Innovate UK

Results of Competition: Software Verification & Validation for Complex Systems
Competition Code: 1509_FS_ICT_SVV

Total available funding for this competition was £467K from Innovate UK and DSTL

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
DRisQ Ltd University of Oxford	SeaSwarm	£94,029	£72,969
Project description - provided by applicants			
This proposal concerns the verification of a Cyber Physical System (an autonomous sea vehicle) with respect toa requirement for collision avoidance while maintaining swarm behaviour with other autonomous sea vehicles.The work builds upon a D-RisQ case study of verifying collision avoidance requirements for decision makingsoftware on-board a sea vehicle for remote unmanned over the horizon operation. The step change is theprovision of communication between individual decision making systems to enable emergent swarmingbehaviour. Such swarming behaviour can be harnessed for search and location. The verification will beaddressed by the use of compositional techniques and a powerful model checker that can be run very cheaplyon cloud servers in order to scale the exhaustive search through trillions of states. The current limiting factorfor modelling swarms is the time taken to compile large models consisting of many parallel components.Oxford University will investigate how compilation can exlpoit multiple cores to speed up compilation, and howlazy compilation can be used to speed-up the compilation of systems containing complex parallel components.			

Innovate UK

Results of Competition: **Software Verification & Validation for Complex Systems**

Competition Code: **1509_FS_ICT_SVV**

Total available funding for this competition was £467K from Innovate UK and DSTL

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Dependable Real Time Systems Ltd University of Leicester	TestMiner	£73,908	£56,873
Project description - provided by applicants			

TestMiner is a tool to reduce the time and cost of the Verification and Validation (V&V) of complex systems. Itwill provide better visibility on the causes of software defects that are found during V&V testing. Testing is animportant part of the software development lifecycle to reduce the number of defects that reach the customerand can be tested in a controlled environment. This project will evaluate an approach to reduce the time andcost of the Verification and Validation (V&V) of complex systems. It can be time consuming looking for thecauses of faults during testing when tests fail. To support the software development process, data mining willbe used to highlight the causes of faults by analysing the test data results, the list of software changes and anychanges to dependant software component libraries or other dependant systems, such as databases. Trackingchanges that cause faults becomes very importing for software that operates in environments that change,such as cloud computing where compute processing can scale up and down. The project will build upon existingsystem analysis techniques used in risk modelling to determine the drivers of change.

Note: you can see all Innovate UK-funded projects here
https://www.gov.uk/government/publications/innovate-uk-funded-projects Use the Competition Code given above to search for this competition's results

Innovate UK

Results of Competition: **Software Verification & Validation for Complex Systems**
Competition Code: **1509_FS_ICT_SVV**

Total available funding for this competition was £467K from Innovate UK and DSTL

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Test and Verification Solutions Ltd University of Bristol Dyson Ltd Thales UK Ltd T&VS India	Advanced Hardware Verification Techniques for CPS V&V	£204,907	£65,098
Project description - provided by applicants			
Cyber Physical Systems (such as robotic vacuum cleaners, driverless cars or drones) have the potential todramatically change the way we live by handing over everyday tasks to computers. However, by their verynature, such systems are very complex and often undertake tasks where failure can lead to injury or loss of life.Thus, the testing of such systems to ensure they correctly perform their assigned function in a safe manner isessential. This project brings together experts in this field: researchers from the University of Bristol, testingexperts from Test and Verification Solutions (a UK-based testing company) and developers of Cyber PhysicalSystems (Dyson, Thales and SCISYS) to develop new test techniques to ensure these systems can be deployedsafely in the future.			

Innovate UK

Results of Competition: Software Verification & Validation for Complex Systems
Competition Code: 1509_FS_ICT_SVV

Total available funding for this competition was £467K from Innovate UK and DSTL

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
DRisQ Ltd University of York	SureSwarm	£93,821	£72,129
Project description - provided by applicants			
This proposal investigates the verification of designs, for Cyber Physical Systems, against a system of systemsrequirement of swarming without collision in the presence of non-determinism due to individual systemfailures and the environment in which the systems operate. The cost of verification versus the capability of thecommunicating designs (which reflects the performance of the swarm) will be assessed. The issue of scalabilityin terms of the number of systems in the swarm and the size of the area they operate in will also beinvestigated. Such swarming behaviour can be harnessed to execute a task in the presence of uncertainty. Theverification will be addressed by the use of compositional techniques and a powerful model checker. Theinvestigation will use a case study of an algorithm for robot swarming in order to introduce failures non-deterministically and compensate for these by enhancing the algorithm with fault tolerance strategies.Environmental constraints will be explored through a combination of model checking and efficient robotsimulation techniques.			

Innovate UK

Results of Competition: Software Verification & Validation for Complex Systems

Competition Code: 1509_FS_ICT_SVV

Total available funding for this competition was £467K from Innovate UK and DSTL

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Vertizan Ltd University of Warwick	Automated verification process for Vehicle-in-the-loop simulators	£99,993	£77,188
Project description - provided by applicants			

This project addresses the need for a new approach to test automation applied to automotive vehicle-in-the-loop ('VIL') simulators. Many new intelligent complex systems are being developed for connected andautonomous vehicles. Those wishing to test and verify these cyber physical safety critical systems are startingto use a VIL simulator driven by test scripts. The problem with such scripted test methodologies is that eachtest case is developed as a fixed order of test actions. Each of these test actions also contains fixed parametervalues. When testing all of the use-case requirements thousands of scripted test cases are needed to cover allthe combinations of test actions and parameter values. Defects and errors could be left in the system if thesetest scripts do not exercise all of the functionality of the system of systems in ways that could occur in real life.The project is to characterise the market requirements and feasibility of Vertizan and WMG serving a possiblyunmet need: automating the process of verifying a complex autonomous driving system of systems throughintelligent automated test input generation.

Innovate UK

Results of Competition: **Software Verification & Validation for Complex Systems**

Competition Code: **1509_FS_ICT_SVV**

Total available funding for this competition was £467K from Innovate UK and DSTL

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Sysbrain Ltd University of Bristol University of Liverpool	Verification of UAS decisions in complex physical environments	£72,659	£55,680
Project description - provided by applicants			
The project is addressing and will solve important challenges for the practical use of semi-autonomous UAS in agriculture, structural inspection and urban police work, site security and transport of small items.Today's autonomous operations of UAS are seriously constrained by maximum 500m line of sight piloting under 400ft. System verification results of this project aim to demonstrate for the first time that human-equivalent piloting of a UAS is technically possible for some practically useful classes of complex environments in some of the UASapplications. If successful, the project will be a significant breakthrough for reliable, safe and dependable autonomous UAS flights for civilian applications which will potentially lead the CAA approval of UAS use across the UK and worldwide. As such the project has export potential and can support increasedemployment in the UK.			

Note: you can see all Innovate UK-funded projects here

https://www.gov.uk/government/publications/innovate-uk-funded-projects Use the Competition Code given above to search for this competition's results

Innovate UK

Results of Competition: Software Verification & Validation for Complex Systems
Competition Code: 1509_FS_ICT_SVV

Total available funding for this competition was £467K from Innovate UK and DSTL

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
Predictable Network Solutions Ltd Test and Verification Solutions Ltd Vodafone Group PLC	PEnDAR - Performance ENsurance by Design, Analysing Requirements	£99,533	£49,355
Project description - provided by applicants			
With society's increasing dependence on ICT, the need for means to predict and assure the performance ofcritical infrastructure grows.Today, the performance of large-scale CPS and System of Systems is often an unplanned emergent propertythat can vary substantially during operational lifetime. Although this hazard is sometimes validated as part ofsystem commissioning, it often it finds its way into deployed systems, substantially impinging on the their longterm usefulness as well as increasing their total lifetime costs.There are mature mathematical techniques to capture, validate and verify the performance (and resource cost)of such systems. This feasibility study aims to investigate the technical issues of how to most effectivelyincorporate these techniques into the workflow of organisations so that they can extract the benefits.			