

Design and Analysis of Indoor Mobile Robot Positioning Technology

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Abstract: In the field of mobile robot technology research, positioning technology is one of the core technologies, so it has been widely concerned in the field of industry. Due to the limitation of space, indoor mobile robots often have a high demand for their own position confirmation in the process of operation. Therefore, exploration based on positioning technology is very important for the further development of indoor mobile robots. Based on the research on the positioning technology of wheeled indoor mobile robot, this paper will make an effective evaluation on the future development direction of indoor mobile robot technology.

Along with the great increase of science and technology, now indoor mobile robot also gradually has been entering people's field of vision and gradually into people's life. In order to let indoor mobile robot to complete more intelligent work and bring great convenience for people, now the indoor mobile robot technology has also witnessed continuously rapid development towards the direction of the matured. Among them, indoor positioning and navigation of indoor mobile robot have become the core direction of its technological development in the next stage. With the in-depth application of positioning technology, indoor mobile robot can realize more accurate enhancement of relevant intelligent services.

1. Overall Analysis of Indoor Mobile Robot Positioning Technology

Since entering the new century, the field of intelligent bionics has made important breakthroughs and progress. Especially at the present stage, with the rapid improvement of intelligent robot technology, more multi-functional robots have been effectively applied in various industries, thus bringing great convenience to life and work. After years of painstaking development, the outdoor positioning technology of the intelligent robot has been applied in a very mature way while the relevant positioning and navigation system has become more scientific and systematic. However, due to the impact of space and other aspects, indoor positioning technology has higher requirements in terms of accuracy compared with outdoor positioning technology. In addition, we also need to better address the impact of some indoor instability factors, since indoor positioning technology needs to be further optimized and improved. To improve the positioning technology of indoor mobile robot, the following aspects should be considered comprehensively: location determination, real-time monitoring, positioning purpose and selected working path. It can be seen that the in-depth development and application of indoor mobile robot positioning technology still has a long way to go, which requires a lot of practice and technical innovation. In particular, highly accurate positioning and real-time confirmation of the robot's operational status are critical to achieve the relevant mission objectives more accurately. Through the analysis of the best positioning technology, the robot can complete the corresponding target task in a relatively short period of time and the indoor mobile robot positioning technology has a more mature application. This technology effectively reduces the positioning interference caused by environmental factors, which is also an important development trend of indoor mobile robot positioning technology in the future.

2. Analysis of Indoor Positioning Mode of Wheeled Robot

2.1 Relative positioning

Ultrasonic network positioning method

With the aid of ultrasonic distance sensor, the obstacles in front of the indoor mobile robot target and the relative distance of the relevant reference target can be calculated effectively.

The key of ultrasonic network positioning is to set ultrasonic sensors around the indoor mobile robot and install no less than three beacons at the top of the room, which is the receiving instrument of the ultrasonic system. Through accurate calculation of the corresponding length of the indoor mobile robot to the corresponding beacon, the specific position of the indoor mobile robot at present can be obtained more accurately.

The receiver and the sensor of ultrasonic wave transmit information effectively with the help of invisible signal. When the ultrasonic sensor sends out the corresponding ultrasonic wave, the opening of timing of the acceptor is carried out at the same time. When the ultrasonic receiver receives the ultrasonic signal effectively, the timing can be stopped, thus obtaining the specific value of the ultrasonic transmission cost. The corresponding professional formula can be used to calculate the corresponding distance between all beacons and indoor mobile robots. This operation method is very simple, but it will be interfered by various indoor transmission signals to some extent, which will affect the accuracy of the transmission information of the whole sensor.

Laser sensor positioning method

By applying the reflection of the laser, it can better detect the specific location of the distance hindrance according to the time difference. It can be placed on the outer layer of the wheeled indoor mobile robot. With the help of the edge-retaining facilities in the scanning area, the time difference between two times can be obtained effectively so that the relevant data information of time difference can be better applied to compile the corresponding code to accurately calculate the corresponding azimuth and distance. If we want to ensure the location of each trip is fixed, we can use it for repeated positioning. The overall effect is very significant and the calculation method is relatively simple. However, the way to test the distance with the help of laser emission may often cause interference to the working signals of other laser components inside the indoor mobile robot, thus causing corresponding errors. Therefore, such measurement method also has certain adverse factors.

Relative positioning depends on fixed objects, so it is very easy to be interfered by indoor environment factors as well as the overall accuracy will be greatly affected, which is a very fatal problem for the development of indoor mobile robot positioning technology. Therefore, it is necessary to comprehensively consider the ways to adapt to various environmental factors and determine the specific orientation of indoor mobile robot from a global perspective. The total indoor relative positioning mode of wheeled robot is shown in table 1.

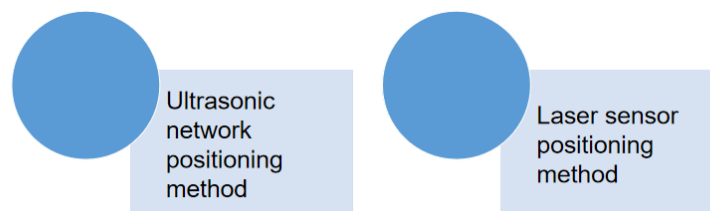


Table 1: Relative positioning mode

2.2 Absolute positioning

Absolute positioning of machine vision

The visual navigation technology means to install the corresponding camera device on the

fuselage of the indoor wheeled mobile robot and to process the information effectively with the help of the real-time scene pictures. In the process of operation, the data taken by the robot needs to be compared in detail with all the indoor site images so as to better confirm the current specific orientation and further complete the precise positioning of the indoor wheeled mobile robot. With the help of vision, indoor wheeled mobile robot can effectively explore and analyze the specific surrounding environment, and analyze, compare and sort out the overall camera information in order to better obtain the specific location of indoor wheeled mobile robot.

Normally, omnidirectional vision can be turned into two steps: first step needs a different color for effective collection offline to better collect information from the feature extraction of science. After parsing is complete, it then will be fully modulated of all the colors for the same area boundary, and is often said that the threshold and effectively stored. When applied to the corresponding site, the image can be decomposed effectively according to the visual data collected by the camera and compared with the actual site image data in depth to effectively complete the positioning.

Integrated positioning of code disc and gyroscope

Indoor wheeled mobile robots need to make effective contact with the ground in the process of running, so they can be placed on the fuselage of the code disk. Through the coordinate axis site of the robot itself, the integration operation of the code plate positioning coordinate system and the site coordinate is carried out, thus effectively realizing the positioning of the whole field. The total indoor absolute positioning mode of wheeled robot is shown in table 2.

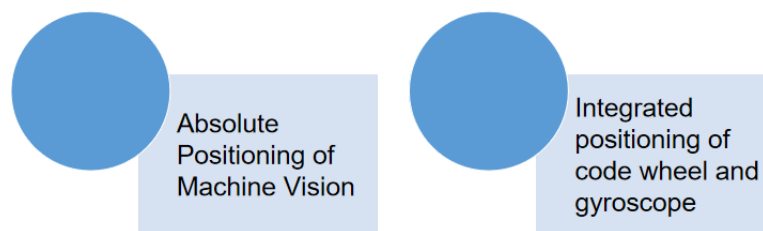


Table 2: Absolute positioning mode

Conclusion

Indoor positioning is often affected by environmental factors, so the positioning method with high accuracy needs to be determined by combining the actual indoor conditions. Through in-depth exploration of indoor wheeled mobile robot, it can be known that to further improve the positioning accuracy, the accuracy of its corresponding sensors should be guaranteed and then the overall positioning method should be thoroughly analyzed. This paper holds that the global positioning form is the direction of the future core research of indoor mobile robot positioning technology, and finds out the corresponding loopholes in the current application mode to correct to achieve the goal of constantly improving the positioning accuracy.

References

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