

Precision 3D displacement sensing



Researchers at the University of Oxford have developed a device that uses low-frequency magnetic fields to track the 3D displacements present in materials such as concrete and soil.



Failure monitoring

Civil structures, such as bridges, pavements and railways, are subjected to large and dynamic stresses on a daily basis. The effect that such forces have on the integrity of the structure is often not visible to the naked eye and requires careful monitoring to ensure that it remains within safe limits. Failure of these key structures can have dire consequences and new methods for the early detection of these risks are in high demand.

Current techniques don't measure up...

At present, the techniques used to monitor 3D displacements within solid structures rely on the properties of the adjoining media. For example, capacitive and inductive methods rely heavily on the moisture content of the material and also generally only provide data on linear displacements. Radio-frequency identification (RFID) technology has also been used, but due to the high operating frequency, the device could not be embedded in the concrete.

Low frequency, high accuracy

Oxford researchers have developed a system that uses low frequency magnetic fields to monitor 3D displacement. The devices can be directly embedded into concrete and achieve a displacement error of less than 0.5 mm in all directions. Low frequency magnetic

fields are not perturbed by changes in the media and therefore are found to be accurate over a range of environmental conditions. The main benefits of this new system are as follows:

- Sensor is contactless, non-line of sight and wireless
- Performance is unaffected by the presence of dielectric material
- Can be embedded into manufactured concrete
- May be set up on existing structures with minimal effort
- Measures displacement in 3D to within 0.5 mm

Patent protection

A patent has been filed in the UK and Greece which covers this technology. Oxford University Innovation Ltd. is interesting in talking to potential partners to aid in the commercialisation of this new device.

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Project number: 13872

Technology Transfer from the University of Oxford

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