**Motivation**

Development of a sensor network architecture tailored for high sampling rate applications and high density of sensor node deployments

**Application example: Active Flow Control (AFC)**

![AFC Image]

Scales of 100 µm for the sensor size and its interspacing

Sampling rates of 100 kHz or more

Large number of sensors required for capturing the phenomena.

**Objectives and System Architecture**

**Objectives**

- Investigate architectural and communication issues for a large-scale dense sensor network, addressing issues like network topology, medium access control, routing and in-network data processing.
- Design of distributed processing strategies for detecting events with low latency which is essential to meet the requirements of RT control systems.

**2D mesh sensor network:**

- Distributed event detection, without the need of central data acquisition and processing;
- Regular structures resembles the architecture of a NoC.

**Node Pinout:**

- Full duplex serial ports: input and output data pins
- Handshaking: input and output control pins

**Node architecture**

- Consists of one switch and one microcontroller connected to the sensor through one ADC.

**Preliminary Results and Future Work**

The principle of operation is based in 3 different states:

1st Network Discovery
Each node discovers its neighbors and the closest path to the sink(s)

2nd Event Monitoring
Sense the environment and communicate the values with their n-hops. (Ex: in figure n = 2)

3rd Event Announcement
A connection path to the sink is established and data is sent by the nodes who detected any event.

**Simulation Scenario**

- Grid of 21 x 21 nodes, with one sink in center
- Grid is superimposed on a pressure distribution snapshot
- Neighborhood size is two (n = 2)
- Only 13% of the nodes transmitted
- Information enough to provide an accurate picture of phenomenon with low latency

**References**

[3] FOCAP, Florida Center for Advanced Aero-Propulsion Projects:
  - FCMP01.01.24.FEDE0.07281 (CISTER);
  - FCMP01.01.24.FEDE0.023212 (SANTRISAN);
  - FCMP01.01.24.FEDE0.012988 (SENODS);
  - FCMP01.01.24.FEDE0.028950 (PATTERN), Co-financed by:

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