Q. HA. ***Data acquisition, monitoring and control for hybrid solar air-conditioners (Keynote).*** *Gerontechnology 2012;11(2):314;* doi:10.4017/gt.2012.11.02.154.00 **Purpose** This keynote presents recent results on energy-efficient buildings using emerging technologies for green automation. The emphasis is on automatic systems that can operate reliably and conform to requirements for energy efficiency, productivity, quality, and environmental sustainability[1]. Research challenges arising from solar-assisted air-conditioning of buildings[2] are addressed through a multi-stage project on the development of a sensor-rich hybrid solar air-conditioner (HSAC) system that is poses no biological threat, is user-friendly, environmentally safe and performs very well. The objective is to cover (i) identification of the HSAC operational characteristics, (ii) modelling system components for monitoring and performance prediction, and (iii) optimal control of performance using multi-input multi-output (MIMO) advanced control techniques. The system, including a direct expansion evaporator and a vacuum solar collector-compressor unit, is extensively equipped with sensors and instrumentation devices for data logging (*Figure 1*). **Method** Research methodologies include (i) simulation of empirical modelling and experimental verification, (ii) identification and computational intelligence techniques for system modelling, (iii) integration of multiple-objective optimisation algorithms and distributed model predictive control schemes, and (iv) MIMO higher-order sliding mode control. **Results & Discussion** Collected data are recorded via a multi-channel data logger and fused for monitoring and control. By adopting the technique developed by Vakiloroaya et al.[3], mathematical models of the system components are validated from data recorded in one typical week in the summer and used to predict performance, in conjunction with a transient simulation software package. Preliminary results indicate a significant amount of energy savings (ranging between 35-42%) can be achieved from the proposed HSAC while satisfying human comfort and a healthy environment requirements.

References

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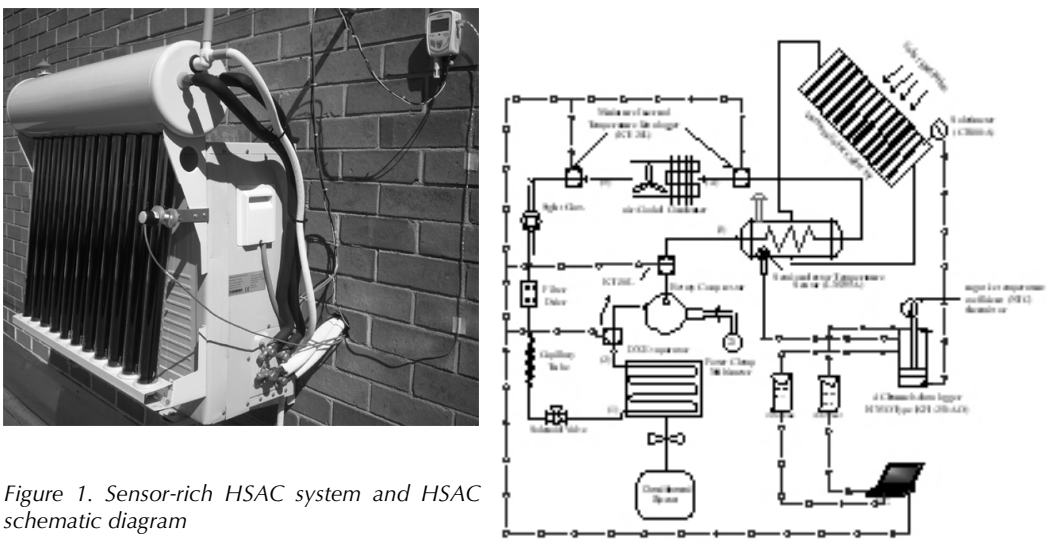

Figure 1. Sensor-rich HSAC system and HSAC schematic diagram