

mobile system for environmental monitoring of permafrost degradation using a wearable sensor

As a response to drastic changes in the environment, sensor networks for environmental monitoring have been the focus of development in recent years. However, mobile tools for browsing and analysing these data in the field are lagging behind. Current mobile GIS technology is often limited by simple data access and visualization. Instead, we offer two different mobile systems for in-field environmental monitoring: the first system uses augmented reality (digital data overlaid over live video footage) to provide an integrated view of the environment and the abstract data associated with it. The system aids in the spatial analysis of environmental processes and supports team-based discussion and decision making.

The mobile system presented here is the second system, which aims at measuring wall inclination changes caused by permafrost degradation, using a wearable sensor setup and display system. The system can provide initial but quick feedback on wall inclination changes in an unobtrusive way.

> measure

The system as provided consists of a mobile, handheld computer to which a high accuracy orientation sensor is attached. The sensor can measure inclination in all three axes (x, y and z) in a fast and rather accurate way. For this purpose, special wall mounts can be attached to strategic points in buildings or other constructions, to which the sensor can easily be attached. The sensor allows sensing changes in the range of 0.05 degrees per axis, which is useful for monitoring general changes over time in an unobtrusive way.

> view

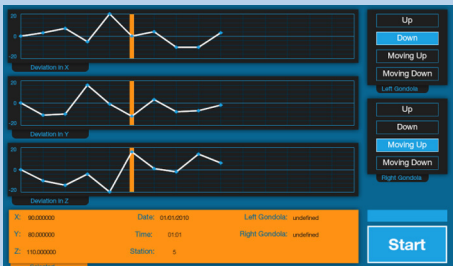
The handheld computer offers an easy interface which can read and display the sensor measurements over time. The application draws upon the numbered wall mounts and plots the changes over time in all three axes. Users can switch through the various readings and see their exact values.

> alternatives?

The system has been a proof-of-concept which has been well received by end-users. The system is good for general assessment, with a reasonably high accuracy of readings. Nonetheless, it will not replace but rather extend the previously used measuring system: this system has a higher accuracy (around 0.01 degree) but is large, is more difficult to deploy, and very expensive.

> more information

For more information, feel free to visit our website at www.hydrosysonline.eu, drop us a line, or visit us for a live demo! Most of the systems are open-source, hence, software can often be acquired for free.



End-user deploying the system near Andermatt, wall mount, and user interface showing (artificial) changes in sensor readings.