Towards a Remote Medical Diagnostician (ReMeDi) – A Medical Robotics Project.


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Abstract

In December 2013 the new medical robotics project “Remote Medical Diagnostician” (ReMeDi) will be starting. The project has been designed in response to an increasing demand by aging societies for medical services. It will be conducted by an interdisciplinary consortium consisting of engineers, physicians, and psychologists.

Nowadays, in the majority of countries, there is a lack of physicians and forecasts warn that this lack will soon grow even worse. This situation has already led to the development of remotely performed health services, called telemedicine. The improvement of medical tele-services is one of the priorities of the World Health Organization (WHO). The ReMeDi project addresses tele-diagnostics in clinical environments. Its aims at prototyping a robotic device that can mitigate shortages of medical specialists by assisting with immediate, non-invasive diagnoses and therapeutic decisions.

Fig.1 ReMeDi system overview

The main challenge for ReMeDi is to enable remote physical examinations and ultrasonography very similar to standard procedures as performed by doctors. Consequently, physicians can intervene from remote locations. The envisioned robotic system will consist of a mobile platform, remote manipulator, palpation effector and actuated neck. A combination of a haptic interface, shape rendering device and user interface will form the diagnostic interface for visual, auditory, and haptic feedback for the remote environment. Advanced perception, reasoning, and learning abilities will allow for optimal remote diagnosis. All of the above modules will be integrated in a context-aware cognitive robot control.
architecture that combines enhanced tele-presence with intelligent autonomous features to support remote palpation and diagnostics.

Each aforementioned module is highly complex in its own right and will therefore be carefully designed and implemented. A robot control system can be considered as a good case in point. It consists of numerous components that are functionally diverse. They are organised in a hierarchy, complemented by effective communication between real-time modules and higher level.

Four use case scenarios are envisaged to test and demonstrate the system: i) Remote diagnosis of abdominal pain - remote physical examination; ii) Remote diagnosis of acute heart failure - remote ultrasonography; iii) Remote assessment of aortic aneurysm and therapeutic plans made by a team of specialists; iv) Solution to help with the recovery after work-related musculoskeletal injuries.

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