



Non-contact sensor detects changes in muscle movement

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The inventors of a new contactless heart rate sensor say it could be used to detect people through walls or control artificial limbs.

The Electric Potential Sensor (EPS), created by researchers at Sussex University and developed by Plymouth-based company Plessey Semiconductors, produces an electrocardiogram (ECG) by measuring changes in the heart's electric field.

Where traditional ECG monitors use up to 12 electrodes attached to the skin with conductive gel, the EPS monitors heart activity using an array of sensors held over the chest, or just two sensors positioned with the heart in the middle, for example, with one in each hand.

'If you look at how difficult it is to take that measurement normally, this could be quite radical in terms of the benefits it could bring for medical applications,' Plessey's technology director, Dr Keith Strickland, told *The Engineer*.

The EPS detects changes in the body's electric field caused by muscle movement so by placing sensors around specific muscles it could also be used to control artificial limbs or to monitor athletes' body movements during sport.

Similarly, if sensors are placed on the temples – or in a pair of glasses – they can detect eye movement. This could allow people to control computers with their eyes, either for gaming or for disabled people who cannot use their limbs.

The EPS is so sensitive that it can detect the interaction of human bodies with the Earth's own electric field, even through a solid wall. This means the device could determine if people are in a room, for example, during the evacuation of a burning building, without entering.

Sussex University's Prof Robert Prance created the EPS as a sensitive way of measuring electric fields without needing recalibration. 'It was a forgotten area of science until we rediscovered it and realised its huge possibilities,' he said.

The device's sensitivity, which allows it to detect activity up to 50cm away, is key to its operation, said Strickland.

'It's effectively like having a perfect voltmeter. A voltmeter has to take some energy from the circuit it's measuring and that causes an error in effect. Because this device is measuring the field, it virtually takes nothing from the circuit,' he added.

Plessey is set to develop the university's prototype devices and manufacture silicon-based sensors as part of computer chips with appropriate microcontrollers and software.

'This hasn't been integrated into silicon technology and there are some barriers associated with doing that,' said Strickland. 'The sensor has to be isolated from its surroundings in terms of its electrical contact. So we will have isolation issues from any other circuitry around it.'

The company also intends to build multi-element sensor arrays to create a 3D video imaging system with each sensor effectively generating a pixel of information, which will open up even more possible application areas.

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