SYH24A1 24G Millimeter Wave Radar

Instruction Manual

1. Principle

Millimeter-wave radar is a sensor that transmits and receives electromagnetic waves through a radar antenna and measures the amplitude and position of an object's movement. After analysis by the algorithm, the human body's breathing, movement, number of people, distance, direction and other information are judged.

2. Application

The millimeter-wave radar is not affected by temperature, humidity, noise, airflow, dust, and light, and is suitable for use in harsh environments; suitable for the care of the elderly, management of hotels and guesthouses, management of office personnel, intrusion alarms, barrier prevention Hit reminders, population statistics, etc.

3. Detection range

The area that the radar module measures human activity is within about 200 square meters, the maximum sensing distance for object movement is less than 20 meters, the measurement breathing distance is within 5 meters, and the radar antenna has a measurement range of 80 ° horizontally and 30 ° vertically. It is a product that can measure different distances through different algorithms.
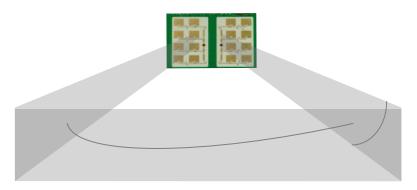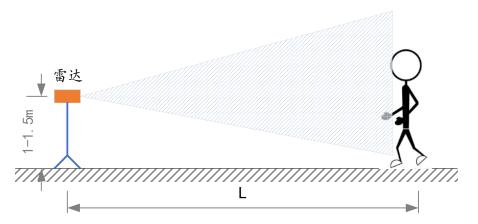
Figure 3-1 Demo picture of module measurement range

4. Installation method

By monitoring different detection distances and different motion amplitudes, appropriate deployment is made according to the room layout. When indoors, it will have a better experience when installed at a high place.

Horizontal installation

When installed horizontally, standing or sitting posture is more conducive to monitoring. Suitable for office, home appliances, barriers, living room and other open environments.

Figure 4-1 Horizontal installation method detection diagram

The horizontal installation height of the radar module is recommended to be 1 m to 1.5 m. The radar is installed horizontally and positively, and the installation inclination angle is within plus or minus 5 °. There should be no obvious

obstructions and coverings directly in front of the radar module, and it should cover the human movement area as far as possible.

In this installation mode, the maximum distance for human motion detection is greater than 10 meters; the maximum distance for human stationary detection is approximately equal to 5 meters; generally the effective action distance is 3 to 4 meters.

Inclined installation

Measure the movement of people in the room. It is mainly suitable for hotels, halls, courtyards and other environments.
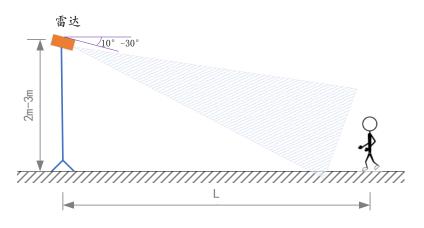

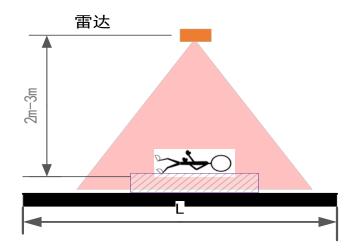Figure 4-2 Detecting diagram of oblique installation

It is recommended that the height be 2-3 meters when installed obliquely; the range of the tilt angle of the radar module when viewed from the bottom is 10 ° ~ 30 °, and there should be no obvious obstructions and covers in the direction of the module.

In this installation mode, the maximum distance for human motion detection is less than 10 meters; the maximum distance for human stationary detection is less than 5 meters, and the effective distance is generally 3 to 4 meters.

In this mode, there may be monitoring blind spots directly below the radar and adjacent areas. As the downward looking angle increases, the static human detection distance will be significantly shortened.

Top installation

Mainly for the monitoring of the human body in the state of lying down, such as bedrooms, nursing homes, hospital beds, etc., can measure a person's breathing state, sleep state.

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Figure 4-2 Top installation detection

The radar is installed vertically to ensure that the radar scan covers the detection area; the radar installation height is recommended to be 2-3 meters; there is no obvious obstruction and cover in front of the radar. Affected by the radar installation height and the radar beam range, the length of the horizontally acting area is about 3 to 5 meters.

5. Output content

The radar module can periodically give the presence and movement status of people in the monitoring range.

The main states that can be given include:

(1) No one's situation;

(2) Someone's condition-static state (sleep state);

(3) Someone's condition-active state;

(4) Someone's condition-approaching state;

(5) Someone's situation-stay away.

6. Matters needing attention and common problems

(1) Startup time

When the module starts to work when it is initially powered on, it is necessary to completely reset the internal circuit of the module and fully evaluate the environmental noise to ensure the normal operation of the module. The module initialization time is about 30 seconds, and the validity and accuracy of subsequent output parameters can be guaranteed after the initialization is completed.

In extreme cases, some users have high electromagnetic noise in the use environment, which can easily cause misjudgment of the status. In the case of the current harsh environment, the internal algorithm of the module supports the learning and adaptation of the existing environment characteristics in an unmanned scenario to reduce the misjudgment caused by the module detection in a harsh environment. The learning process needs to be powered on in an unmanned environment. Run for about 2 hours.

(2) Judgment time

Within the radar detection range, the detection and feedback time when the object is moving is within 1 second, and the data is output synchronously. Because of the algorithm's superimposed calibration, the radar needs to collect data in multiple dimensions and improve the accuracy when detecting the stationary human body or the unmanned state evaluation to ensure the reliability of the radar output state. The radar output evaluation time is currently set to 10 minutes, and the response time can be further optimized according to user scenarios in the later stage.

(3) Environmental factors

For the measurement of moving objects or moving human bodies, it is necessary to prevent interference from other continuously moving objects in the environment. This radar has already processed and filtered the data for long-distance moving objects in algorithm, but if there are other moving objects in the short-range monitoring range, interference data may be uploaded to the module to cause incorrect data judgment. In actual use, in order to ensure the accuracy and stability of the output data of the radar module, objects that may cause interference should be avoided from entering the detection range, such as household fans, automatic toys, and fish tanks with fish activities.

(4) Effective detection distance

Radar effective detection distance is related to the motion amplitude and distance. The larger the object's motion amplitude, the farther the detection distance is. The detection distance of human motion data is within 20, and the detection distance of human respiratory data is within 5 meters.

(5) Penetrability

The antenna of this radar module has a fixed angle output. The millimeter wave can penetrate clothing, bedding, glass, wooden boards and other materials, but cannot penetrate the human body and walls.

(6) False positive rate

Human biological signals belong to ultra-low frequency, weak reflection characteristic signals. The radar module needs a relatively long time to perform data accumulation and data processing. In the process of data accumulation, many factors may affect the radar parameters. Occasional detection failures are normal. You can reduce the false alarm rate by adjusting the installation angle and distance.

(7) Radiation

The output power of this radar module is very low, the signal power is less than one tenth of that of a mobile phone, and there is no risk of excessive radiation or radiation pollution.

(8) Power supply

The operating power consumption of this radar module is about 0.5W. It is recommended to be used with a power adapter. It is not suitable for applications powered by separate batteries.