Exam Project
Embedded Systems, 2022

DANIA ACADEMY

General Information

- **Choose one project from the following mini exam projects.**
- **You can work individually and group of 2-3 members.**
- **One raspberry pi and one microcontroller are the compulsory components of the exam project.**
- **Configure and setup project components and write the program code for the project on 19th April 2022 by 14:00 p.m.**
- **Upload the technical/requirements document to wise-flow on 19th April 2022 by 14:00 p.m.**
- **After 14:00, there will be a 5–10-minute group presentation followed by individual oral exam of 5 minutes related to your project.**

Parking garage sensor

Make a parking garage sensor, that can detect an obstacle (car) moving into a garage. The sensor is to detect an object from 3m away and be accurate to within 5cm. The sensor is to send the data to a control & display panel that can show the distance and give feedback to how far the obstacle is from the sensor. If the obstacle is more than 2m away the system is to be in standby (display is off, no lights on), if the obstacle is between 2m and 1m there is to be a green light showing.

Between 1m & 30cm the light is to be yellow, and below 30cm the light should turn red. There is to be a hysteresis of 5 on all distances. The lights can be shown either clearly in the display, or by using a colored bulb (Hue).

2. Weather station

Make a weather station that can measure the temperature, pressure and humidity of the environment in near real time. The temperature sensor is to have an accuracy of +-0.5C, with a precision of at least 0.1C. The pressure is to be accurate to within 2hPa, and the humidity to within 5%RH. The system is to send data wirelessly to a controller at a 0.2Hz frequency, which the controller then can display the values in near real time in a user chosen graphical interface.

The data is to be stored on the controller so that the chosen GUI can also show historical values over time – this is to be implemented for at least 1 of the data sets.

3. ’Running light’ system with remote

Make a system that can do a running’s lights effect https://www.youtube.com/watch?v=lKNymvm8WfM with at least 4 12V LED lights by using a MCU. The system is to activate the lights by using a motion sensor and have a timeout to turn the lights off after 15sec in the same order the lights turned on.

The lights also are to be controlled from a button connected to the MCU. A remote system control panel is to show the status of the lights, and the status of the motion sensor. The control panel must also have a button that can control the lights remotely. Both buttons are to have a toggle function, so if the button is pressed when the lights are on, the lights should turn all off immediately, and if the lights are off, they should all turn on immediately.

4. AC system for greenhouse

Make an Air conditioning system that can regulate the temperature of a given space. The system is to keep the temperature below 28C. If the temperature rises above 28C a cooling device (a 12V LED strip is to be used to simulate a cooling unit) is to turn on.

The cooling application is to have a 2C hysteresis to avoid the cooling from turning on/off around the 28C mark. The temperature is to be accurate withing 1.0C and have a precision of 0.1C. On a control panel on a controller device the temperature is to be displayed and updated every 5 seconds. If the system crosses a threshold boundary it is to send a notification to the user wherever they may be.

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5. Person counter system for Crowd control

Make a people counting system to be used in a building to keep track of the number of people always present within the building. The building has 1 entrance and 1 exit point. A control panel is to display the number of people, and the maximum allowed, which is 10. Should the number of people exceed the maximum, the system must display an alert, both at the control panel and at the sensor, also the system is to break the circuit to the motor controlling the entrance doors so these cannot open.

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