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Fibre Optic Temperature Measurement Sensors for a Robotic Hand

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Robotic applications are found in both commercial and everyday environments. The Photonics Research Group at the University of Johannesburg is currently researching the use of optical sensors in robotics. In this paper optical temperature sensors are developed for use in a robotic arm. Optical sensors have many benefits including immunity to electromagnetic noise, high sensitivity, low propagating losses, small size and the possibility of multiplexing many sensors in a single fibre.

A Fibre Bragg Grating (FBG) was chosen to perform the temperature sensing. For each degree Celsius of temperature change, there was a wavelength shift of 9.2pm in the reflected Bragg wavelength. To increase the sensitivity of the sensor the fibre was glued to a thin copper strip. The expansion coefficient of the copper and of the glue used was higher than that of the germanium doped silica core of the optical fibre, thus causing a greater shift in the Bragg wavelength as the temperature increased. When the fibre was glued to a piece of copper, the sensitivity of the FBG intensified and for each degree Celsius change there was an average 92pm shift in the Bragg wavelength. This thus increased the sensitivity of the FBG temperature sensor by 10 times, providing results sufficiently accurate for temperature measurement. The sensor was tested in a temperature range of -15 °C to 85 °C and provided real time results.

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Hons

Main supervisor (name and email) and his / her institution

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