

ESN 12:

Advanced co-design labs

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The rules



1. 3 x 4 hours of advances system codesign (ESN 12)
2. Allowed resources:
 - a. Your ESN-11 project
 - b. DE10 Datasheet + OpenCore I2C IP + Doc + ADXL345 Datasheet
 - c. Checking StackOverflow and IntelFPGA forums is allowed
 - d. No internet copy-pasta
 - e. No autopilot/OpenAI generated stuff !
3. Evaluation report:
 - Architecture schematics
 - System photos and comments are welcome
4. Your lab supervisors are here to **supervise**
 - a. They are not here to debug your code
 - b. You know how to read Quartus errors ...

Evaluation ...



You will be evaluated based on your lab report + Quartus project

- Both have to be sent to kamel_eddine.abdelouahab@ext.uca.fr
- Git submissions are encouraged through github:
<https://github.com/organizations/ESN2022/>
- Send a single archive :
 - Report, project source file and a single packaged sof file
- Do not submit Quartus generated stuff !
- ***HARD DEADLINE: last ESN11 lab***

Lab submission



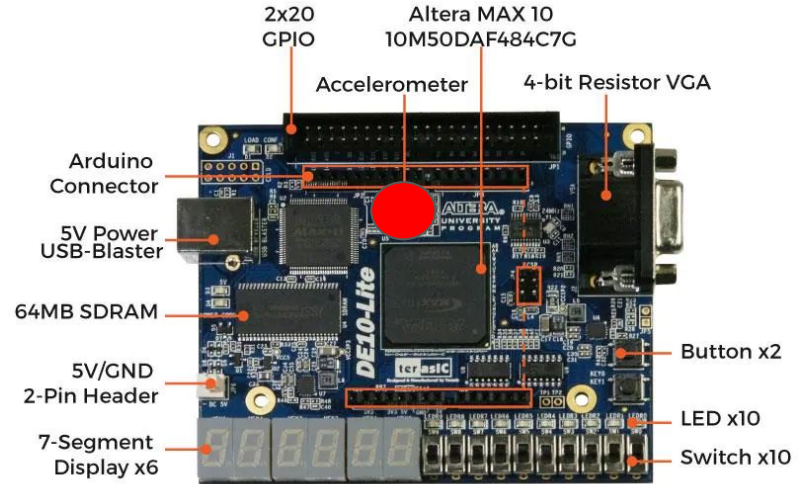
- **Report content:**
 - a. Introduction
 - b. ***System architecture:***
QSYS components and their interaction, HW blocks, design choices
 - c. Progress, results (take photos if needed)
 - d. Conclusion: What have you learned, comment progress, pitfalls and solutions
- **Submission Format**
ESN2022 / <FAMILY_NAME>_Lab3

Your task



Display the gyroscope data of your DE10-Lite board with the following specs

1. Calibrate your board accelerometer (*Use gravity ...*)
2. Inquiry acceleration data each second
3. Read acceleration along X,Y and Z axis
4. Display their value on the 7seg display (*Acceleration can be negative ...*)
5. Swap between values using push button



Steps



1. Depict the system architecture
2. Basic Nios system
3. Accelerometer can be interfaced through I2C or SPI.
Opencore IPs are made available in your ENT and can be added to your QSYS.
4. Rewrite I2C_READ and I2C_Write according to your specifications
5. Display acceleration data through JTAG_UART
6. Calibrate the sensor: Use gravity and I2C_Write :)
7. Add the (timer + PIO + BinTo7Seg) setup from ESN 11 in your design
8. Implement a button to switch between axis.

