



Selex ES

A Finmeccanica Company

Strathclyde University Collaboration

UDRC Industry Day

27th June 2014



WHY SHOULD INDUSTRY COLLABORATE WITH ACADEMIA?

Industry suffer from a variety of issues which hamper innovation

- Pressure to cut overheads and deliver to tighter schedules
 - The majority of staff are required on 'current account' business not the development of future technology
 - Budgets (and therefore hours) for working on research are reduced
 - The result is not enough 'thinking time' to come up with or investigate new ideas
- Pressure for more immediate returns on investments
 - Funding for proof of concept becomes difficult
 - Research and development strategy becomes risk adverse (negative results are frowned upon although they are an important part of the scientific method)
 - Results in technology tends to be evolutionary rather than revolutionary
- Difficulty in recruiting staff with relevant skills and experience
 - The industrial base of the country has shrunk making industries more specialised and skills less transferrable between businesses
 - Science and engineering is growing in popularity but undergraduate students have a broad knowledge not always skills specific to industry

WHY SHOULD INDUSTRY COLLABORATE WITH ACADEMIA?

Collaboration with academia can help

- Academic groups can provide the thinking time – novelty is encouraged in research applications and publications
- Funding is available from various sources in the UK and EU which can be shared with/augmented by funding from industry
 - EPSRC
 - Technology Strategy Board
 - MoD
 - Framework 7/Horizon 2020
- Research themes and material included on courses can be influenced to produce the skills industry requires

HOW DOES INDUSTRY COLLABORATE WITH ACADEMIA?

Collaboration works at different levels

- Informal
 - Visits to find out what a research group does
 - Conferences, seminars etc
 - Support and advice to MSc/MEng/PhD projects (no financial contribution)
- Sponsorship
 - CASE PhD and EngDs
 - Funded placement in the company
 - 3 months in summer break
 - 6 months for MEng project
- Collaboration
 - Input to joint-funded projects (e.g. Knowledge Transfer Partnership)
 - Provision of equipment/data
- Formal
 - Sub-contracting work to universities
 - Joint ventures

ARE THERE ANY ISSUES WITH COLLABORATION?

Generally academics and industry get on well but there can be a few issues

- Finding students/researchers
 - For defence work students and researchers need to come from the UK and EU or NATO member country (depending on classification)
 - Engaging with good candidates early in their career and offering sponsorship and placements to mitigate education costs helps
- Viability of ideas
 - Complex, highly mathematical algorithms may produce interesting results in theory but may not be easy to implement in practice
 - Industry engagement with research projects through out their course is essential to ensure that new concepts are exploitable
- IPR
 - As universities seek to commercialise more they rightly seek to protect their IPR
 - Too rigid agreements can hamper collaboration especially when the research may not yield anything exploitable

SELEX ES AND STRATHCLYDE UNIVERSITY – A GOOD EXAMPLE

- Collaboration began with informal visits by John Soraghan and Carmine Clemente during Carmine's PhD
 - Industry's opinion was sought on the methods Carmine was developing in terms of viability and exploitability
- In 2013 Selex ES provided industrial supervision for two masters projects
 - The students visited the Selex ES site in Edinburgh and were given briefings on what the company does and asked to show how their project could be relevant to industry
 - Data was provided in support of one of the projects
- Collaboration continues through UDRC
 - Formal attendance at meetings
 - Informal advice and supervision of projects
 - Review of reports and publications
 - Provision of relevant data
- The future
 - Sponsorship of MEng projects?
 - Collaborative PhD?

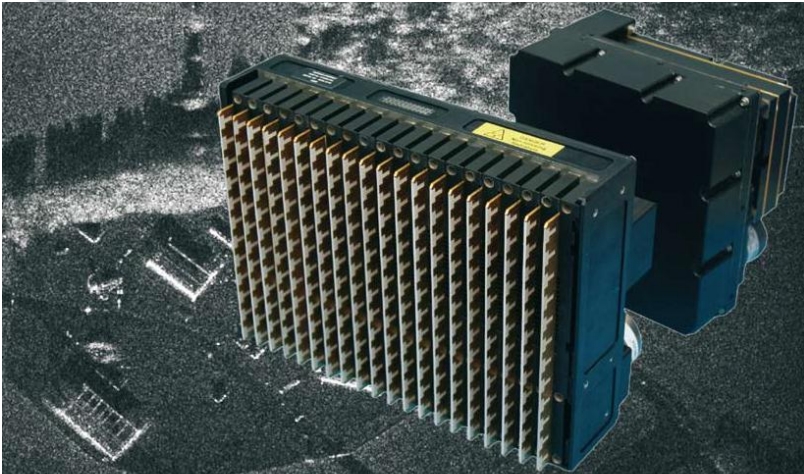
SELEX ES PROVISION OF TRIALS DATA

- Few academic groups have their own radar systems and rely on access to data from experimental systems.
- The UK has no airborne radar system that academic research groups can get open access to (Germany, France and the USA do)
- Selex ES is awash with data and does not have enough people or time to make full use of it
- The recent collaboration with Strathclyde has included the collection and provision of trials data.
- Trials are based on common research themes
- Academic input helps to shape the trials plan
- Selex ES resources are used to collect trials data – PicoSAR radar
- PicoSAR is a product for small UAVs and light aircraft but is also used extensively for trials work

SELEX ES PICOSAR RADAR

- Lightweight (10kg) compact (about the size of a shoe box) radar system
- In-built Navigation system (GPS and IMU) and 12v DC power supply means it does not have to be fully integrated on an airborne platform (and can be used on the ground also)
- Easily installed in a variety of platforms (e.g. helicopter below)
- Can be controlled with a laptop in the cabin or my remote data-link
- Supports Synthetic Aperture Radar (SAR) image formation (<1m resolution)
- Can also be programmed with novel waveforms

SELEX ES PICOSAR RADAR



TRIALS EXAMPLE

- Study into Micro-Doppler classification.
- PicoSAR installed in a van and pointed towards a scene across a valley
- Various controlled targets are recorded by the radar including a walking person and a horse

Trials site



Radar here

Terrain
profile



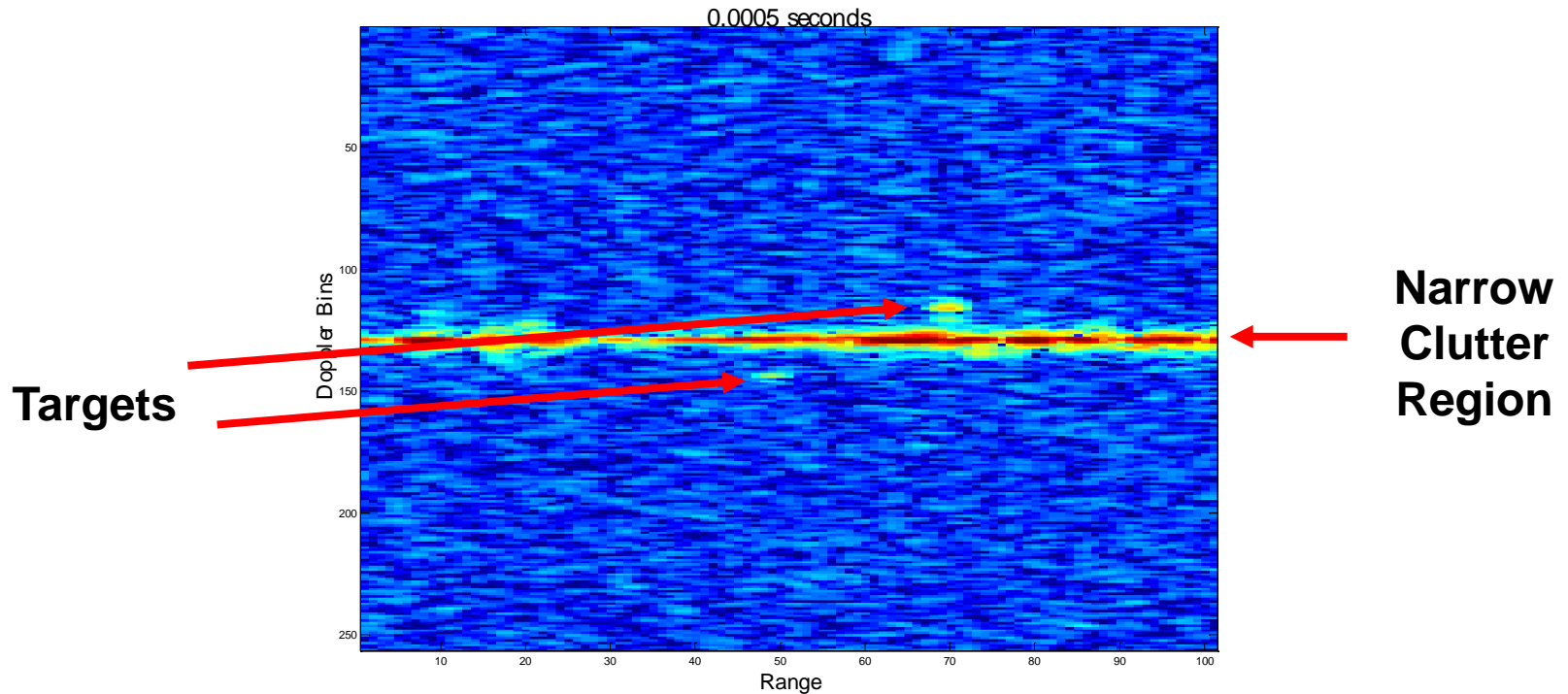
TRIALS ANALYSIS

- Ground truth data (including video footage) helps algorithm development



DATA EXAMPLE: RANGE/DOPPLER

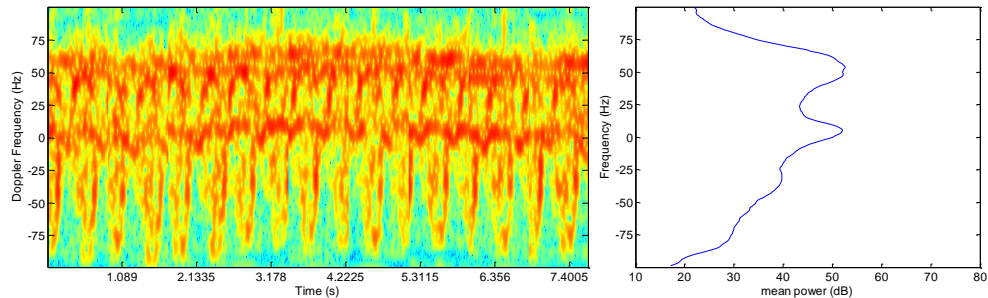
- Data is processed so that it can be easily developed by academic partners and results can be replicated by industrial researchers.
- The plot below shows basic processing of the trials data.



EXAMPLE RESULTS

- Profile analysis allows classification techniques to be developed by both partners in the collaboration.
- The plots below show the micro-Doppler profiles of a walker and a horse. These profiles form the basis for classification.

Walker



Horse

