

Modular Skin for Humanoid Robot Systems

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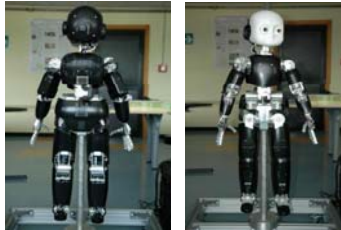
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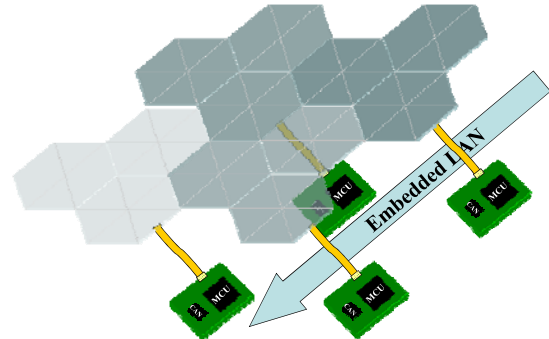
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MOTIVATIONS

- ❑ Robots are traditionally built as *stiff* and *accurate* (in terms of position control) machines.
- ❑ These specs. are not appropriate for implementing tasks involving complex *human/robot* or *robot/environment* interaction.
- ❑ Advanced robot interaction tasks require large scale touch/contact sensing for feedback control and high level cognitive perception.



MODULAR SKIN ARCHITECTURE



CONFORMABILITY TESTS

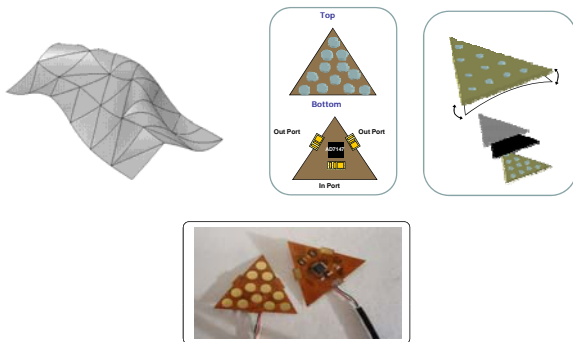


REQUIREMENTS

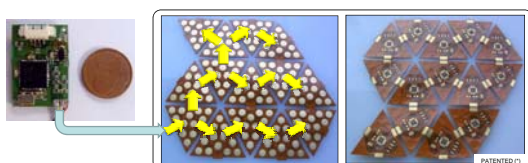
- ❑ Robot skin should:
 - cover large parts of the robot (limbs, torso, hands, ...)
 - provide multimodal response
 - have modular structure and be networked
 - be implemented on different robots

THE SKIN SYSTEM

- ❑ The main sensing mode is based on capacitive transducers.
- ❑ The skin is formed by scalable meshes of flexible triangular modules with 12 taxels each capable of conforming to curved surfaces.
- ❑ A set of modules (up to 16) forms a skin patch.
- ❑ Modules are connected by an embedded communication network driven by a single microcontroller in order to limit wiring complexity.

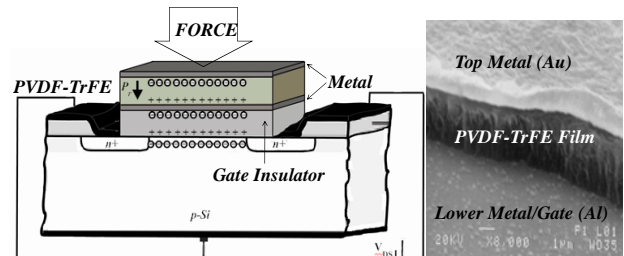


PROTOTYPE ON A FLEXIBLE CIRCUIT



CONCLUSIONS & FUTURE DEVELOPMENTS

- ❑ A modular robot skin concept has been demonstrated.
- ❑ Integration with two different robots is ongoing.
- ❑ Development of an integrated system combining Capacitive and Piezoelectric Polymer (e.g., PVDF) thin film based transducers is currently in progress.
- ❑ Integration in the skin design of a Piezoelectric Oxide Semiconductor Field Effect Transistor (POSFET) device. POSFETs are implemented by spin coating thin (~2.5 μm) piezoelectric polymer (PVDF-TrFE) film, directly on to the gate area of the MOS transistor. The polymer film is processed *in situ*.
- ❑ The POSFET device represents an integral “sensotronic” unit comprising of both transducer and transistor and is therefore capable of “sensing and processing at same site”.



Left: The concept and working of POSFET Touch Sensing Devices.
Right: SEM picture of the polymer film on POSFET.

ACKNOWLEDGMENTS

This research project has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 231500 (Project ROBOSKIN).

For more informations visit: www.roboskin.eu