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Activity Report

Developed Sensor fusion technique to detect Air Pollution

Summery

The invention provides an air pollution detection system based on a sensor fusion technique. The system comprises a wireless sensor network, an air pollution monitoring platform and a remote control terminal, wherein the wireless sensor network is used to monitor air pollution, acquire air pollution monitoring data, and process and forward the data; the air pollution monitoring platform is used to perform two-way communication with the wireless sensor network, can receive and analyze the air pollution monitoring data sent by the wireless sensor network, and can send an alarm signal when the air pollution monitoring data exceeds a set normal threshold; and the remote control terminal is used to remotely access the air pollution monitoring platform and receive the alarm signal sent by the air pollution monitoring platform. According to the scheme of the invention, the detection of air pollution can be achieved by adopting a sensor fusion technique.

Detailed Description

The developed Sensor fusion technique to detect Air Pollution, including: (1) the wireless sensor network is used for monitoring atmospheric pollution, acquiring atmospheric pollution monitoring data, processing and forwarding the atmospheric pollution monitoring data; (2) the atmospheric pollution monitoring platform is used for being in two-way communication with the wireless sensor network, receiving and analyzing atmospheric pollution monitoring data sent by the wireless sensor network, and sending an alarm signal when the atmospheric pollution monitoring data exceeds a set normal threshold; and (3) the remote control terminal is used for remotely accessing the atmospheric pollution monitoring platform and receiving the alarm signal sent by the atmospheric pollution monitoring platform.

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The remote-control terminal is a remote computer, and can access the atmospheric pollution monitoring platform through the internet or a 3G network or a GPRS network and receive the alarm signal. The atmospheric pollution monitoring platform comprises a communication module for bidirectional communication with the wireless sensor network, an atmospheric pollution monitoring data storage module and an atmospheric pollution monitoring data management and analysis module.

The sensor fusion technology utilized to obtain the atmospheric pollution monitoring data and analyze and process the data, can accurately and timely reflect the atmospheric pollution condition and give an alarm, has good expandability, is suitable for constructing a large-scale monitoring system and is suitable for popularization and application.

The wireless sensor network comprises a base station and a plurality of sensor nodes randomly scattered in a set atmospheric pollution monitoring area; the atmospheric pollution monitoring data collected by the sensor nodes are finally transmitted to the base station, and then the base station transmits the received atmospheric pollution monitoring data to the atmospheric pollution monitoring platform.

In the related technology, the connectivity distribution function in the scale-free network has a power rate form, and the degree of the nodes has no characteristic length, so that the sensor network topology constructed based on the scale-free performance of the complex network can enable the network to have higher random survivability, and the number of the connection links among the nodes is less, thereby reducing the communication waste. Although the method improves the network performance in the aspect of random survivability, due to the uneven degree distribution, energy consumption of some key nodes is huge, and the key nodes die early to cause the failure of the network. The embodiment is further improved on the basis of the method, and a new topology evolution mechanism is provided to construct the wireless sensor network topology.

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Based on that, when the topological structure of the wireless sensor network is constructed, the factors of the residual energy, the communication range and the node degree of the sensor nodes are comprehensively considered, and a new calculation formula of the connection probability between the nodes is defined, so that the connection probability between the nodes depends on the current communication radius and the node degree of the sensor nodes, wherein the current communication radius of the sensor nodes is constrained by the residual energy of the sensor nodes, the wireless sensor network can be promoted to be converted to an energy-saving direction, thereby balancing the network energy consumption, avoiding the failure of the sensor nodes with larger node degree caused by energy depletion, effectively overcoming the energy void problem possibly encountered in the process of establishing the wireless sensor network, and prolonging the life cycle of the wireless sensor network.

The construction mode of the initial topology of the wireless sensor network is limited by the embodiment, and the sensor nodes for constructing the initial topology are selected according to the utility value, so that the sensor nodes with large residual energy and closer to the base station have higher probability to participate in the construction of the initial topology, thereby improving the survivability of the initial topology, balancing the energy consumption of the wireless sensor network, further being beneficial to saving the operation cost of the atmospheric pollution monitoring system, and ensuring that the atmospheric pollution monitoring data can be effectively provided for the atmospheric pollution monitoring platform for a long time.

A specific strategy for preferentially connecting the new node with the sensor nodes within the communication radius and the topology of the new node according to the connection probability is set, and the strategy can prevent the new node from being connected with the sensor nodes of which the node degrees reach the saturation state, so that the node degrees in the wireless sensor network can be controlled to be increased according to the setting of the node degree threshold

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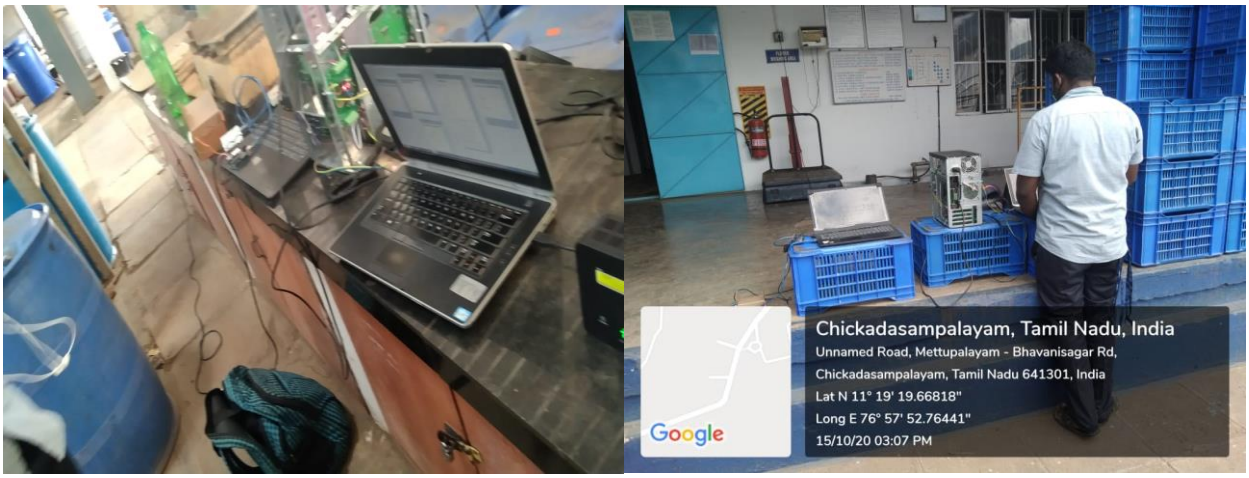
value, the purpose of optimizing the topology performance is achieved, and the reliability of collecting the atmospheric pollution monitoring data is improved.



Developed sensor fusion technique to detect Air pollution @ Field survey

Advantages of the developed system

- The sensor fusion technique utilized to obtain the atmospheric pollution monitoring data and analyze and process the data, can accurately and timely reflect the atmospheric pollution condition and give an alarm, has good expandability, is suitable for constructing a large-scale monitoring system and is suitable for popularization and application.

- The sensor nodes for constructing the initial topology are selected according to the utility value, so that the sensor nodes with large residual energy and closer to the base station have higher probability to participate in the construction of the initial topology, thereby improving the survivability of the initial topology, balancing the energy consumption of the wireless sensor network 1, further being beneficial to saving the operation cost of the atmospheric pollution monitoring system, and ensuring that the atmospheric pollution

monitoring data can be effectively provided for the atmospheric pollution monitoring platform for a long time.