Industrial Signal Processing Challenges

From Science to Application

Andy Stove

THALES

Q: What is the Most Important Signal Processing Challenge?

A: Leveraging the Technology into Products

Technical questions are less challenging than the environment within which we operate

Must Demonstrate that something useful has been done

Needed to demonstate the value of R & D

Else the wider community may be justified in not supporting further research

At some point the Engineer must 'dot the "i"s and cross the "t"s'

◆ All the 'awkward' cases

◆ Everything must work for the whole system to work

◆ And it should all work all the time

….. before going on to the next interesting idea

THALES

A new technique must:

- *Be implementable*

- *Behave reliably*

- *Do something better than existing products*

- *Meet a real need*

- *Have a market*

THALES

Must not make unreasonable demands on the hardware

- Typical issue is Spurious-Free Dynamic Range

Software

- Is the software implementable on cost-effective digital hardware?
  - Note that test is 'cost effectiveness' rather than the vaguer 'practicality'
  - If not - would it be so if we waited five years

Algorithms

- Are the algorithms supportable by industry in the long term?
  - Can industry find employees who can understand them?
  - Or are they so 'perfect' that we don't need to understand them?
    - They will never need to be modified?
    - Some examples exist, (e.g. FFT?). but they are rare

THALES

Perfection is not needed, but predictability is

- ◆ Military customers are known to be very good at working round the limitations of equipment
  - ○ if the benefits are sufficient to justify it

- ◆ Consumers are actually the same:
  - ○ classic example must be text messaging (SMS)
    - • User interface is a disaster

- ◆ The best never comes
- ◆ The second best comes too late
- ◆ So choose the third best
  - ○ Robert Watson-Watt

But customers need to how know the new 'system' will behave

(Not discussing hardware reliability)

THALES

Do Something Better

- ◆ Bear in mind the overheads of development, training etc. associated with introducing a new technology
- ◆ This means that if the 'new' technology is only as good as the 'old' the cost of the 'learning curve' means it will not be cost-effective

Meet a Real Need

- ◆ Unless the 'new technology' does something which is really needed, no-one (or not enough people) will want to use it

Of course these are 'marketing' issues not technical

- ◆ Can sell fancy-coloured laptops at a premium
  - ○ Not what we would consider a 'real need'

THALES

Even if the customers 'want' it they might not be able to afford it

- Although that is really a question of how *much* they want it

Military Customers worked to tightly constrained equipment cycles

- If they've just bought something, then the Treasury won't let them buy a newer one
- If the technology 'misses the boat' then it will not be implemented for a long time
- Other nations have similar, but asynchronous cycles
  - But sales to home nation are important to give credibility for export
- Exceptions?
  - Spiral Evolution to insert new technology?
  - Urgent Operational Requirements

THALES

Timing uncertainties of UORs mean that we must have a 'treasure store' of technology 'in hand'

- ◆ Militates against too great an emphasis on need for research to meet (perceived) 'needs'
- ◆ This is an *industry* view

Need to be clear why research is being done

- ◆ No right/wrong reasons
- ◆ But perceived need for relevance leads to dubious justifications
- ◆ Lack of clarity leads to bad research

Need to 'complete the task'

- ◆ Understand all the issues, not just the 'trendy bits'
- ◆ Before moving on to the next extension
  - ○ Potential incompatibility with the need for 'novelty' for publication

Balance Technology and Marketing

- ◆ Industry and Academia

DCMS UK

© Thales UK 2014

THALES