

Smart Sustainability: the link between renewable intelligent systems and renewable energy

The need to reduce the rate at which the earth's resources are being consumed as a result of human activities, and alleviate the quantity of greenhouse gases that are being added to the atmosphere, constitutes an urgent and well-recognised problem for humankind. There is a need to satisfy current needs without jeopardising the existence of future inhabitants of the planet. The research areas of information technology and intelligent systems are not often regarded as obvious contributors to the solution to this problem. However, computer-based systems can provide accurate measurement, control, modelling and optimisation functions which can be applied as easily to sustainability-orientated problems as to other applications. Such systems can make a significant contribution to the global sustainability agenda.

"Smart Sustainability" is proposed as a new theme for intelligent systems research, focusing on the considerable benefits that can be gained from the application of artificially-intelligent systems techniques to global and local sustainability and alternative energy problems. There are a number of examples where this approach can prove beneficial. Renewable energy systems demand accurate and convenient sensing methods. The ability of neural networks to provide indirect, virtual, sensing techniques can make a valuable contribution where physical energy sensors are not economically viable or practicably available. Neural networks can also be used to conveniently construct black-box models in situations where complexity makes mathematical, or other types of model, difficult to derive, for example complex energy systems. Energy systems formed using efficiently-utilised fossil fuels in combination with renewables demand control and scheduling algorithms that may not be amenable to conventional control techniques. Fuzzy methodologies can offer advantages in this situation. Such systems benefit from modelling and simulation to determine optimum configurations and designs, and neural, fuzzy and genetic algorithms can be of use here. The optimum use of the earth's resources needs careful monitoring and full cradle to grave lifecycle assessment of materials and products is necessary to achieve this. Rule-based and fuzzy techniques have been found to be advantageous here.

This talk explores the concept of Smart Sustainability and demonstrates the way in which intelligent systems can be of benefit in striving for a sustainable world.