

Innovate UK

Results of Competition: Smart Round 2 2015-16 - Proof of Concept
Competition Code: 1505_SmartRd2_POC

Total available funding for this competition was £8.144M from Innovate UK

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
Penteract28 Ltd	Information Density Holography for Multi-stage Data Reduction and Storage	£175,139	£100,000
Project description - provided by applicants			
<p>Digital information underpins modern life and levels of data generation and movement are growing exponentially, predicted to rise from 4.4 billion TB (2013) to 44bn TB/yr by 2020. However, the value yielded by this data ' supporting \$1.5trillion benefits ' is entirely conditional on a robust framework for data storage, access and transfer, critically dependent on the data volume. In contrast to existing data storage and compression technologies, which are not able to bridge the data capacity gap, the overall concept of information density holography (IDH) has been invented and developed by Penteract 28 Co-founder and CEO George Frangou as a framework for multi-stage high-fidelity data volume reduction, based on dimensional reduction and compression of complex topological/holographic data structures. Now Penteract28 seek to prove the advanced concept of IDH for high compression data storage, as an enabling technology for future big data storage, access and movement technologies. Through a project to develop a mathematical and software implementation of IDH for specific storage aspects, Penteract28 target a step change in data volume reduction. Building significantly on recent advances in topological data analysis (TDA), discrete geometric data analysis (GDA), compressive sensing, principle component analysis and digital holography, the proposed project will develop: holographic transformations of high ND topological data structures, topological/geometric data analysis; combinatorial compression algorithms; and a novel decompression scheme for high fidelity reconstruction.</p>			

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SurgeryTech Ltd	Interactive medical image segmentation software for preoperative planning of complex cancer surgeries	£171,946	£100,000
Project description - provided by applicants			
The visualisation of anatomy in 3D has been shown to improve the ability to localize structures when compared with traditional 2D imaging slices. This has allowed imaging to move from a largely diagnostic tool to one that can be used for both diagnosis and operative planning. To allow for this segmentation of the images need to be performed, where each voxel is labeled by its nature i.e. extracting anatomical structures such as bones, lungs and other organs. This allows for better 3D visualisation and consequently facilitates understanding of the anatomy. Currently segmentation of medical images is not widely used in clinical practice, because of the time required to learn and use existing software. It can take several hours of work, even for a trained biomedical engineer, to perform a segmentation of anatomical structures using current available software. Also setting up the software for a few cases can be expensive, and clinicians often do not have the computational resources to run these algorithms. The objective during the proof of concept study is to: a) Develop a novel algorithm to allow for an interactive segmentation of medical images. b) Make the interaction with the software web based, using the latest web technologies. c) Test the proof of concept by performing segmentations for a clinical study for patients undergoing kidney cancer surgery.			

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Alchera Technologies Ltd	Alchera Mixed Mode Bicycle Detection	£156,166	£91,166
Project description - provided by applicants			
Vivacity Labs is a leading Intelligent Transport Systems company that designs and operates intelligent camera-based platforms to interpret, predict and react to movements using computer vision technology. Following the success of this platform in tracking pedestrian and vehicle movement in public places such as stations, we now want to develop an advanced system to specifically identify and differentiate cyclists in mixed mode traffic, to ultimately reduce the number of cycle related road accidents. Although systems exist to track cars, difficulties in identification, differentiation and automation means no one has managed to achieve this for cyclists on a low-cost platform before. Our first step to doing this is the design and development of a series of algorithms to detect cyclist's unique characteristics using computer vision and machine learning technology.			

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S-cool Youth Marketing Ltd	PoC - S-cool iALTS (intelligent Adaptive Learning Tutoring System)	£169,311	£100,000
Project description - provided by applicants			
For over 15 years, the S-cool website (www.s-cool.co.uk) has been the UK's largest free GCSE and A level revision website with over 7.8 million visitors, viewing over 24.9 million pages of educational content a year, via its website, online books and phone apps. Following a successful 'Proof of Market' research project, S-cool plan to perform a 'Proof of Concept' R&D project to create a basic prototype of an artificial intelligence that uses self-improving machine learning to deliver virtual tutoring support of GCSE and A level students using online content. This ground breaking new product is called Intelligent Adaptive Learning Tutoring System (i-ALTS). Should this R&D project be successful, this would provide a ground breaking, widely available and affordable intelligent tutoring service to millions of UK GCSE and A Level students initially through S-cool's vast user base and all other online learners.			

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SFD Systems Ltd	The SFD System, an advancement in electronic shelf label technology	£168,892	£100,000
Project description - provided by applicants			
<p>For more than 25 years, Electronic Shelf Labelling (ESL) have been considered one of the most promising innovations in Global retail offering greater control & flexibility for product pricing & replacing paper based systems which are both costly & labour intensive (with some retailers changing up to 5- 10 million paper based shelf edge labels/ week -all manually) Despite the potential offered by ESL, adoption in the UK retail market is limited, failing to progress beyond initial trials with the main barriers based around format, security & reliability, power consumption, integration and cost. Based on consultation with leading Supermarkets & a technical design concept established aligned to their needs, SFD aims to address these key barriers currently preventing adoption of this highly sought after but elusive technology in the UK retail sector, through the development of true step change in ESL. The proposed secure fit and forget solution, is based around the use of full colour digital displays presenting the Store's form and text pricing formats and allowing for the incorporation of product branding. Other key functions include an ability to provide unlimited accurate updates in real time (from a central server to any store within a retailer's network), allowing a retailer to dynamically match pricing to varying demand & market conditions. Next to an estimated 23% uplift on sales, the impact of the system is the potential save up to £150K per store per year and a better more informed, consistent shopping experience for the consumer. With the replacement of paper labelling representing a key goal for all Global retailers, the development of the proposed SFD System represents a significant business opportunity with direct relevance to all forms of retail & other markets e.g. transport</p>			

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Cat international Ltd	CAT International Limited - Development of 3D printing machine for carbon and carbon composite articles	£207,726	£100,000
Project description - provided by applicants			
<p>The problem with producing high purity single crystal (SX) materials is that contaminants and defects present in the casting mix, oxidation, and contamination from the crucible, or by simply not using filters at all results in low yield production. Structural defects or grain boundaries are introduced, and the advantageous mechanical, oxidative and heat resistant properties essential for high end applications are lost. To solve SX low yield production, which costs foundries scrap losses as high as 40% (\$110m) a year, we aim to provide a low cost, high yield production technology of manufacturing aids, carbon composite filtration devices, which can be produced in a SME viable commercial 3D printer. Ultimately, the proposed 3D printer will be printing filters for production purposes. The new filters will allow smaller scale filters, with greater control over porosity, surface area and extraction efficacy, allowing higher yield SXs to be produced for the first time. The main project printing innovation is the creation of the ceramic and carbon precursors and the delivery of the precursor through a novel print head. This will enable a new 4th class of 3D printing, not previously possible since the birth of 3D printers in the early 1970's. The prototype high purity metal filtration device will be an improvement over the standard article, essential across all metal casting industries processes. We will further create enhanced degassing rotors from the SX materials, essential to all aluminium pours for enhanced yield. Although SX alloys account for only 0.02% of the total high performance steel market, their value per tonne is 46 x greater for high performance alloys compared to crude steel (0.014 cf 0.06, Roskill). The 3D printing process can be adapted to generate rapid prototyping and further manufacturing aids that will lead to novel, new technology</p>			

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Pearwalk Engineering Ltd	PyroGen - End of life plastic to oil pyrolysis for a closed loop energy from waste process	£256,162	£100,000
Project description - provided by applicants			
<p>The UK is increasing its adoption of alternative waste disposal options including increased material recovery & recycling, & processes that enable the recovery of energy from wastes such as anaerobic digestion (AD), incineration & advanced thermal treatment processes such as pyrolysis & gasification to reduce landfilled waste & meet the UK's increasing energy needs. Currently, UK waste disposal facilities (MRFs, AD plants, composting facilities, etc.) send 27,000kt of end-of-life plastics to landfill at a total cost of ~£70M (gate fees of £80/t) per annum, placing the UK in the bottom 7 of the EU27 for diversion from landfill & at risk of reaching landfill capacity by 2018. Pyrolysis provides a viable solution for the conversion of these end of life plastics back into oil. Smaller scale pyrolysis technologies in operation have been designed to handle a consistent organic biomass feedstock & are limited in scale by pre-treatment & refinement processes. Due to the inconsistent mix of plastics in the municipal solid waste (MSW) stream, the quality of oil products derived from ELPs is low and further processing is required to give a quality fuel product. Pearwalk propose a novel integrated pyrolysis system which uses a continuous process that will allow for a closed loop/continuous system across a variety of scales using smaller but more frequent waste streams. The technology will provide a significant opportunity for AD plant operators & material recover facilities (MRFs) to turn their unsorted, unwashed waste end of life plastics into clean low sulphur fuels (for heating & energy generation) without the need for extensive, complex & costly pre-treatment or refinement processes. The project aims to design a small scale pyrolysis rig prototype & to evaluate its use with a variety of mixed end of life plastic feedstocks to ensure that sufficient output yields can be achieved for a commercially viable energy from waste solution to be developed.</p>			

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Evolve Growing Solutions Ltd	RIPE (Rapid Installation Process for ETFE) – facilitating the use of advanced ETFE glazing materials into commercial greenhouses	£165,499	£99,299
Project description - provided by applicants			
<p>Greenhouses (GH) protects crops from adverse conditions, allowing year-round cropcultivation and enhanced management against pests and diseases. This is particularly essentialfor warm crops (tomatoes, cucumbers and peppers) in Europe. Although glass is thetraditional material for commercial GH, innovative materials such as ETFE can offerenhanced properties and impact to the crops. Experimental studies confirms that ETFE is theideal material for GH, minimising the energy use and eco-compatible. Japan has 3,500ha ofETFE GH's, developed as the alternative to glass, some with over 20yrs old, with nomeasurable material change. ETFE is growing worldwide (9.91% CAGR) mostly driven byglass replacement on architectural projects. Yet, there is huge entry barrier on Europeanprofessional GH building industry. Paramount is the shift from handling glass (a hard andheavy material) to ETFE film (a soft and light material, 1% glass weight). Based on ourexpertise and access to supply chain, we have developed the initial concept of a roofinstallation system ('RIPE ' Rapid Installation Process for ETFE') that would providebuilders with an effective method to handle and install the film on GH's roofs at same costlevel as the current model. The technology is based on achieving tension with heat (with totalfreedom to operate in the UK and EMEA) and mechanising the'roll to roof' process. Thisproject will support Evolve in proving the technical feasibility of a tension system to installETFE on rooftops. That will enable us to reach Evolve's goal of advancing ETFE adoption bythe horticultural market, and therefore, contributing to: (i) higher quality produce due to betterlightning conditions; and (ii) potential significant reduction in pesticide use due to UVtransmission affecting the plants own mechanism's for resisting these vectors.</p>			

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SENSE Biodetection Ltd	Novel technologies for profiling of colorectal cancer biomarkers at the point-of-care.	£166,657	£99,994
Project description - provided by applicants			
Colorectal cancer (CRC) is the fourth largest cause of cancer death worldwide, with 694,000 deaths per annum. In the UK it is the second leading cause, with 16,187 deaths in 2012. In current clinical practice, CRC patients are tested for mutations in certain cancer-related genes in order to assess their prognosis and determine eligibility for particular targeted therapies. Typically, tumour biopsy tissue is used for screening, which does not always reflect the mutational status of the disease during progression and can lead to incorrect treatment decisions. We aim to develop technologies for a novel single-use, handheld testing device to profile key mutations using a pin-prick of blood to sample DNA released from tumour cells. This approach aims to provide accurate real-time diagnostic information to clinicians. The low-cost and usability of our test will provide potential for its routine use in monitoring treatment response and early detection of recurrence to improve the chances of long-term survival for patients.			

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Pet Technology Ltd	Felcana – a simple, connected, pet platform	£172,448	£100,000
Project description - provided by applicants			
<p>The Felcana project will confirm that human electronic sensors can be successfully utilised in the animals. In humans the use of 'wearable' and other connected devices is expected to increase dramatically over the next 5 years. The pet population presents huge potential to employ similar technology as pet owners are interested in their animals' health and wellbeing. Current wearable and connected technology for animals is nascent. Devices are available for identifying location and activity levels but are cumbersome and have poor battery life. In the veterinary hospital environment, devices offering basic clinical monitoring (e.g. heart and respiratory rate, ECG, temperature) are routinely used. However, these devices are large, expensive, and complex for continuous use outside of a veterinary hospital. Felcana will be a highly innovative animal platform. Current human sensor technology will be adapted to enable activity level and basic clinical monitoring to be continuously measured outside a clinical setting. The Felcana platform will enable owners to monitor what their animals are doing as well as providing early warnings of many potential illnesses. Certain challenges need to be overcome to enable human sensors to work well on animals. The presence of fur limits the effectiveness of sensors that normally require direct skin contact. Additional durability is also essential since animals may brush the device against hard surfaces or expose it to water. The Proof of Concept will confirm that sensors can be effectively used in animals in specific situations. Necessary adjustments to increase durability will also be developed to result in a simple device that can be worn by pets with appropriate functions and connections to software as required. The Proof of Concept project will evolve into a Proof of Prototype project which will enable the device to be reduced in size, enhance battery life and extend wireless connectivity so that it can be used in small breeds.</p>			

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Protea Ltd	"AIR-IQ" - 'Automated Infra Red Identification and Quantification' in the application of environmental gas monitoring	£145,181	£87,108
Project description - provided by applicants			
<p>Protea Ltd. has been at the forefront of the use of Fourier Transform Infrared (FTIR) spectrometry for the measurement of industrial pollutants for 20 years. One major advantage of FTIR spectroscopy is that it can give detailed qualitative and quantitative chemical information for a wide range of gases. As a detection and analysis tool it is very powerful, but its analytical capability in real time is limited. It is either in the hands of a trained operator (a spectroscopist) who can study IR spectra and apply the correct calibration routine in the software for the gas matrix observed or is automated to the detection of a specific gas for a specific industrial emission. This adds significant extra cost to the ownership and operation of the equipment. This means that FTIR technology is often viewed as a difficult or skilled technique requiring expertise. Full automation of the process would remove the time and skill required for the pre-programming of a system for expected gases and the post-collection analysis routines. Therefore the aim of this Project 'AIR-IQ' is to prove the concept for real time dynamic qualification and quantification using IR and advances in software algorithms, and to deliver this in a portable light weighted gas analyser. This would be an industry first, and would result in a gas analyser that can be switched on in factory or field and give qualitative feedback as to what gases are present in a sample, before then automatically applying the correct quantification analysis to report direct concentration values. Industrial users will for the first time be able to see, in real-time, what gaseous species are present in their process or emission gas streams. Furthermore, the analyser's readings will be able to be reported to legislative bodies, such as in reporting emission limit values for which a plant would have permitted levels. Protea's technology will therefore contribute to the UK's goal of reducing harmful gas emissions.</p>			

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LIG Nanowise Ltd	Super-Resolution Optical Microscopes	£164,420	£98,652
Project description - provided by applicants			
<p>Optical microscopy is an important imaging technique that is used throughout scientific research. However due to the optical diffraction limit, within the visible light spectrum, existing optical microscopes are restricted to a theoretical resolution of 200nm. This limitation therefore prevents standard microscopy from being utilised in further applications, such as the study of live viruses (typically <100nm in size), their interactions with cells and drugs and inspection of nanostructures. LIG Nanowise aims to develop the first commercially available, low cost, white light microscopes at a 75-100nm resolution and confocal optical microscopes at a 25-50nm resolution, without the reliance on the use of fluorescence particles embedding into the target materials, which will enable the study of living viruses and their interactions with drugs and cells. Both are unique and well beyond the current optical microscope capabilities.</p>			

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Rais Opportunities Ltd	rais - customer intelligence agent	£163,634	£98,180
Project description - provided by applicants			
<p>Rais, an innovative UK SME, intends to provide online retailers with a novel intelligence solution that will reduce their cost of customer acquisition and generate more repeat business. SME retailers typically can't generate sufficient consumer insights to prepare the personalised and relevant campaigns needed to drive repeat business. Many suffer from a high cost of acquisition too, and do not have the consumer intelligence or means to find new, profitable customers. As a result many SMEs bombard their customers with irrelevant marketing communications and with generic offers and recommendations. This both disengages customers and reduces retailer profitability ultimately impacting consumer choice. Rais' powerful, but simple-to-use software tool will uniquely use advanced machine learning and AI to enable clients, particularly SMEs, to focus their marketing communications leading to the acquisition of high lifetime value customers and increased repeat orders. The proposed project will generate a novel product capable of:</p> <ul style="list-style-type: none">a). Extracting (from disparate sources), connecting, auto-analysing and generating insight from consumer datab). Recommending what actions to take as a result of the insight generatedc). Presenting insight and recommendations in an easy to absorb manner for retail marketers so they can take actions more quickly, e.g. what customers should buy next, what they might like to buy and with what sort of discount (if any)d). Learning whether the recommendations were good or not based on the resulting actions by consumers (via machine learning and artificial intelligence)			

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Molecular Products Ltd	Vortex: A non-powered active CO2 scrubber for mine refuge chambers	£174,124	£100,000
Project description - provided by applicants			
<p>A mine refuge chamber is an underground shelter used in emergencies where evacuation is no longer safe or practical, & must prevent CO2 build-up that could lead to suffocation or poisoning. Currently, mine refuge chambers use passive CO2 absorbing curtains, as there will often be no means of powering an active CO2 scrubbing system in an emergency. The curtains rely on natural airflow to remove the CO2. In low airflow, typical of enclosed spaces, the morphology of the curtains means that only 60% of the scrubbing compound can react before the end of their lifecycle, reducing their lifetime. Furthermore, they generally use lithium hydroxide (LiOH) which is toxic & can cause burns, & the reaction between CO2 and LiOH often causes the chamber to exceed temperatures of ~35°C which can lead to stress, dehydration, nausea & fainting. The curtains are large & cumbersome & have to be rolled out & hung up which can waste precious time in a life or death situation. To address the problems & take advantage of the market opportunity, Molecular Products Limited are proposing a non-powered, active CO2 & CO draft tube reactor system (Vortex). The system will use latent heat from the scrubbing reaction to create its own airflow & actively remove the CO2 from the air. Advantages over curtains:- Lifetime is increased by over 30% - Vortex will use 85-90% of the available reactant & will self-regulate due to the active airflow, increasing lifetime by at least another 6 hours.- Vortex will produce ~25% less heat energy - uses non-toxic, less exothermically reactive Sofnolime®, so ambient temperature will be significantly lower.- The forced airflow will allow Vortex to retain a more consistent CO2 removing capability over its lifetime, similar to powered systems.- 1/5 the volume of a curtain ' making easier storage & saving space when in use.- As well as removing CO2 from the atmosphere, the draft tube will also contain Moleculite®, so will remove CO.</p>			

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Asymptote Ltd	Equipment for shipping cryopreserved T cell therapies	£138,797	£83,278
Project description - provided by applicants			
<p>Cancer treatments are being transformed by T-Cell therapies and present a huge global opportunity. However, logistical problems transporting the cells to and from the patient are restricting the industry's growth. There is an urgent need for a portable shipping device that combines; controlled sample freezing, temperature controlled shipping, data logging, short term frozen storage and thawing. This project will develop a basic prototype, free of liquid nitrogen, optimised for the shipping of T-cell therapies. This will be an electrically powered system based on a Stirling cryocooler, with a target isothermal hold temperature of -120°C. The system will be able to operate on mains power, a 12V vehicle supply or via an uninterruptable power supply (UPS). The storage chamber will be vacuum insulated and the device will maintain -100°C for 24 hrs when disconnected from all power. To allow transport of the source T-cells, the equipment will also be able to carry out the controlled rate freezing (CRF) of samples. The equipment will also act as a storage device at the clinical site, maintaining the sample temperature below -100°C until required for treatment. In discussions with a range of end users (academic and commercial) we have confirmed that there is currently no suitable cryogenic service for autologous treatments which can offer CRF of the source cells, temperature controlled transport, data logging, short term storage and thawing.</p>			

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AJA.LA Studios Ltd	AJA.LA STUDIOS: A Novel System for Recognizing and Synthesizing Speech for African Languages	£88,254	£52,952

Project description - provided by applicants

This project will demonstrate commercial viability of automated voice-recognition (AVR) and text-to-speech (TTS) for Sub-Saharan African languages. AVR receives speech and applies a mathematical model that converts the speech into information a computer can understand and manipulate. TTS decomposes text into a symbolic representation a computer can understand and applies a statistical model that manipulates the symbols to synthesize speech humans can understand. Commercial AVR and TTS systems are available for languages of Europe, the Americas, developed Asia, and China. Globally, speech products represent a ~20b industry and have applications in industries including financial services, health care and telecoms. AVR and TTS vendors have mostly limited commercial coverage of Sub-Saharan Africa to South Africa. Growing regional economies and an expanding consumer class suggest a significant commercial opportunity for speech products across Sub-Saharan Africa. Key challenges associated with AVR and TTS for African languages include language tonality, ligatures in colloquial speech, and unique phonemic combinations. Many African languages have limited documentation and offer many dialects. AVR and TTS systems should also be accessible to the widest audience possible, with consideration for regional connectivity & device demographics. This project addresses three key innovations. Firstly, design of a mathematical model to recognize speech at commercially viable qualitative & quantitative error rates. Secondly, design of a statistical model to synthesize speech from text. Both models will address the unique challenges described earlier. Thirdly, design a system for delivering AVR and TTS in low connectivity areas and on older mobile device models to capture the widest possible audience. For tractability and to address two key markets of economic and demographic significance in Sub-Saharan Africa, the project will target a small vocabulary of Yoruba and Swahili words.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Utonomy Ltd	Intelligent Gas Grid Management	£166,569	£99,941
Project description - provided by applicants			
<p>Utonomy was founded in May'15 to develop technology for reducing leakage in low pressure gas distribution networks by optimising pressure in the network. We want to verify use of advanced predictive analytics to reduce overall pressure and therefore gas leakage which is indirectly proportional to the pressure in the network. Natural gas (used in the networks) is comprised largely of methane which is a potent greenhouse gas and leakage of gas is a big contributor to global warming. Although only 14% of greenhouse gas emissions worldwide are methane, it traps up to 84 times more heat than CO₂ (over 20 years). This smaller amount of methane is 12 times worse for climate change than CO₂ over 20 years. In the UK, leakage from the gas network is estimated at 7,000 GWh (1% of gas transported) costing the consumer £180m pa and releasing 10m tonnes pa of CO₂e (the method by which the greenhouse effect of all gases are measured is by comparison to CO₂). By optimising the pressure, we expect to reduce leakage by more than 20%. The Intelligent Gas Grid Management (IGGM) project, will develop and test a method of predicting demand and demand/pressure relationships automatically regulating pressure in a network to keep it just above the minimum. To achieve this, we will undertake R&D on the two most challenging aspects of the proposed solution 1. Mathematical analysis of large datasets to develop a predictive software control model 2. A means of accurately adjusting the governor's (gas pressure control valve) outlet pressure through a mechatronic hardware design. The PoC output will be software that allows us to model the leakage savings on an example gas network, plus hardware that demonstrates that precise governor control can be achieved within cost and reliability targets. To exploit outcomes, we will approach gas distributors for trials/commercial partnerships and seek investment & funding to develop a prototype for an end-to-end pressure control system.</p>			

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Innovate UK

Results of Competition: Smart Round 2 2015-16 - Proof of Concept
Competition Code: 1505_SmartRd2_POC

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Lindhurst Engineering Ltd	Self-regulated asynchronous cogeneration to enable micro-scale waste-to-energy biogas utilisation	£188,829	£100,000
Project description - provided by applicants			
<p>Methane-rich biogas produced as a waste-to-energy (WTE) by-product of organic effluent treatment in anaerobic digesters and microbial fuel cells has potential to generate 30TWh of electricity. Yet, whilst combined heat/power units (CHP) based on dedicated industrial biogas engines currently recover energy from large-scale WTE and cogeneration (CG) technologies (250KWhe), the current size is not compatible with the waste/energy requirements of most potential users, meaning that only 1.6% of the available feedstock is being utilised. Micro-scale WTE technologies ' which are uniquely aligned with these requirements ' are therefore predicted to dominate the market through widespread public and industrial application. However, despite uptake of micro-AD/MFC growing rapidly, there is no commercial technology for biogas micro-CG due to a fundamental restriction on scalability of synchronous generator costs with reducing CHP size. Lindhurst Innovation Engineering aim to realise an enabling technology for a turn-key biogas micro-CHP, by instead proving the technical feasibility of self-regulated asynchronous generation, allowing key expensive components for synchronisation to be omitted. Based on a novel framework for high power factor grid-linked induction, a dedicated micro-scale biogas engine and integrated scrubbing, the project targets a step change in engine displacement/electrical generation capacity, system complexity, cost, noise and maintenance.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Trantor International Ltd	High Speed Tractor Suitable for Conservation Agriculture	£156,746	£94,047
Project description - provided by applicants			
<p>With increasing pressure on the natural environment and resources it is essential that we develop farming systems that have a low impact on the environment, and are also highly productive in meeting the needs of a growing population. Finite soil resources and the compaction and erosion of soil has a significant impact on food population. A new farming system, conservation agriculture, is being promoted globally. This involves interventions such as mechanical soil tillage being reduced to an absolute minimum to minimise detrimental effects on soil structure, composition and natural biodiversity. It has proven potential to improve crop yields, while improving the long-term environmental and financial sustainability of farming. Trantor International Ltd propose a radically new approach to tractor design. It will meet the needs of Conservation Agriculture and will also be able to undertake a range of conventional tasks.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Glass Technology Services Ltd	Centrifuge machine for the production of glass microspheres	£187,706	£100,000
Project description - provided by applicants			
<p>Glass microspheres represent a class of additives that offer enhanced mechanical performance, process control and cost benefits for the: (1) Biomedical sector - orthopaedic implants/cements, dental pastes & maxillofacial implants; and (2) Industrial sector - oil extraction, waterless gas fracking, water purification, transportation and aerospace. In 2013 the global microscopic glass spheres market was valued at US\$3.4 billion [microspheres.us] and projected to reach US\$5.9 billion by 2019 with growth driven by emerging applications, superior structural properties and increased demand for efficiency. Current crushing or milling methods are energy and temperature intensive affording geometrical irregularities and changes in the crystal morphology and thereby structural properties. Deficiencies include (1) non-homogeneous grain structure; (2) decreased tensile strength; (3) increased wear; and (4) premature mechanical failure. GTS wishes to conduct a Research project to assess the technical and commercial feasibility of designing, engineering and testing a small machine capable of utilising the energy associated with molten glass to (ideally) form uniform sub-micron glass spheres or (as a compromise) glass fibres or flakes which could act as precursors to spherification. Initial core focus will be placed upon servicing the biomedical industry, specifically for orthopaedic implants. Global health organisations including the NHS will economically benefit from efficiencies related to faster, less traumatic surgeries, faster mobilisation of patients and reduced risk of implant failure thus avoiding costly revision surgery. Similar benefits are also feasible for dental and maxillofacial surgical procedures which require implant coatings, cements and pastes. Emphasis will also be placed on exploring whether acquired know-how could allow technology transfer to glass sphere production for industrial applications e.g. oil and gas.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Maynard House Ltd	A new cold pasteurisation technique for the processing of fruit & vegetable juices to retain nutrients & vitamins	£162,877	£97,726
Project description - provided by applicants			
<p>The demand for nutrient-rich fruit and vegetable juices with reduced sugar content is rising steadily each year within the UK, as consumers strive to achieve a healthier lifestyle. As supermarket sales account for 80% of the market within this industry, a good shelf life for produce is necessary. To achieve this, the vast majority of fruit & vegetable juices are processed by heat sterilisation (pasteurisation), including the well-established Innocent Smoothies. Although this process is successful at killing any harmful pathogens, it also substantially reduces levels of vitamins, nutrients and enzymes present in the juices; subsequently affecting taste, smell and colour. Since there are notably fewer health benefits to drinking fruit & vegetable juices which have been treated using pasteurisation techniques, there is a clear need to develop an alternative processing method which will drive the fruit and vegetable juice/smoothie market to distribute healthier produce and continue growth. Our idea is to develop an innovative new technique for processing juices/smoothies (without heat treatment and at much lower cost than high pressure processing) by employing ultrasonic technology. The technique will prolong the shelf life of fresh juices, but without loss of vitamins and enzymes to generate healthier, more nutritious products. Our goal is to establish a clear 'proof of concept' for pathogen inactivation in juice using ultrasonic technology and create a novel processing chamber and system specification. The development of this technology would enable juice/smoothie manufacturers to capitalise on new business opportunities and provide significant health benefits for the population; consumers will be able to increase their fruit & vegetable intake by making healthier juices more economical and widely available.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Medical Wireless Sensing Ltd	MetaSurface - A compact device to drastically reduce MRI scanning times	£164,617	£98,770
Project description - provided by applicants			
<p>Rising to the Nicholson Challenge. Magnetic resonance imaging (MRI) is the leading technique for diagnostic medicine, biology, and neuroscience. It is the only method capable of measuring brain neural activity, detecting early cancerous cells, imaging nanoscale biological structures, controlling fluid dynamics and functional cardiovascular imaging. The demand for MRI scans is increasing year after year, resulting in longer waiting times due to a limited number of machines. In addition, there is greater requirements for higher resolution imaging using higher static magnetic fields (3T or higher), however these machines are bulkier and more expensive. These factors place huge pressure on the NHS to meet the demand within existing budget constraints and resources. This project will investigate the feasibility of a breakthrough invention to drastically increase MRI efficiency by improving its signal-to-noise ratio (SNR). MetaSurface is MediWise's 'smart' material technology, a proprietary non-ferrous metallo-dielectric grid compact structure. It is a comfortable yoga mat-like structure, positioned underneath a patient's body as they lay flat on the MRI table. It is a passive device with no electrical or mechanical parts and can be easily repositioned or moved from one machine to another. The project will expand upon preliminary experimental and pre-clinical data and will deliver a new prototype that will be used on human subjects for the first time. This technical feasibility study will demonstrate MetaSurface's performance enhancement reporting on SNR, MRI image acquisition speed, sensitivity and image resolution. MetaSurface is machine-agnostic. It can be used with any commercial MRI scanner for any field-strength and has the potential to increase the patient throughput by 50% which is translated in millions of pounds of savings per year for the NHS.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
LastFit Ltd	LastFit	£166,439	£99,863
Project description - provided by applicants			
<p>It is widely recognised within the footwear industry that shoemaking has not changed for over a century, despite being tedious, time consuming, and expensive for manufacturers, retailers and consumers. Although there is progress in construction of CAD files of shoe lasts (physical form to determine final shape/fitting of a shoe), digital production in the prototyping phase, and 3D body scanning technologies to capture consumers' measurements for garments; vast improvements are still required to accelerate shoe production and diminish the costs associated with prototyping. While lasts are currently CAD designed, the iteration process still involves extensive manual work and pattern making takes several attempts to reach a final version to cut material from (highly important with difficult fabric such as leather). This is because sizing is not integrated with the actual foot size but rather a closest tolerance and best match across an average of 12 lasts, to avoid subsequent complications when making the actual shoe. This is more troublesome in bespoke footwear, where shoes are designed for a given consumer, with shoe lasts hand modified separately for consumer's right and left foot (as up to 60% of us have mismatched feet - College of Podiatry, 2014). LastFit, aims to redefine these century-old techniques and streamline manufacturing processes by introducing an innovative approach to construct and iterate shoe lasts, and develop accurate patterns, whilst still retaining historical craftsmanship. The iteration process will drop from 3 days to few hours, a significant step change in the industry, improving SOA. The project targets bespoke men's footwear market as a showcase of tech potential, and will widen the adoption of mass customisation - first by supporting manufacturers to shorten their prototyping cycle and then by increasing accessibility to comfortable, perfectly custom-fitted for consumers, at a similar price to current high quality mass-produced shoes.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
TecExec Ltd	HEDON - High Energy Dispersion of Nanoparticles	£99,932	£59,959
Project description - provided by applicants			
<p>The inclusion of engineered nanoparticles has been shown to dramatically improve the performance of many materials and there is growing commercial interest in their widespread use across most industries. For example, carbon nanotubes and graphene are proving to have an enormous impact on properties such as tensile strength and electrical and thermal conductivity when added to polymers. There are also numerous examples in the field of inorganic particles, such as nano titanium dioxide being used in transparent UV-resistant coatings. Much of the excitement, interest and investment to date has been focused on the creation of high quality, uniform particles of various kinds. However, to be used in real applications, these usually need to be mixed into a fluid medium. Unfortunately, the small length scales involved result in strong inter-particulate forces that often cause particles to agglomerate (form lumps) when added to a fluid and lose many of their special 'nano' properties. Effective dispersion and stabilisation of nano particles in fluids usually require a combination of chemistry and high mechanical energy. In the laboratory, ultrasonic mixers and media mills are currently the state-of-the-art for mechanical mixing but they are difficult to scale up and are limited to low viscosities. TecExec Limited is a British company that has developed a range of innovative mixing technologies over the last 20 years. It has concentrated on high energy mixers that are used by companies all over the world in process intensification applications at industrial scales. The TecExec Group has recently developed and patented rotor-stator machines with exceptionally high performance that it believes could be used for nano particle dispersion. This project intends to test this hypothesis with real customer materials for industrial-scale applications and thereby open the market to large-scale exploitation.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
Geometric Design Ltd	Vibrating element loadcell	£88,219	£52,931
Project description - provided by applicants			
<p>SMART factories ('industry 4.0' or 'fourth industrial revolution') are the future for manufacturing via fully integrated and affordable factory automation solutions that streamline materials flow through a manufacturing facility. Key components of Smart factories are Checkweighers - automatic machines for checking weight of packaged goods, normally found at the output of a production process. Checkweighers can weigh in excess of 500 items per minute depending on carton size and accuracy requirements. Current checkweighers use load cells that are analogue devices of low natural frequency and their main problem is response/settling time. They are also affected by machine vibrations 'resulting in uncertainty of measured package weight. Ultimately, this can translate into loss of profits from overweight packs. Our idea is to create a high-speed, high-resolution, shock-resistant (high-Q), digital load cell with no moving parts that can be used in any industrial applications needing fast, accurate and repeatable responses to a change in weight such as checkweighing, packaging and filling machines. Success will create a new market-leading technology in a rapidly growing market where total market revenues for Smart factory solutions are expected to reach \$246 Billion by 2018, with Compound Annual Growth rates (CAGR) of 8.5%. This proof-of-concept project seeks to prove technical viability of our novel load cell technology and work towards a near-term commercially exploitable goal in consultation with a number of end-user stakeholders in the R&D process.</p>			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
XAD Communications Ltd	An advanced Video Analytics Platform (VAP) enabling advanced capability for the global CCTV market.	£196,343	£100,000
Project description - provided by applicants			
XAD Communications build audio, video and data solutions for small and large organisations. Telecom companies and public sector organizations are the major clients of XADCommunications. The company builds video surveillance systems for public and privatesector, high frequency communication systems for critical applications and has a matureplatform for audio/video data acquisition, processing and retrieval that is being used by anumber of clients.This project will develop a fast and scalable video analytics platform that can detect, track andrecognize objects of interest without latencies.			

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
SPA Worldwide Ltd	Bug graph POC	£169,586	£100,000
Project description - provided by applicants			
<p>The problem we are addressing is the barriers to writing automated test that are easy to maintain for mobile applications. The solutions that are used by manual (non technical) testers to create automated scripts are primitive and are incredibly hard to maintain. By supporting and upskilling a the workforce of manual testers we will be able to save customers a significant amount of time and money. SPA Worldwide Limited, trading as GAT provide specialist app testing to the developer community by testing apps through a crowd of professional testers. Having tested thousands of apps including companies like Facebook, Spotify and Candy Crush we have identified 2 major trends: 1) Similar bugs appear in multiple apps 2) Apps are built using similar building blocks. For example - messaging feature, social login, image manipulation, etc. Every time that someone builds an app or a new feature they have to write and design tests to make sure that the Functional GUI works. However based on the above two observations, developers and testers are having to write the same tests every time. Over the past 2 years we have broken these building blocks down and begun to collate all the bugs (defects) that we've found in each of the sections, and we call that database our BugGraph. The Bug Graph was designed to help our testers, by guiding them to spot bugs in an app. This proof of concept project aims to automate the many manual steps in the app testing process, allowing a manual tester to write automation scripts for testing mobile apps. The most important part of this process is the ability to understand the context of the app so that it can be maintained easily as the app develops over time. This will be done by utilising a modular based automated script design that allows script templates to be connected to the context areas of the app.</p>			

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