

## Scanning kidneys becomes easy

- R. PRASAD



The system can be operated by semi-skilled persons.

*Preliminary results have been published recently in the 2014 IEEE 16th International Conference on e-Health Networking, Applications and Services*

Thanks to software developed by IIT Hyderabad researchers, semi-skilled persons can use an ultrasound imaging device to perform preliminary diagnosis to classify a kidney as either normal or abnormal in terms of stones, cysts, or bacterial infection. When fully functional, the imaging system developed by a team led by Prof. P. Rajalakshmi, Department of Electrical Engineering, IIT Hyderabad can provide a fillip to healthcare in rural and remote areas where lack of trained sonologists has become a norm.

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Unlike in the case of the sphygmomanometer (blood pressure measuring instrument) or ECG, only skilled people can use an ultrasound probe to get the desired information. The very objective of Prof. Rajalakshmi's work was therefore to turn the device into one that can be operated by semi-skilled people.

To do that, a six-second ultrasound video is converted into images — 15 frames per second. An organ validation algorithm developed by the team then checks each frame to see if useful information has been acquired. The algorithm was developed based on ultrasound videos of kidney collected by sonographers. "The system alerts the operator to rescan the organ when partial data or useful data is not available," she said. "We have developed a novel organ validation algorithm for kidney but it can be expanded to other organs too."

Once the organ validation is performed, a CAD algorithm does a preliminary diagnosis to classify the kidney as normal or abnormal. "The length of the kidney, the textural features and first and second order statistics are applied to classify a kidney as normal or abnormal," said Prof. Rajalakshmi. The abnormality could be a stone, a cyst or bacterial infection. The algorithm only classifies the organ as normal or abnormal and does not say what the abnormality is.

Though 32 features extracted come under the first and second order statistics, the team found kidney classification can be based on fewer features. "Our analysis shows that only 10 features are needed to classify a kidney as normal or not," she said.

The valid images are uploaded to the cloud and information on whether the kidney image is normal or not is also tagged along with the image.

The good news is that the organ validation algorithm and CAD can be integrated with ultrasound machines.

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