# ORCHID project re-inventing our relationship with computers

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University of Southampton researchers are at the forefront of a new science that is finding ways in which computers can work intelligently in partnership with people. This could support the management of some of today's most challenging situations, such as the aftermath of major disasters and smart energy systems.

The five-year ORCHID project has looked at how we work with computers: instead of issuing instructions to passive machines, we will increasingly work in partnership with agents, highly interconnected computational components that are able to act autonomously and intelligently, forming human-agent collectives (HACs).

Agents can be in sensors collecting and analysing information to give the 'bigger picture' of an emergency situation as it develops or in a smart meter monitoring the energy consumption of your home, recommending how you might adapt your usual routine to reduce both the cost of the energy that you consume and its carbon content.

On 22 September at the Royal Academy of Engineering in London, there will be a showcase of world-leading ORCHID research from the fields of energy systems, citizen science and disaster response. The event will feature keynote talks from project leaders, presentations of case studies and demonstrations of technologies such as:

- Joulo - a home heating advice system that uses a low-cost temperature logger and online algorithms to provide feedback to

households on how they are using their current heating system, along with autonomous intelligent home heating agents that can learn the householders' comfort preferences in order to provide efficient comfortable heat control.

- AtomicORCHID - a mobile mixed-reality game in which first responders work together with a response headquarters to rescue as many casualties as possible. This game has allowed researchers to study team coordination and understand how human responders can be supported by computational agents that assist the planning and execution of the rescue mission, including the coordination of multi-UAV deployments.

- Japan Nuclear Crowd Map platform - Following the Fukushima nuclear disaster in 2011, citizen scientists deployed sensors and uploaded data to help track the spread of airborne radioactive particles. To identify accurate information from some many sources, the platform combines reports from thousands of sensors and uses machine learning algorithms to correct for biases and noise and weed out those sensors that are defective.

The £10m funded project (£5m from EPSRC with the rest from matched support from project partners) has brought together around 60 researchers from the universities of Southampton, Oxford and Nottingham, together with industrial partners at BAE Systems, Secure Meters UK Ltd, Rescue Global and the Australian Centre of Field Robotics. It is led by Professor Nick Jennings, who leads the University of Southampton's Agents Research Group - the largest research group of its kind in the world.

Professor Jennings says: "This vision of people and computational agents operating at a global scale offers tremendous potential and, if realised correctly, will help us meet the key societal challenges of sustainability, inclusion, and safety that are core to our future.

"This shift is needed to cope with the volume, variety and pace of the information and services that are available. It is simply unfeasible to expect individuals to be aware of the full range of potentially relevant possibilities and to be able to pull them together manually. Computers need to step up to the plate and proactively guide users' interactions based on their preferences and constraints. In so doing, greater attention needs to be given to the balance of control between people and machines."

Provided by University of Southampton

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