	0.1
Lab Assignment #5	0.2
Lab Assignment #6	0.3

Note: Tentative grading policy for course is as follows:

Quizes	**Lab Assignments**	**Midterm**	**Final**
10%	**30%**	**20%**	**40%**