Architecture for Remote Training of Home Telemedicine Patients

Albert M. Lai, MS,[1] Justin B. Starren, MD, PhD,[1, 2] and Steven Shea, MD[1,3,4] for the IDEATel Consortium[5]

Depts. of [1]Biomedical Informatics, [2]Radiology, [3]Medicine, and [4]Mailman School of Public Health, Columbia University, New York, NY, [5]www.ideatel.org/acknowledgement.html

Abstract*: In spite of efforts to develop easy-to-use devices, patients may require multiple training sessions to achieve mastery of advanced telehealth devices, especially those incorporating web-access. In geographically-distributed projects, such repeat training can be costly. A software architecture for simultaneous voice conferencing and remote device control over a single telephone line is presented. Evaluation of the pilot implementation is favorable.*

Background: The IDEATel project is an 8-year randomized controlled study of the efficacy of a home telemedicine system for diabetes care of the elderly rural and inner-city patients in medically underserved areas, supported by the Centers for Medicare and Medicaid Services (CMS). Central to this project is the home telemedicine unit (HTU), which provides: videoconferencing, remote monitoring, secure messaging, data review, and web-based education.

As expected, few elderly patients were able to master complex functions, such as web navigation, in a single session.[1] Conventional telephone support solutions are unsatisfactory because many patients have only a single telephone line, thus they are unable to use the device and maintain a telephone conversation at the same time.

Architecture: The new architecture leverages the existing H.323 VOIP audio chat infrastructure used by many home telehealth devices. In addition to using the H.323 capabilities, one can support remote training by adding remote control through the use of a remote display protocol (RDP). Prior to this work, little research has been done on the use of RDPs simultaneously with H.323 audio chat over narrow-band connections.

In conjunction with the HTU vendor, we selected Virtual Network Computing (VNC) as our RDP. We chose VNC for multiple reasons. First, VNC is open source, allowing us to modify the software if necessary. Second, VNC allowed for remote control of a computer when used in conjunction with Windows. Lastly, previous work has shown that VNC provides good performance in low bandwidth environments.[2] The system has been implemented on prototype home telehealth units.

Evaluation: Evaluation of the remote training was performed by conducting a mock training session for the IDEATel data review website over a phone-line simulator. A case manager, a trainer, and a researcher were selected as expert evaluators of the system. First, the remote control tool was demonstrated to the evaluators from the perspective of the patient. After seeing how a training session could be performed, the evaluator was then guided through using the system as a trainer. After experiencing the remote training from both perspectives, the evaluators completed a 6 item questionnaire scored on a 5 point Likert scale.

The overall response was favorable. Individual responses ranged from 3 to 5, where 5 is best. Averages for questions ranged from 5 for the overall utility of the system, to 3.7 (range 3-5), on whether the system would reduce the need for home visits. The remaining questions on audio quality and remote control performance averaged between 4 and 4.6.

Discussion: A software architecture for remote telehealth training over narrow-band connections is presented. Pilot testing has shown that it supports basic training needs over a standard POTS telephone connection. We were able to maintain a H.323 audio chat simultaneous with performing a remote control session, while maintaining both acceptable audio quality and remote control performance. The evaluators overwhelmingly thought the system would be useful in patient training. Production implementation and field evaluation of the system are ongoing.

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References

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