Systems Engineering for Autonomous Systems
Defence Technology Centre

SEAS DTC

LSASD

BAE SYSTEMS

Large Scale Autonomous Systems Demonstrator

The BAE Systems Advanced Technology Centre (ATC) Large Scale Autonomous Systems Demonstration (LSASD) Project aims to validate and make available a demonstration facility for integrating, demonstrating and evaluating multiple technologies for autonomous systems developed under the SEAS DTC consortium.

The facility will allow SEAS DTC technologies to be demonstrated, matured and tested on Real Platforms (mobile and otherwise) in a Real World Environment.

A case study has been successfully completed, with Oxford Vision Group's (OVG) 'Topological Slam Loop Closing Algorithm' (SEN011) having been integrated onto the Demonstration Facility (the ATC's Discovery Platform).

AIM

The LSASD Project aims to validate and make available to the SEAS DTC a demonstration facility for integrating, demonstrating and evaluating multiple technologies for autonomous systems developed under the SEAS DTC consortium.

APPROACH

The Demonstration Facility will consist of a number of mobile and static platforms, camera networks, and a demonstration site to facilitate integration, maturation and testing of different SEAS-DTC projects.

OUTCOMES

Enable the cost effective integration of SEAS DTC technologies into system of systems demonstrations and also enable the early adoption of the SEAS DTC technologies into real world military products.

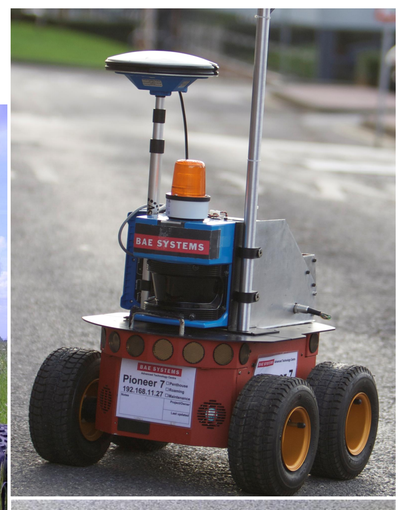
The Demonstration Facility

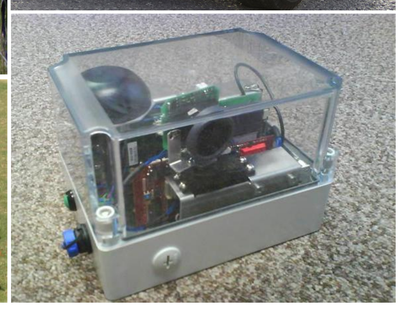
The Facility consists of a number of mobile and static platforms:

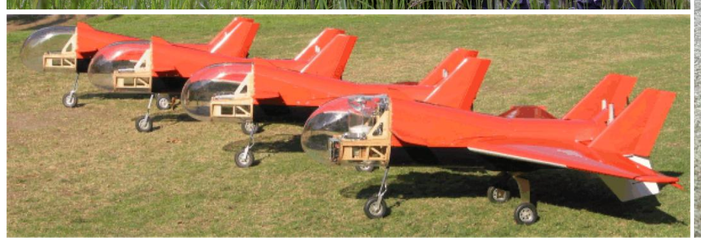
- The Wildcat Autonomous Ground Vehicle test/demonstration platform,
- Robovolc 6 wheel, skid steer, mid sized autonomous platform,
- Pioneer 4 wheeled, skid steer, small autonomous platforms,
- Unattended Ground Sensors (UGS) with wireless communications, camera, GPS, ultrasonic tripwire and seismic geophone.

As well as the platforms described above, the facility includes a CCTV camera network, and the LSASD Project is also exploring the possibility of using UAVs and UUVs.

Further, the demonstration facility utilises a modular 'Autonomous Systems Architecture' across its platforms and assets, which enables ease of integration, and results in a more robust, flexible and stable facility.







Future Work

The next phase of the LSASD Project will produce a series of demonstrations which validate the facility with a variety of SEAS DTC technologies, illustrating its suitability and usefulness. A preliminary set of demonstration and performance metrics will also be generated for assessment of the technologies being incorporated.

To ensure the facility is robust and easy to integrate with, technologies will be selected from across the SEAS DTC themes and partners.

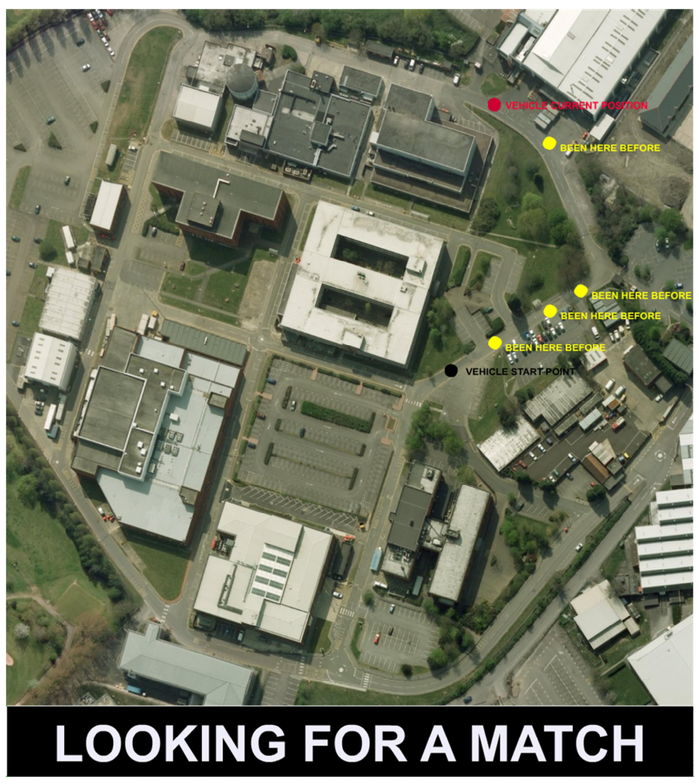
Successful completion of the LSASD will be signified by the availability of a robust Real World Demonstration facility to be utilised by technologies within the SEAS DTC for demonstration, maturation and operational performance assessment.

Case Study (Trial)

The OVG SEN011 algorithm was integrated onto a Land Rover Discovery vehicle (representative of the ATC's Wildcat Autonomous Ground Vehicle) and driven around the demonstration site to 'learn' its surroundings. It used the ATC's localisation software to collect the vehicle's GPS position, and then associated this GPS position with images taken around the demonstration site.

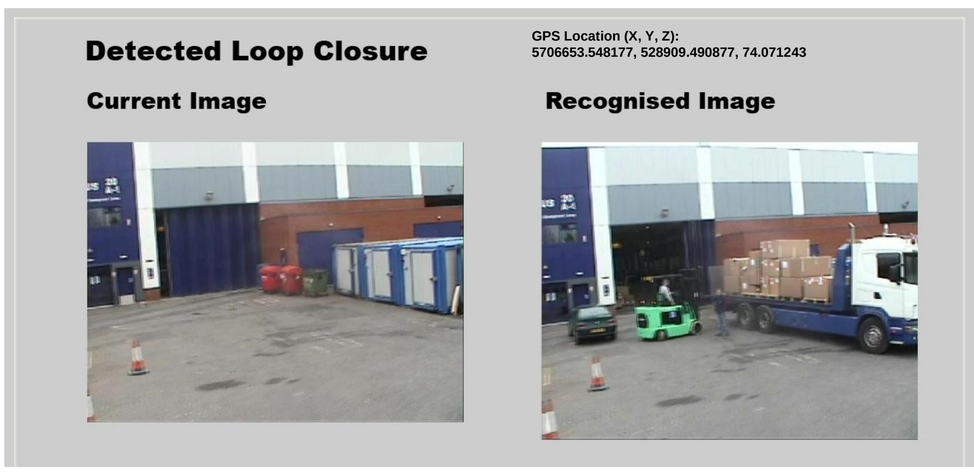
After the initial (learning) lap, the GPS localisation system was turned off.

On the subsequent laps, the system compared current imagery from the demonstration environment, with previously recorded imagery (which had GPS locations associated with it). This allowed the current vehicle position to be inferred from the matched image.



The Discovery vehicle captured images from a left and right camera every 1.5 metres travelled.

In the example shown below, the images were matched despite the lorry, forklift and car having left the scene.



Case Study (Summary)

For the LSASD Case Study, we integrated Oxford Vision Group's (OVG) 'Topological Slam Loop Closing Algorithm' (SEN011) onto the facility.

We found the image matching algorithm to be robust particularly in dealing with scene occlusions such as people and vehicles. The results for inferred GPS correctness are still being analysed.

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DTCs : Industry and the science base working in partnership with UK MoD to develop innovative defence technology

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