

Tactile Skin in Robotics and Medical Applications

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The miniaturization led advances in microelectronics over 50 years have revolutionized our lives through fast computing and communication. Recent advances in the field are propelled by applications such as robotics, wearable systems, surgical instruments and health monitoring etc., which require electronics to conform to 3D surfaces. This calls for new methods to realize sensing, electronics, and energy related components on unconventional substrates such as plastics and paper. This lecture will present various approaches (over different time and dimension scales) for obtaining distributed electronics and sensing components on flexible and conformable substrates, especially in context with tactile or electronic skin (e-skin). These approaches range from distributed off-the-shelf electronics, integrated on flexible printed circuit boards to advanced alternatives such as e-skin by printed nanowires, graphene and ultra-thin chips, etc. The lecture will also discuss the how large area tactile sensing has changed the research paradigm in robotics from hand-based manipulation to using large body contacts to plan and execute movements even in unstructured environments. The technology developed for sensitive flexible (and possibly stretchable) touch sensing based systems could also enable solutions for numerous emerging fields such as internet of things, smart cities and mobile health as well as global issues related to sustainable environment and health and safety. This lecture will also discuss how the flexible electronics research may unfold in the future.