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A Nanoparticle Self-Assembled Tactile Sensor with Sensitivity & Resolution of Human Finger VIVEK MAHESHWARI, CHIEU NGUYEN, RAVI SARAF, University of Nebraska, Lincoln — Sensation of touch, primarily the determination of stress distribution over the area of physical contact between the sensor and the object surfaces, is critical for advancement of minimum invasive surgical procedures and for development of humanoid robots. The spatial resolution of current large-area tactile sensor (> 1 cm^2) lags by over an order of magnitude compared to human finger. Using metal and semiconducting nanoparticles $\sim$100 nm thick, large area thin-film device is self assembled such that the change in current density through the film and the electroluminescent light intensity are proportional to local stress. Both lateral and height resolution of texture are comparable to that of human finger, 40μm and 2 μm respectively. The sensitivity of 9 KPa is well within the 10 to 40 KPa range that a human finger applies to sense texture and shape. Stress image can be constructed by directly imaging the electroluminescence on a CCD or by mapping the current density over the surface of the device. The device is based on the principle of electron tunneling. Being solution processed it can be easily assembled on large surfaces and complex shapes..

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