Skoltech

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Efficient energy use of local and remote data processing

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Perfect Storm

Lower Power device IoT

The cost of connecting and technology are going down

More devices are being created with Wi-Fi capabilities and sensors built into them.

Smartphone penetration is sky-rocketing

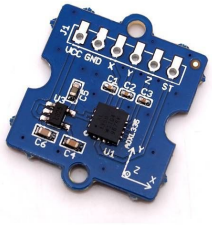
Broadband Internet is become more widely available.

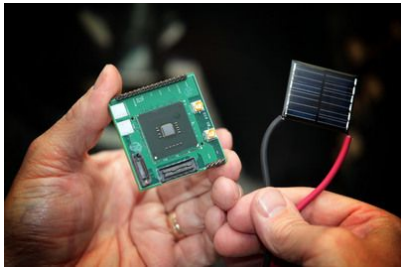
IOT

Network of physical devices, with electronics, software, sensors, and network connectivity which enable these objects to connect and exchange data.

Where can we find it?

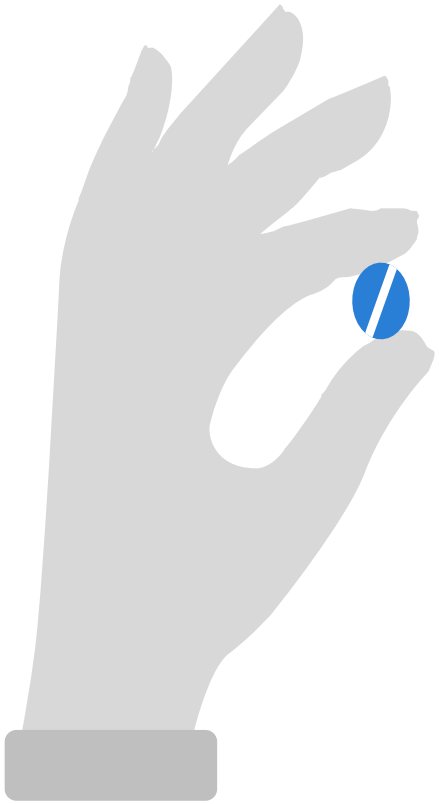
It is everywhere





The Problem

Lower Consumption Optimization



The full potentials of new wireless technology in the case of power saving has not been reached.

There are different reasons that affects the power consumption, one of theme is that the full data processing is not optimally distributed between the sensor and the host .

What we will do:

We will implement a simple NLA data processing algorithm and compare the efficiency of it when:

We process the data in the host

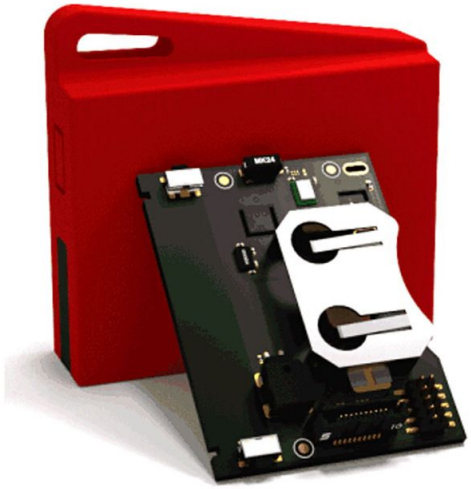
We process the data in the smart sensor

Sensor to use:

CC2650 Wireless MCU

Contains sensors for:

- Gyroscope
- Temperature
- Digital Microphone
- Light
- Accelerometer
- Pressure
- Humidity
- Magnetometer



Algorithm

Language: C 99

Library: arm_math.h

BLAS 1

A + B = C

$O(n)$ data

$O(n)$ operations

BLAS 2

matrix-by-vector

A*v = v'

$O(n^2)$ data

$O(n^2)$ operations

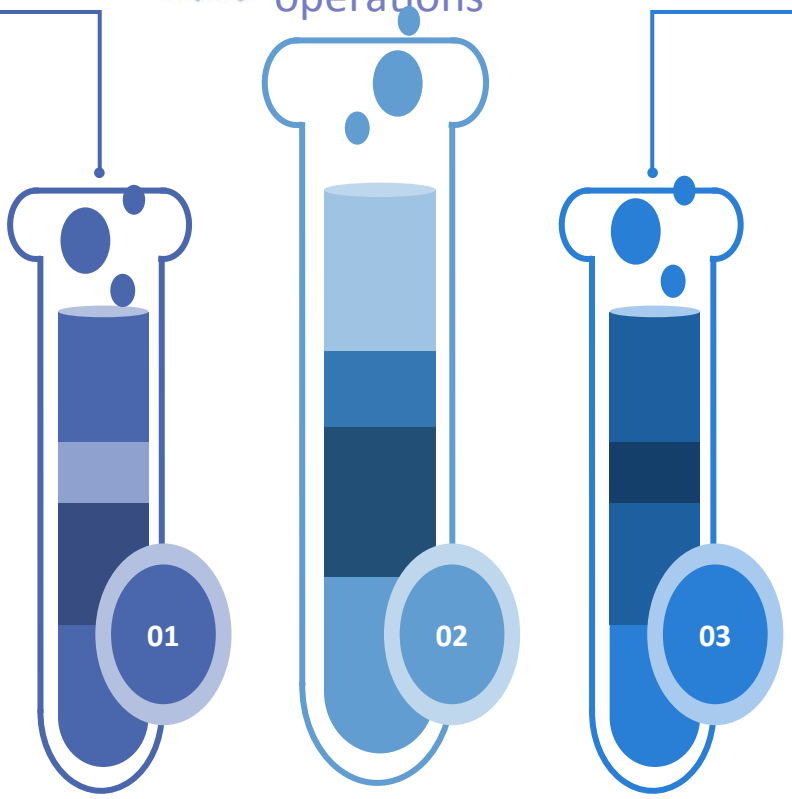
BLAS 3

matrix-by-matrix

A*B=C

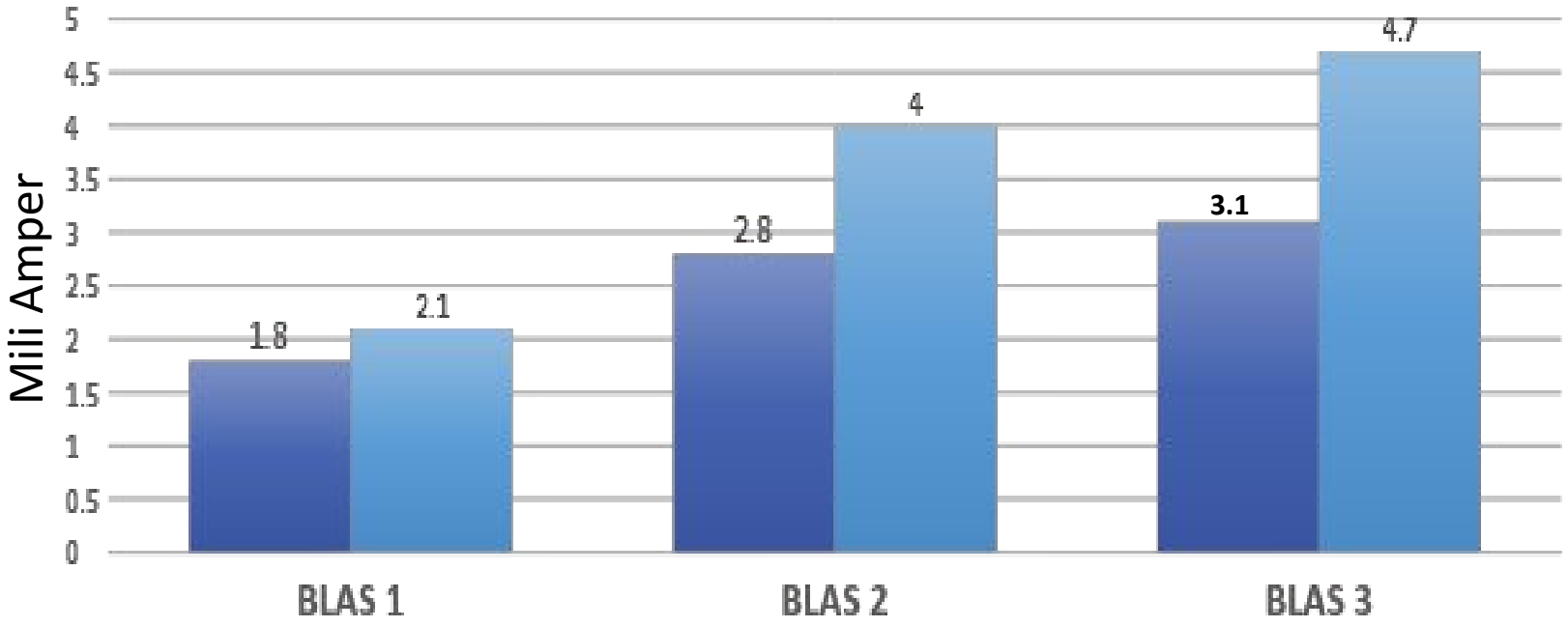
$O(n^2)$ data

$O(n^3)$ operations



Results

Power Consumption



Local Processor

Remote Processor

Conclusion & Future Steps

01 By processing the data in a local way we can save from 1 to 1.5 years of battery life time .

02 In base of the results we can select the most optimal way to process data according to the characteristics of the task and do it in an efficient way.

03 As future steps, we are hoping to find a criteria of effective data processing allocation.