

管网检测的无线传感网络信息采集同步

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摘要：

无线传感网络的时钟校准决定了各节点信息采集的同步性。在供水管网泄漏检测中，各节点信息采集的时间同步误差将引入漏点的定位误差。在泛洪时间同步协议的基础上，提出拨号时间同步方案，在同步过程中采用定向拨号和线性回归相结合的方法，周期补偿终端节点间因本地时钟源频差而产生的时钟偏移，实现网络时间校准。对单跳网络，每2分钟进行1次校正，测试表明节点间的同步误差每秒在10微秒以内，累积误差不超过1毫秒，这样引起的管网漏点定位误差在1米以内，可以满足供水管网泄漏检测的要求。

关键词：供水管网检测，无线传感网络，信息采集，时间同步，漏点定位

Information acquisition synchronization in wireless sensor networks for pipeline detection

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Abstract:

Clock calibration in wireless sensor networks guarantees the synchronicity of information acquisition at nodes. The time synchronization error of information acquisition will introduce the leak location error in water supply pipeline leak detections. A Dial-up Time Synchronization Algorithm (DTSA) is proposed based on the Flooding Time Synchronization Protocol (FTSP). The directional dialing combined with the linear regression is used to periodically compensate clock drifts resulting from the frequency differences of local clocks at nodes and the network clocks are thus tuned synchronized. While the clock compensation is carried out every 2 minutes in a single-hop network, the practically tested synchronization error between nodes is within 10 microseconds per second, and the cumulative error is less than 1 millisecond. In this case, the leak location error resulting from the synchronization error is within 1 meter, which meets the requirement of water supply pipelines leak detection.

Keywords: water supply pipeline detection, wireless sensor network, information acquisition, time synchronization, leak location

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