Preface

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Biographical notes: Dr. Lilian Tang obtained her PhD from the University of Cambridge, UK in 2000. She is currently a lecturer in the School of Electronics and Physical Sciences, University of Surrey. Her research interests include: semantics-based image analysis, retrieval, and annotation; context analysis and reasoning; multiple classifiers and probability computation; natural language processing and machine translation. She has been working on the applications and projects in these areas, including tele-homecare, medical image analysis and annotation, and computational artist.

Two factors seriously impact on the quality of primary healthcare. Firstly, it is not humanly possible to absorb and recall all the information that is needed to maintain an up-to-date understanding of all the aspects of medical science that are relevant to general practice; secondly, the limited time available per consultation means that there is a steadily increasing likelihood that certain high-risk, low-incidence syndromes may be misdiagnosed.

The efficiency and effectiveness of primary care could be significantly improved if there were a more informed dialogue between patient and carer. Technologies are emerging to enable this. Wearable technology, 3-G mobile communication, high-bandwidth audio-visual interaction in the home, advanced multimedia processing technology and emerging standards for communication of medical information mean that computer support for patient advice and care can be pushed directly into the home. This will enable patients to use a state-of-the-art multimedia information system to prepare themselves for efficient and informed dialogue with medical practitioners, and enable continuing patient care to be supported at home and on the move.

This needs to be supported by medical informatics and knowledge management, mechanical inference with rich explanatory power and techniques for extracting semantic content multimedia modalities. In addition, such work must be performed within a framework that provides common standards for information exchange between home, general practice and specialist referral centres. The integration of new technology should make the above not only possible, but a natural way of caring (e.g., wearable devices can send sensed medical information directly to the centre without patients being aware of it). The papers in this special issue demonstrate the research efforts within such a context, directly or indirectly addressing these issues. Especially, they emphasise:

- The provision of services via product types that are already in the home. The key is to make the patient-care services completely accessible even without a home PC (Bryant, Colgrave and Coleman). This also coincides, for example, with the Connected Planet Vision proposed by Philips Consumer Electronics, which aims to enable consumers to have access to various services of their choice, anytime,

anywhere in the home and on the move, in an intuitive and easy manner. Such capability is essential in virtual clinical services to integrate healthcare and lifestyle.

- Multimedia and multimodal interaction with the patient, technicians and doctors. This requires the fusion and communication of multimedia information via a unification grammar (Beveridge) or platform. This is especially useful for the development of multimedia interaction with patients and carers through speech and vision recognition and generation techniques. The same principle is desired if multiple language machine translation techniques are to be developed to make the clinical services available across many countries.
- Sensitivity to the patient's physical and emotional state (LeRouge and Lisetti). This is a matter of realising the potential for developing affective computing techniques that exhibit cognitive and observational skills to assess patient status from a distance. This can provide valuable additional insight into the state of well-being of a patient, and opens a new avenue in providing comprehensive, quality tele-home healthcare, especially for patients with disabilities.
- Integrated capabilities of medical informatics and knowledge management. This perhaps is the most active area with a wide and diverse spectrum that has attracted many researchers. The key in virtual primary care is the ability to interpret the clinical data obtained from different modalities or sensors into useful information. Here information extraction, analysis, reasoning, annotation, content-based image browsing and retrieval techniques to provide innovative training, support for data management and analysis and clinical screening are discussed (Varga, Ducksbury and Somol), (Dasmahapatra, Dupplaw, Hu, Lewis, Shadbolt and Lewis) and (Wang). An advanced expert system for the special care required for wheelchair users with spinal injuries has been developed (Athanasiou and Clark), although development of argument-based statistical and qualitative inference techniques and temporal reasoning inference techniques to support auditable and accountable automated inference are needed in many other applications. In addition, engineering methods for clinical care are also investigated (Khong and Ghista).

To develop a fully functional virtual primary care system is never straightforward. Apart from looking at more diverse technology capabilities (e.g., to further supply services such as agent technology to provide 'friendly demons' to act on behalf of patients, and seek and negotiate services and information that may be of value to them), there are still many more issues involved, such as to identify the legal and ethical concerns for the presentation of computer-generated recommendations and advice. With the realisation of the above research prototypes and further findings, the concepts and technology frameworks for virtual primary care will mature. I hope researchers will find this issue useful in the development of effective and efficient technology for the needs of virtual primary care.