R&D fact sheet

Wearable health and comfort monitoring

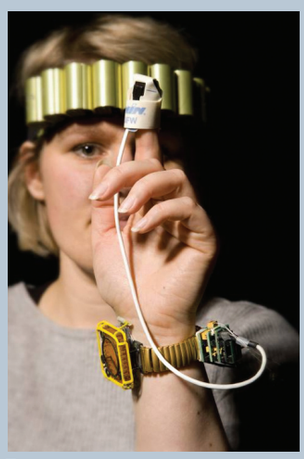
Small autonomous sensor nodes can be used to create a body area network that is worn on the body and monitors vital body parameters. When alarming values are reached, a doctor or ambulance can be contacted. This is especially interesting for elderly people (who can stay longer at home in this way) and for diagnosis of diseases such as epilepsy or Alzheimer. Besides these medical applications, sensor networks are an interesting tool for sports applications where data can be analyzed e.g. by the trainer, and for gaming applications were a feedback loop can be realized between body parameters and game.

The main technological challenges that are tackled are:

- *Creating 'wearable' and patient-friendly sensor and actuator systems*
  All building blocks of the sensor nodes must be efficiently integrated using innovative packaging technologies to ensure a small size. These packaging technologies include 3D-cube type of integration as well as flexible and stretchable technologies. The latter enables for example a flexible 'band-aid' with sensors and actuators for closed-loop drug delivery systems.

- *Making the sensor nodes autonomous*
  User-friendly sensor nodes must have a long lifetime without batteries to be replaced every week or month. The autonomy of the sensors implies that they consume little power (ultra-low-power radio communication with other sensors and central device; ultra-low-power sensor front-ends for the extraction of biopotential signals; ultra-low-power signal processing) and that they are responsible for their own energy generation (micro-power generation from mechanical energy, light energy or thermal energy; power management circuits).

Innovative integration and packaging technologies allow for the miniaturization of sensor nodes to systems of only 1 cm³.



Two autonomous sensor systems: a wearable EEG system, powered by the body heat of the forehead, and a wearable oxymeter using the body heat of the wrist.

Application domains

- E-health;
- Ambulatory monitoring;
- Mobile gaming;
- Diagnostics.

Potential Partners

- Integrated device manufacturers;
- Micro battery manufacturers;
- Medical device manufacturers;
- Pharmaceutical companies;
- Sport equipment manufacturers.

This research is conducted at Holst Centre, a joint initiative of IMEC and TNO in the Netherlands.
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