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The idea of artificial intelligence guidance algorithm suitable for multiple robot platforms

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Abstract: *This article aims to propose an artificial intelligence guidance algorithm that can be applied to multiple robot platforms and address the navigation needs of the blind. With this idea, the blind guide device can be more efficient, more convenient, and less expensive.*

Keywords: *Artificial Intelligence, guidance algorithm*

1. Introduction

Have we ever thought about how visually impaired people can guide them in their lives?

Blind tracks, guide sticks, guide dogs...they have no choice.

It is not uncommon for blind tracks to be occupied or even destroyed. Guide sticks can only let people perceive whether there are obstacles around them. As for where the road is, it can only rely on experience and temptation. Guide dogs are extremely rare, and their training is challenging, the cultivation time is exceptionally long, and the cultivation cost is also high. Relevant data indicate that the relevant training must last at least one year before the guide dog takes the job, and the probability of success is less than 30%. Because some dogs are too active, or too timid, or have biting behaviour, they will be eliminated. The high adoption fee is prohibitive, not to mention that not everyone can adapt to the existence of dogs.

So, are there any powerful blind guide devices that can replace traditional blind guide methods?

For the visually impaired, it is extremely important to understand what is happening around them and the path underneath. They can rely on some auxiliary facilities, such as electronic canes with ultrasonic sensors. Such devices can tell users whether there are obstacles around them, but their functions are nothing more than that. It is difficult for people with normal vision to imagine the difficulties faced by the visually impaired. 80% of visually impaired people feel that most of the blind guide facilities currently available on the market cannot meet their activity needs, and they cannot provide users with The correct path cannot clearly tell the user what obstacles are around. Almost all visually impaired people want to have an assisted navigation device that can guide them like a carer because this can ensure their safety and convenience on the road.

The current Chinese research focus is mainly on crutches, and there are also projects such as "machine guide dogs". However, the programmes of most robots are fixed, which makes them unable to guarantee the optimal decision in any scenario. This shows that our investment and research on blind guide equipment is relatively insufficient. How can we help these unfortunate people effectively? I thought of robots. With the current level of technology, they have the ability to become a right-hand man for the visually impaired.

The blind guide robot is a service robot that provides navigation assistance for the visually impaired. It uses a variety of sensors to detect the surrounding environment, processes the detected information, and then provides corresponding feedback to the driving device and the visually impaired. To help users effectively avoid obstacles. There are many excellent robot platforms on the market. If someone can design an artificial intelligence algorithm that can be adapted on most platforms (quadruped, biped, wheel-foot), then it will be possible to realise the popularisations of blind-guided robots.

2. Methods

In my opinion, algorithms suitable for blind guide robots need to implement the following functions:

(1) Independent navigation capabilities that do not rely on the Internet and satellite maps and the

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ability to identify road signs and public facilities. It can plan the safest and most time-saving route for the user to reach the destination and provide the user with necessary assistance in daily life (loading, information broadcasting, item picking).

(2) With the support of intensive learning algorithms and continuous training, such smart devices should be able to have functions equivalent to those of care and security personnel and effectively improve the quality of life of users. Its adequate working time and reliability far surpassing conventional equipment will bring unparalleled advantages to it.

(3) In addition to serving the visually impaired, the algorithm can also be used in a variety of equipment and application fields, such as hazardous area detection, mapping, street patrol.

After collecting information, I found an excellent quadruped robot platform: the Boston Dynamics spot mini. The spot mini-series of quadruped robots from Boston Dynamics has strong passability and active adaptability. Its vision system is composed of 5 groups of RGBD cameras (2 groups of cameras in the front and a group of cameras on the left and right sides and at the rear), which enables it to independently plan routes and recognise and analyse various objects in real-time. The flat backplane and universal guide rails make it possible to carry a variety of sensors to suit different work requirements. Based on them, with excellent algorithms, it is possible to guide or even find the way for the visually impaired.

3. Conclusion

I will use spot mini as a carrier to imagine artificial intelligence algorithms. In order for the algorithm to "understand human speech" and understand the needs of users, it must support natural language processing and human-computer interaction. In addition, with the support of this deep neural network, it should also have the ability to collect environmental sounds, judge the surrounding conditions in real-time, and relay the information to the user as soon as possible. Since this robot has RGB cameras in four directions, front, back, left, and right, and supports ranging functions, as long as you add a target detection and recognition algorithm based on convolutional neural networks, it can see and understand everything around for the user and then plan the route of travel provides a data basis.

Spot Mini already has an advanced walking algorithm and attitude control algorithm. Developers only need to focus on how to "teach" it to lead others. The extremely flexible robotic arm and the depth camera inside the "hand" make it capable of autonomously grabbing some items or opening doors and drawers. With the support of the reinforcement learning algorithm, Spot is likely to be competent for the basic housework of the visually impaired, which can reduce part of the burden on their lives. Its back is flat, and there is plenty of space. Active lidar can be installed to draw surrounding maps in real-time and rely on the reinforcement learning network to calculate the safest and fastest path. In addition, it should also be able to record the location of surrounding infrastructure with a vision system and guide users to the nearest facility as soon as they need it.

The purpose of reliability evaluation is not only to maintain the reliability of the current robot platform, but also obtain reliability information to provide the basis for further continuous improvement and improvement of reliability. The reliability evaluation score of NAO robot platform was obtained by example calculation. In the "pass" grade. Among them, processing system and development system two aspects of the gap. Obviously. compared with similar humanoid robots such as ASIMO, ICUB and ATLAS, NAO does real processor and programming development at a disadvantage, consistent with the actual situation. The next step, should establish communication with manufacturers, feedback, analysis and improvement channels to help improve NAO robot platform reliability. At the same time, the model method is generalized, it is applied to the reliability evaluation of similar humanoid robot platform to promote humanoid machine.

4. Discussion

The above is my idea of what this algorithm can do on spot mini. In addition, I also found another excellent platform: ANYmal, a quadruped robot developed by the Robot System Laboratory of the Swiss Federal Institute of Technology Zurich and ANYmal Robotics. Compared with spot mini, ANYmal is more "intelligent". It is a controller obtained by reinforcement learning for gait control and behavioural decision-making, which means that it is more likely to "evolve" to be optimal in any environment. The "guide dog" of path planning. Like the spot mini, it can also be equipped with various information collection devices for object recognition, surrounding terrain recognition, temperature detection, gas analysis to protect the safety of users.

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However, endurance is still the "pain point" of all robots at present, and the high cost also makes it difficult for them to serve ordinary families. Nevertheless, I believe that with the advancement of technology and productivity, high-end artificial intelligence equipment will surely get into our daily lives. In addition to providing convenience and efficiency to ordinary people, they will also be useful for the visually impaired or other disabled people. I hope this day will come soon.

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