QINETIQ

Marine – Land – Air Autonomy 2017

Collaborative Autonomy

The workshops were set the question of what innovation is required to enable collaborative autonomy. There were broad discussions across a number of areas and the following themes and points of interest emerged:

- Customer Pull, Conceptual Thinking and Requirements
  - Customer's requirements are currently shaped by legacy solutions. Asking for a direct replacement of old equipment with new doing a similar task.
  - Instead there should be a wider questioning of whether autonomous technology can enable a task to be done in a completely different and better way and therefore require new machines with new methods of working rather than replacements.
  - Industry needs to help open customer's eyes to the art of the possible to enable them to consider these new approaches and write suitable requirements.
  - Little commercial pull, while O&G uses Hugins they are still using them like ROVs and therefore are not unlocking the full capability and benefits yet.

- Technology Challenges
  - Communications and providing decent bandwidth and connectivity to get data back is a current issue, therefore operating without communications is a key challenge:
    - Machine decision making to operate truly autonomously
    - Data fusion and processing to compress data and only send back the desired information rather than raw data.
  - Units that can respond to emergent issues, such as communications and sensor failure.
  - Power Supply and Management, current systems are limited by not enough power.
  - Launch and Recovery of units is a challenging area that has not been fully addressed.

- Organisation of Swarms and Collaborative units
  - Master-Slave relationships allow for a team leader to control the other units and make the decisions. However the master is a single point of failure. This can be overcome by using a team of same units that can reallocate the master unit if the unit is lost.
  - Swarms of same vehicles can be used that have no master and therefore no single point of failure. However the complexities of true collaboration without a master is difficult to achieve.

- Social Acceptance and Trust
    - Customers are traditionally conservative over trust of technology and adoption. This needs to be overcome.
    - How do we engender trust:
        - Through robust simulation, verification and validation of units
        - Through experience and demonstration. Get units out there and learn through operational experience and demonstrate their capabilities and, where necessary, develop and improve them where they fall short.
        - Reporting to the operators/supervisors to let them know the units are working fine, even when there is no new data that needs to be highlighted to them.

- Verification and Validation
    - Simulation is becoming a more important tool as systems become more complex and it is not possible to perform enough “real world” testing due to cost and time restraints. However simulations can be run quicker than real time at a lower cost than a full exercise allowing simulated testing of the autonomy behaviours.
    - There is an outstanding question on how to validate Artificial Intelligence and Machine Learning. One approach is to treat them more like humans and look to train, examine and certify them.

- Business Models to encourage development
    - More Grand Challenges required to encourage collaboration between industry companies and between industry, academia & the customer; perhaps shaping these challenges is something the SCMC could support? These need to be suitably well funded to encourage participation.
    - Better governmental/trade body roadmaps for both the technology development and funding.
    - There is a desire for greater customer investment in concept development and experimentation, along with longer core research programmes to provide continuity.

Our thanks also go out to all of those who presented at the event and we hope that the mix of industry, academia and customer base has led to some interesting conversations on the day, and the possibility of collaboration in the future. We hope to provide you with a list of all presentations and the associated slides in the near future.

Workshop Lead

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