Large Area Electronic Skin

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The microelectronics technology and subsequent miniaturization have revolutionized computing, and communication. The exponential rate of advancement based on Moore's Law has been propelled by $1Tr of investment over 50 years.

Recent advances in the field, pursued through "More than Moore" technology, are propelled by burgeoning fields such as wearable systems, bendable displays, and biomedical applications. Often these applications require electronics to conform to 3D surfaces and therefore arises the need to have sensors and electronics on unconventional substrates such as plastics and even paper. The sensitive electronics systems on large areas and stretchable substrates are other related developments, which will open new application avenues such as intelligent robotics. An example of one such tactile or electronic skin on the body of a humanoid robot is shown in the figure.

This lecture will present various approaches for obtaining distributed electronics and sensors on flexible and conformable substrates, especially in context with electronics skin. The lecture will begin with the developments such as using off-the-shelf sensors and electronic components on flexible printed circuit boards. This will be followed by various alternatives being explored today (e.g. printing of nanowires, and ultra-thin chips, etc.) and the potential challenges and success on various time scales. The lecture will conclude with a discussion on how the field may evolve in the future with applications such as disposable solutions for mobile health or skin-on-objects as the enabler for internet of things and smart cities.