3D shape measuring sheet utilizing gravitational and geomagnetic fields

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Abstract: We introduce a novel sensing device named "three-dimensional capture sheet (3DCS)." The cloth-like sheet measures its own 3D shape with no external equipment. It has many potential applications such as 3D modeling, size and shape measurement, wearable motion capture, tactile sensor, and so on. It consists of a lattice structure inside of the sheet, and each link of the structure has a sensor chip consisting of a triaxial accelerometer and a triaxial magnetometer. The sensor chip measures the gravity and the geomagnetic field to obtain the link posture. After all the link postures are obtained, the whole shape of the sheet is reconstructed by combining them. Additionally, owing to the redundancy of the problem, the estimation error (caused by random noise, a distorted magnetic field, and so on) can be corrected. The feasibility and stability of the estimation algorithm are confirmed through simulations, and the prototype is presented. © 2008 SICE.

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