UNIVERSITY OF MINNESOTA
Driven to Discover℠

Lower Extremity Edema Monitor (20150192, Dr. Rajesh Rajamani)

IP Status: Issued US Patent; **Application #:** 15/240,731

Wearable Edema Tracking Device

A wearable, multi-sensor device incorporated into socks measures leg size, tissue elasticity, and lower leg water content to remotely monitor lower extremity edema. Calibration-free magnetic field sensors accurately measure leg size, thin-film force sensors measure tissue elasticity, and measuring the change in ultrasound speed detects tissue water content. The device provides fluid accumulation information from these sensors to healthcare systems in an effort to provide home based monitoring of chronic diseases whose status is predicted by the level of lower leg fluid retention.

Early Detection for Lymphedema, Chronic Venous Insufficiency

In lymphedema, fluid accumulates in the lower legs occurs due to blockages in the lymphatic system. Fluid also accumulates in lower legs due to a number of other medical conditions, including chronic venous insufficiency (CVI), congestive heart failure, pre-eclampsia, liver disease, kidney disease, critical illnesses and in response to medications. Diagnostic tests for lymphedema and CVI are currently done in a clinic and often occur only after significant deterioration of disease status. Early detection would be valuable since treatment for both lymphedema and CVI is easiest and most effective when disease deterioration is detected early. In the case of heart failure, the ability to monitor fluid status and predict potential onset of acute decompensation can help prevent hospital readmissions and provide significant cost savings. While fluid accumulation is not specific to just one disease, monitoring its status can predict deterioration in disease status of any previously diagnosed patient-specific chronic condition such as heart failure, lymphedema or CVI.

BENEFITS AND FEATURES:

- Multiple biosensors more reliably predict increasing accumulation of fluid in lower legs
- Magnetic leg size sensors do not require calibration before use and provide accurate drift-free measurements
- Better predictive value over standard self-measurement and self-reporting of weight changes and symptoms
- Wireless transceiver offers passive monitoring technology
- Noninvasive and unobtrusive: does not require surgery
- Improved patient compliance
- Home-based monitoring, avoiding clinic visits and prevention of hospital readmissions

APPLICATIONS:

Technology ID
20150192

Category
Engineering & Physical Sciences/Instrumentation, Sensors & Controls
Life Sciences/Human Health
Life Sciences/Medical Devices
Software & IT/Algorithms
Agriculture & Veterinary/Veterinary Medicine

Learn more

- Patient monitoring equipment in hospitals (e.g., intensive care, coronary care unit)
- Home-based monitoring that prevents hospital readmissions and saves cost by eliminating clinic visits
- Cardiac monitoring/arrhythmias
- Patients at risk for edema (e.g., congestive heart failure, lymphedema, chronic venous insufficiency, obstetrics, geriatrics)
- Mobile cardiovascular technology
- Digital health IT
- Healthcare
- Electromedical/electrotherapeutic apparatus manufacturing
- Medical devices
- Manufacturing

Phase of Development - Prototype and testing

Researchers

Rajesh Rajamani, PhD
Professor, Mechanical Engineering
External Link (www.me.umn.edu)

Publications

Development of Elasticity Sensors for Instrumented Socks and Wearable Devices
Applied Physics Letters, Vol. 107, Article 243701, December 2015
Modeling of Magnetic Fields on a Cylindrical Surface and Parameter Estimation for Development of a Size Sensor
Measurement Science and Technology, Vol. 27, No. 115006, 11pp, 2016

Interested in Licensing?

The University relies on industry partners to scale up technologies to large enough production capacity for commercial purposes. The license is available for this technology and would be for the sale, manufacture or use of products claimed by the issued patents. Please contact us to share your business needs and technical interest in this technology and if you are interested in licensing the technology for further research and development.