Multi-sensor based Surveying of House Drainage System

The current state of the art

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ABSTRACT

Private sewer network connect buildings and other facilities with the public sewage system and is also referred to as house drainage system (HDS). In recent years the sewerage industrial sector has been focusing on the inspection of these private sewer networks as specialists suspect high risks for the environment as a result of damages of pipes. For this reason, these networks have to be inspected and also the damages have to be located and repaired. To locate damages, the complete network has to be surveyed. Because of small diameters of 80-200 millimeters, representative geodetic measurement methods cannot be used and alternative methods had to be developed.

This paper deals with the current state of the art in surveying HDS with a special low-cost multi-sensor system called geoASYS which was developed to survey DSH during the TV inspection of sewage systems.

In the paper the main components of geoASYS, a low-cost INS sensor, an odometer and a processing software module are described. The latter is of specific importance as so-called motion model conditions have to be considered and specific measuring strategies had to be developed to handle the drift of the low-cost INS sensor as well as the irregular motion of the inspection unit and to guarantee the required accuracy which is about 50 cm in position and 20-30 cm in height. The paper also includes the results of practical tests in a surveyed test sewage network which have on the one hand shown that the required accuracy can be met with sewer networks of 25 – 30 meters in length but have on the other hand also shown that the system concept has certain limitations. The paper is concluded by an outlook of a future system which can meet even higher accuracy requirements.

KEYWORDS:

multi-sensor system geoASYS, INS, sewage network surveying