

1. A gas leakage positioning system based on multi-sensor fusion, characterized in that it comprises a multi-point acquisition module, wherein the multi-point acquisition module detects the concentration of leaked gas and ambient humidity through sensors, and transmits the detected data to a threshold alarm module and a correction module; the multi-point acquisition module is connected to the threshold alarm module, the threshold alarm module receives the leaked gas concentration values transmitted from the multi-point acquisition module, and a preset gas concentration threshold is set in the threshold alarm module, when the detected leaked gas concentration value exceeds the preset gas concentration threshold, a gas leak is determined, and the leak location determination module is activated; the threshold alarm module is connected to the leak location determination module, the leak location determination module receives the command from the threshold alarm module to start, and determines the specific leak location based on information detected by multiple sets of gas concentration detection sensors; the leak location determination module is connected to the correction module, the correction module, in terms of gas concentration detection standards, uses a correction formula, Gaussian diffusion model, and weighted centroid algorithm, integrating concentration, wind direction, and humidity to correct the leak location; the leak location determination module is connected to a feedback interaction module, and the feedback interaction module displays the determined gas leak location through a display device.

2. The gas leakage positioning system based on multi-sensor fusion according to claim 1, characterized in that, in the multi-point acquisition module, the sensors include: gas concentration detection sensors, wind speed sensors, and humidity sensors, and multiple sets of gas concentration detection sensors, wind speed sensors, and humidity sensors are provided in a 1:1:1 configuration.

3. The gas leakage positioning system based on multi-sensor fusion according to claim 2, characterized in that the gas concentration detection sensor detects the concentration of the discharged gas and transmits the detected gas concentration information to the threshold alarm module;

the wind speed sensor detects the ambient wind speed at the location of the current gas concentration sensor and transmits the detected wind speed information to the correction module;

the humidity sensor detects the ambient humidity at the location of the current gas concentration sensor and transmits the detected humidity information to the correction module.

4. The gas leakage positioning system based on multi-sensor fusion according to claim 1, characterized in that, in the leak location determination module, the determination criterion is as follows:

according to the gas concentration information detected by each group of gas concentration sensors, the higher the gas concentration, the closer to the leak point.

5. The gas leakage positioning system based on multi-sensor fusion according to claim 1, characterized in that, in the correction module, the correction formula is specifically as follows:

$$C'_i = C_i \times [1 + k_h \times (h_i - h_0)]$$

wherein:

c'_i represents the gas concentration of the i th gas concentration sensor after humidity correction;

c_i represents the original concentration directly detected by the i th gas concentration sensor;

k_h represents the humidity correction coefficient;

h_i represents the ambient humidity detected by the i th humidity sensor;

h_0 represents the reference humidity.

6. The gas leakage positioning system based on multi-sensor fusion according to claim 1, characterized in that, in the correction module, the Gaussian diffusion model is specifically as follows:

$$w_{wind\ i} = \frac{1}{1 + \alpha \cdot v_i \cdot \cos(\Delta\theta_i)}$$

wherein:

$w_{wind\ i}$ represents the wind field correction weight of the i th sensor;

α represents the wind speed influence coefficient;

v_i represents the wind speed at the location of the i th sensor;

$\Delta\theta_i$ represents the difference between the wind direction angle and the sensor azimuth angle;

$$\Delta\theta_i = \alpha_i - \theta_i$$

wherein:

θ_i represents the wind direction angle (the angle between the wind direction and true north);

α_i represents the azimuth angle (the directional angle of the sensor position relative to the leak point).

7. The gas leakage positioning system based on multi-sensor fusion according to claim 1, characterized in that, in the correction module, the weighted centroid algorithm is specifically as follows:

$$x_{leakage} = \frac{\sum_{i=1}^n (x_i \cdot w_i)}{\sum_{i=1}^n w_i}, y_{leakage} = \frac{\sum_{i=1}^n (y_i \cdot w_i)}{\sum_{i=1}^n w_i}$$

$$w_i = c'_i \cdot w_{wind\ i}$$

wherein:

$x_{leakage}$, $y_{leakage}$ represent the coordinates of the leak point on the x-axis and y-axis;

x_i , y_i represent the coordinates of the i th sensor on the x-axis and y-axis;

w_i represents the comprehensive weight of the i th sensor;

c'_i represents the true concentration value after humidity correction;

$w_{wind\ i}$ represents the wind field correction weight.

8. The gas leakage positioning system based on multi-sensor fusion according to claim 1, characterized in that, in the feedback interaction module, the display device includes: a liquid crystal display, a tablet computer, and a mobile phone.