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Information Processing

Christos Bouganis

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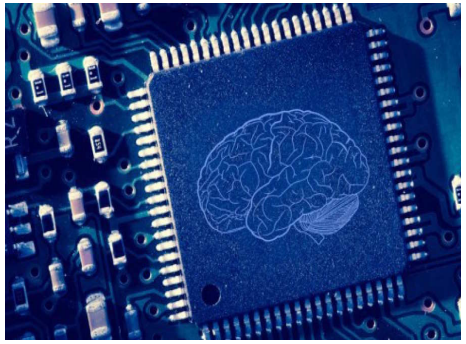
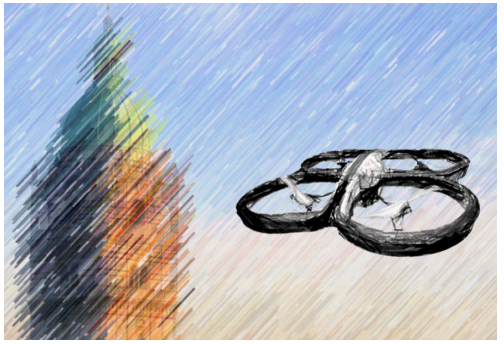
Some background on myself

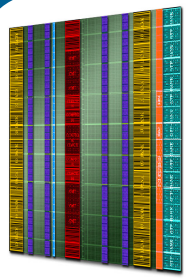


Computational Machine Learning

Computer Vision

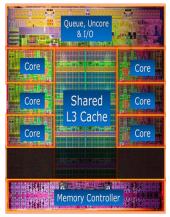


Robotics and UAVs

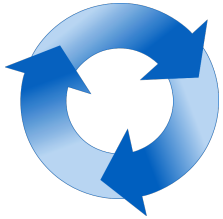


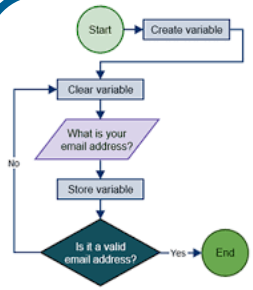
FPGAs

GPUs



Multi-core





Algorithms

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Covered in the previous term

Discrete Maths

- algorithms
- analysis
- complexity

Software systems

- networking
- databases

Instr. Arch + Compilers

- Verilog
- CPUs

Information Processing

- Signals
- filtering

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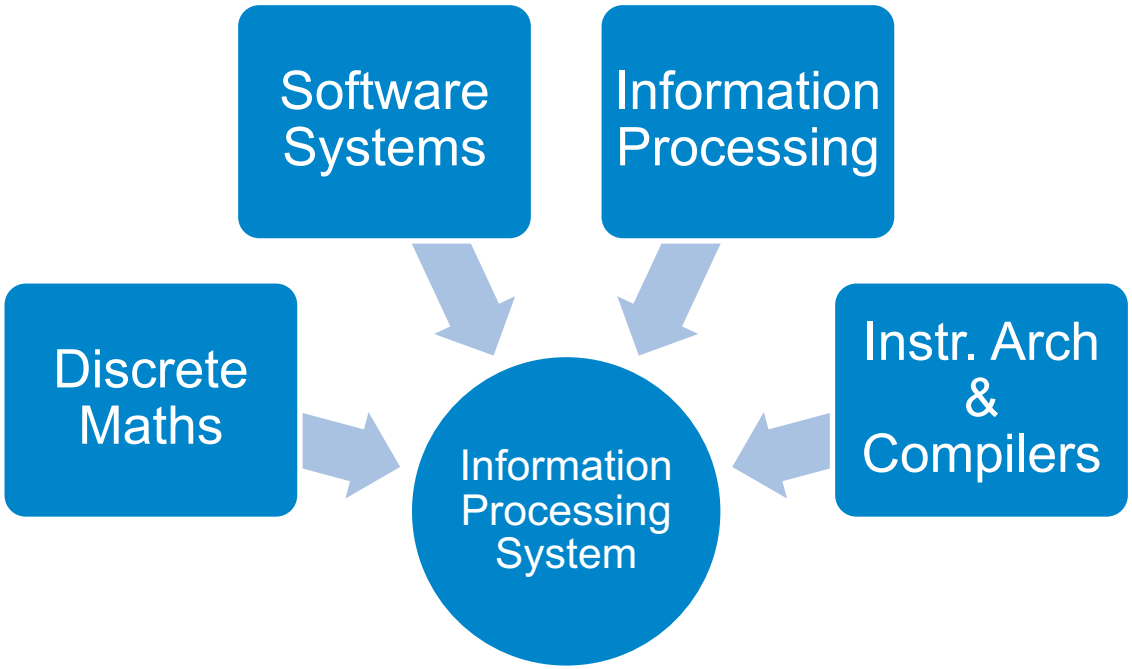
Objectives and delivery

- Bring together theory and application from other modules
- Create an information processing system
- Project-based learning and integration of knowledge



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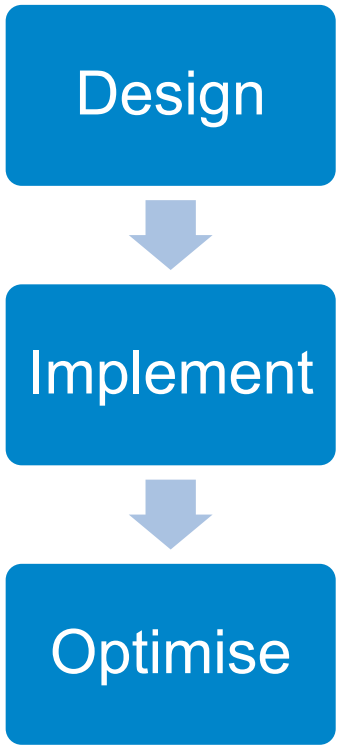
Intended Learning Outcomes

- **Design** an information processing system that ingests, analyses, manages, and outputs signals
- **Implement** an information processing system using a combination of software, hardware, networks, and databases
- **Optimise** a system to achieve given performance or quality constraints



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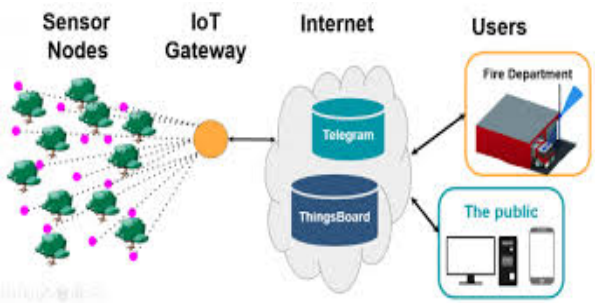
In other words…

Design → Implement → Optimise

Information Processing System



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Let's be more specific…Design an IoT system

- Nodes for local (signal) processing of accelerometer data
- Communication to a server
- Integration with a database
- Adapt processing in nodes

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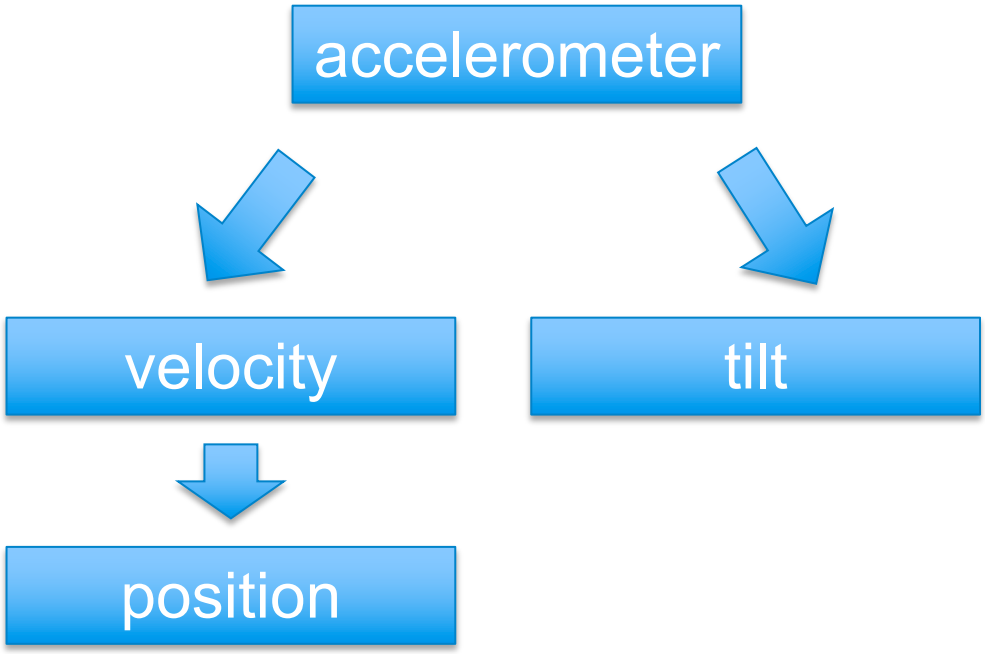
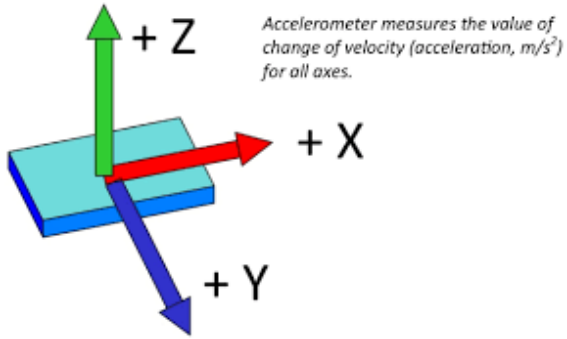
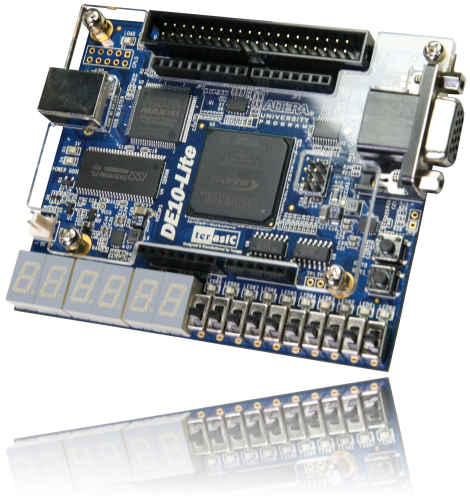
A bit of more information - accelerometer





Accelerometer measures the value of change of velocity (acceleration, m/s^2) for all axes.



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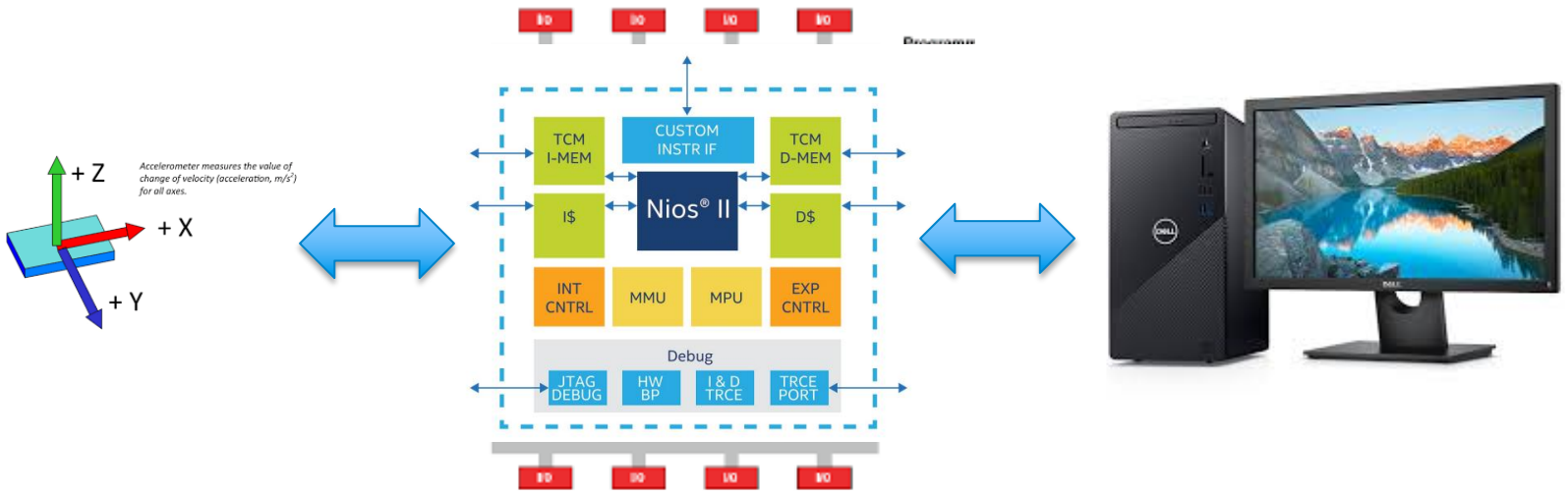
A bit of more information – development board

- DE10-lite
  - FPGA
  - Instantiate a soft processor (NIOSII)
  - Process data
  - Establish communication with local PC



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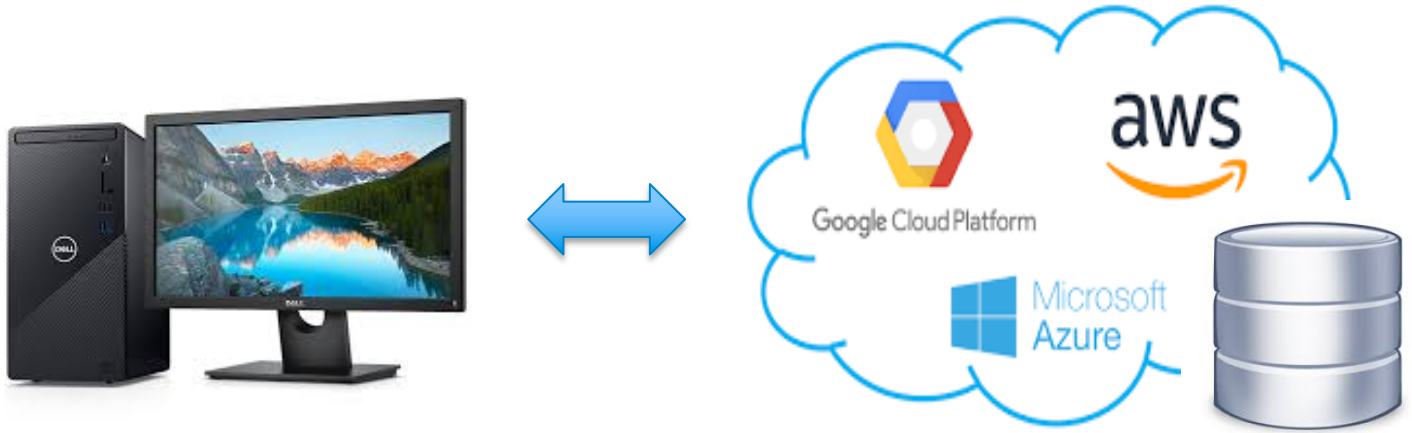
A bit of more information – AWS - Database

- Instantiate a database on the cloud
- Communicate from the host PC to the database



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Structure

- Part 1 – Training (week 2 – week 6)
  - Lab based
  - Material to help you getting going
  - Time to provide help
- Mid-term Assessment (20%) (week 7)
  - (completion/understanding of the labs)
- Part 2 – Project (week 8 – week 11)
  - Functional requirements
  - Non-functional requirement
  - Time to provide help
- Final Assessment (80%) (week 11)

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Part 1 - Training

- On your own pace. An indication of what is expected:
- Structure
  - Lab 1: Introduction to DE10-Lite. Install tools and program the device
  - Lab 2: Instantiate a NIOSII system, use the accelerometer
  - Lab 3: Establish a UART-base communication between the board and the PC
  - Lab 4: Design an IP module for performing a moving average in HW. Connect to NIOSII and process the accelerometer data
  - Lab 5: Create a remote server in AWS and run a custom service

- Availability through BB

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Coursework

- Adapted to remote working
- General idea:
  - Local node needs to communicate with a server
  - Information needs to propagate back to the nodes
- Ideas
  - Try to see how one node can impact other nodes
  - Detect events, and change the processing in the nodes through a centralised way.
  - Log/query events. Action on the events

- Detailed functional and non-functional requirements will be communicated

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Logistics

- Lectures (ad hoc basis)
- 2 hours of support per week (10min slots). Prepare your questions – book a slot
- Groups of 5
- Material:
  - BB
  - Teams (with private channels per group)
- Install tools
  - Natively: Quartus Prime v20 Lite + Eclipse
  - Virtual Box (best solution if you have powerful enough machine)

- When do I start? Next week

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Questions?