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Information Fusion Algorithm Based on Internet of Things Technology and Its Application

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ABSTRACT. *With the development of the Internet of Things in the social development, information fusion technology is widely used in social life. This paper studies the information fusion algorithm of the Internet of Things, and discusses the effect of the application information fusion algorithm with examples to propose the Internet of Things technology. Prospects for information fusion algorithms.*

Keywords: *Internet of Things; information fusion algorithm; application*

1. Introduction

As early as 1991, Sundemaker et al. of the Massachusetts Institute of Technology proposed the concept of “Internet of Things”. Six years later, at the World Summit on the Information Society, the International Telecommunication Union officially confirmed and expanded the interpretation in a report. The Internet of Things is a sign of the arrival of a new era. The operation principle of the Internet of Things is that various objects in the real world are connected to the Internet under the premise of sensor operation. It can intelligently realize people and objects, even between items, by means of identification, positioning, real-time monitoring and tracking. Information exchange. The information fusion technology based on Internet of Things technology can use computer technology to classify and process different information according to the corresponding standards. This paper will analyze this.

2. Brief introduction of information fusion algorithm under internet of things technology

The emergence of the Internet of Things is a new challenge in computer science and technology. The Internet of Things is known as the third wave of the world's information industry after computers and the Internet. The Internet of Things is a new technology system that is a combination of multiple information technologies[1]. It uses the Internet as a platform to integrate sensing nodes such as sensor nodes and radio frequency tags to realize the interconnection between human

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society and physical systems. It is a seamless connection between people and objects or between objects and objects. Therefore, the Internet of Things has obvious "intelligence", and intelligent information processing is the key technology to guarantee this feature. Therefore, the key technologies and research foundations of intelligent information processing play an important role in the development of the Internet of Things. Information fusion is an important stage and method of intelligent information processing. Information fusion is a multi-level, multi-faceted process of processing data from multiple data sources (or sensors) in a sensor network. It achieves higher accuracy, more efficient and easier to understand inferences than a single sensor. At the same time, it is an architecture that includes methods and tools for jointly processV

3. Related work

The Internet of Things requires the fusion of data from multiple sensors to cover a variety of technologies, such as optimization theory, neural networks, estimation theory, artificial intelligence, uncertainty theory, and pattern recognition. Researchers have proposed a variety of data fusion techniques from different perspectives. From the types of data fusion algorithms, they are mainly divided into the following categories[2]:

(1) Weighted Fusion Algorithm: the data collected by sensors of different weights given to different, then weighted, the weighted average obtained is the result of fusion.

(2) parameter estimation theory: multiple observations using the estimated parameters associated with the variable parameter estimation. It mainly includes maximum likelihood estimation, least squares method, Kalman filtering and so on. These methods require a model of the relationship between measured and estimated parameters and require statistical knowledge of measurement errors and estimated parameter characteristics.

(3) Neural network fusion method: Try to imitate the process of life system from a certain angle, distribute the information in each connection right of the network, and then get the uncertainty reasoning mechanism according to the sample data provided by the sensor, and then according to the uncertainty The reasoning mechanism is fused. It mainly includes neural networks, expert systems, genetic algorithms and so on.

(4) Fuzzy Theory: it specifies a real number between O to a 1 degree information represents the true sensor observations, which consists of a fuzzy set true. The fuzzy set is fuzzy inferred according to the fuzzy rule, and the fusion result is obtained. It mainly includes fuzzy logic, fuzzy integral theory, and wavelet analysis theory.

4. Based on detection probability Internet of Things information fusion algorithm

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In the past, the information fusion algorithm only considered the variance of the single sensor and the mean square error of the sensor network, but did not consider that the object link is composed of a large number of wireless sensors. They are indeterminate in position, and the detection weight of the target point is also due to the position[3]. The change has changed. In [2], a sensor detection model is proposed. The detection radius of the sensor in the wireless network is r, and d(i,j) represents the Euclidean distance between the sensor at position i and the monitoring target j, ie d(i,j) = $\sqrt{(xi-xj)^2+(yi-yj)^2}$ Sensor monitoring is not deterministic, that is, it cannot simply represent the form of 0,1. Then, the monitoring target can be expressed in the form of probability, and the detection probability model is expressed as follows: $P(i,j)=e-^{ad}$

Where: a is the physical property of the sensor, and the IoT is a wireless sensor network with n sensors; the weighting factors of each sensor are W1, W2...Wn, Sij represent the information that the i-th sensor node perceives the target j Here, i=1, 2, 3...n, j=1, 2, 3...m,m is the number of monitoring targets.

In some cases, there may be obstacles in the monitoring area. It is assumed that the position and shape of the obstacle are known in advance, and the visual information is built into the obstacle model based on the principle of visual line of sight. (See Figure 1) is a monitoring area with obstacles. Some types of sensors cannot cross obstacles. Therefore, the probability of detection when there are obstacles in the monitoring area should be considered. In order to calculate the monitoring probability of an obstacle, it is necessary to calculate a black area that cannot be detected by a sensor, called a sensor node. The sensor node with coordinates (x, y) cannot detect the grid point behind the obstacle. Sensors cannot be placed on the grid with obstacles. The figure is an example of a black area with obstacles. The method of calculating the black area is to first calculate the two lines of the sensor node and the obstacle. The grid point between the two lines is the black area of the sensor. . Since the sensor does not detect the target in the black zone, it is located at each grid point in its black zone j pij=0.

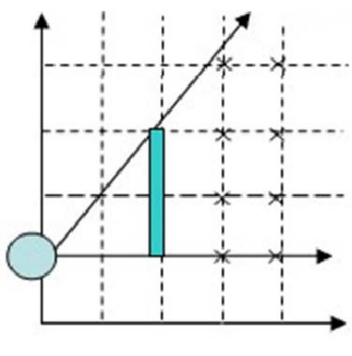

Fig.1 obstacle model

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It is easy to know that the sensor node i monitors the jth target with the following conditions:

$$\begin{cases} Sj = \sum_{i=1}^{n} WiSij \\ \sum_{i=1}^{n} Wi = 1, 0 \le Wi \le 1 \end{cases}$$

Where: $Wij = Pij, Sj$ The final fusion result algorithm for the jth target is described as follows:

For detection point j, For i=0 to n

$d(i, j) = \sqrt{(xi - xj)^2 + (yi - yj)^2}$, if there is an obstacle between the node i and the target j Pij=0, $Sj = \sum_{i=1}^{n} WiSji$.

END for Sj as the fusion result of goal j

5. Application of information fusion algorithm for forest fire monitoring system

The data acquisition system mainly arranges the sensor nodes according to the specific requirements of forest fire prevention monitoring,[4] and performs the number in real time.

According to the acquisition, the main sensors include temperature sensors, humidity sensors, carbon dioxide sensors and so on. Sensor will collect

The incoming data is sent out over the network. The transmission network mainly transmits the data collected by the sensing nodes to the server via the Internet according to a certain format, specification and standard by deploying a wireless network or a dedicated wired network in the forest. The function of the transmission system is to connect the front-end monitoring points and monitoring centers, and transmit the front-end data to the monitoring center to realize remote and real-time monitoring of the forest. The monitoring center mainly undertakes the analysis and processing of data. It is the core of the system. The main task is to clean, transform, merge, and mine the collected data, and give an assessment of the state of the forest.

The application uses temperature sensors and humidity sensors to measure the temperature and humidity of the monitoring area in the forest, assuming that existing[5]The temperature sensor has an accuracy of ±2 °C, the humidity sensor has an accuracy of ±5%, and the sensor has a sampling frequency of 100 per minute. According to the statistics, the humidity in the forest has a great impact on the forest fire. When the relative humidity is greater than 75%, there is basically no fire. When the relative humidity is 55-75%, a fire may occur. If it is less than 55%, it may be In the event of a major fire, forest fires are highly prone to occur when the relative

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humidity is less than 30%; fires are most likely to occur when the temperature in the forest is above 40 °C.

The fusion result in the window maintains the trend of measurement properties, reduces the data uncertainty caused by interference, and obtains relatively reliable results. However, compared with the fusion results in different windows,[6] there is a discontinuity, which is because of the limitation of the window size, and also indicates that the redundant information between the windows has not been utilized. At some time in the window 4, the temperature data is greater than 40 °C. If the judgment is made directly through the monitoring data, there will be a misjudgment, which will cause a false alarm. The use of the DIFAT algorithm effectively reduces the occurrence of such misjudgments.

6. Conclusion

In summary, the Internet of Things has played an important role in the overall production and life application process. The time of the emergence of the Internet of Things in China is not short, but it involves many fields, and the information involved is complicated. The process is in urgent need of improvement. The information fusion algorithm is applied to the Internet of Things technology. Combined with the specific application scenarios, using the DIFAT algorithm in the forest fire monitoring system can reduce the uncertainty of the data, and thus reduce the occurrence of false negatives and false positives in the system.

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