

The Current Application Status and Future Trend Outlook of Artificial Intelligence Visual Technology in Pet Behavior Interaction

Junyu Liu

Department of Computer Science, Macau University of Science and Technology, Macau, 999078, China
1085389217@qq.com

ABSTRACT

Artificial intelligence visual technology, as an important branch of the field of artificial intelligence, has demonstrated significant application potential in the field of pet behavior interaction in recent years. This article delves deeply into the current application status of artificial intelligence visual technology in pet behavior interaction, analyzes its specific applications in pet behavior recognition, emotion analysis, health monitoring, etc., and looks forward to future development trends, including technology integration, expansion of application scenarios, and deepening of personalized services, aiming to provide theoretical references for promoting the further development of artificial intelligence visual technology in the pet industry.

Keywords: Artificial Intelligence Visual Technology; Pet Behavior Interaction; Current Application Status; Trend Outlook.

1. INTRODUCTION

With the steady growth of the global economy and the remarkable improvement of people's living standards, the role of pets in the family has undergone profound changes, from a simple companion to an indispensable and important family member^[1]. This huge market scale not only reflects the growing demand for pet companionship, but also shows the important position of pet economy in the consumption field^[2].

In modern society, pet owners' concern for their pets has expanded from basic feeding needs to pet behavior, mood and health status. The behavior and emotional state of pets not only reflect their physical health, but also are closely related to the quality of interaction between pets and their owners^[3]. For example, the abnormal behavior of pets may indicate potential health problems, and their emotional changes will also affect the interaction with their owners. Therefore, understanding the behavior and emotions of pets is very important for providing scientific and accurate pet care services.

In the past, the method of observing pet behavior mainly relied on the subjective judgment and accumulated experience of the owner. This method has obvious shortcomings^[4]. On the one hand, the owner's observation may be influenced by personal cognitive level and emotion, and the result is not objective and accurate enough; On the other hand, it is difficult to monitor the behavior of pets in real time and continuously by manual observation, and it is impossible to find the abnormal behavior and emotional changes of pets in time. For example, when the owner goes out to work, it is impossible to know the situation of the pet at home in time. Once the pet encounters an emergency, it may not be able to take timely measures^[5].

The emergence of artificial intelligence vision technology provides an effective solution to these problems. This technology has powerful image recognition, analysis and understanding capabilities, and can capture detailed information such as pet behavior and expression changes in real time. Through in-depth analysis of this information, artificial intelligence vision technology can accurately identify different behavior patterns of pets, such as eating, playing, resting and anxiety, and can also monitor the emotional state of pets, such as happiness, sadness and anger. Based on these analysis results, pet owners can get more scientific and accurate pet care advice and adjust their pet care methods in time, thus improving the quality of life of pets and strengthening the emotional interaction between people and pets^[6].

In addition, the application of artificial intelligence vision technology in the field of pet behavior interaction also has great commercial potential. With the continuous expansion of the pet market, pet owners are increasingly demanding intelligent and personalized pet care products. Artificial intelligence vision technology can be integrated into various pet intelligent

devices, such as smart cameras, smart feeders and smart toys, to bring more convenient and efficient pet care experience to pet owners. At the same time, the application of this technology can also provide strong technical support for surrounding industries such as pet medical institutions and pet training institutions, and promote the upgrading and development of the entire pet industry chain^[7]. In a word, it is of great theoretical significance and practical value to study the application of AI vision technology in pet behavior interaction. This paper will deeply discuss the principle and method of AI vision technology and its specific application in pet behavior interaction, hoping to provide theoretical reference and practical guidance for the wide application of this technology in the field of pets.

2. OVERVIEW OF ARTIFICIAL INTELLIGENCE VISION TECHNOLOGY

Artificial intelligence vision technology is a science that studies how to make machines “see” and understand pictures and video content. It uses cameras and computers to take photos instead of human eyes, and then uses deep learning and machine learning algorithms to process the captured images and find out the feature information of the target objects, so that the tasks of identifying, classifying and tracking these things can be completed^[8]. This technology involves many fields, such as image processing, feature extraction and pattern recognition. It can work quickly and accurately, and can handle a lot of complex image data, which provides excellent technical support for the study of pet behavior interaction.

3. APPLICATION STATUS OF ARTIFICIAL INTELLIGENCE VISION TECHNOLOGY IN PET BEHAVIOR INTERACTION

3.1 Pet Behavior Recognition

Artificial intelligence vision technology can accurately identify various behaviors of pets, such as walking, running, jumping, resting, eating, drinking and so on. Through the real-time monitoring and analysis of pet behavior, pet owners can understand the daily activities and habits of pets. For example, some smart pet cameras use computer vision algorithm to identify the activity status of pets at different times and feed back the data to their owners. According to this information, the owner can reasonably arrange the time and space for pets’ activities and provide them with a more suitable living environment. Moreover, behavior recognition technology can also be used to detect abnormal behaviors of pets, such as exciting scraping, frequent head shaking and so on. These abnormal behaviors may be a sign that the pet is sick or has psychological problems. Timely detection and taking measures will help to protect the health of pets.

3.2 Pet Emotion Analysis

The emotional state of pets has a great influence on their health and behavior. Artificial intelligence vision technology can judge the mood of pets by analyzing their faces and body postures. For example, when pets’ ears stand up, their eyes are bright and their tails are wagging, it usually means that they are happy and excited; When a pet’s ears are close to his head, his body is huddled up and his tail is drooping, it may indicate that he is afraid or uneasy. Some smart pet devices use emotion analysis technology, which can provide corresponding interaction methods according to the pet’s emotional state. For example, when the pet feels lonely, the device will play soft music or make soothing sounds to interact with the pet and relieve their bad emotions. Emotional analysis technology can also help pet owners better understand the needs of their pets, adjust the way they get along with their pets, and enhance the emotional communication between people and pets.

3.3 Pet Health Monitoring

Artificial intelligence vision technology can be of great use in the health examination of our pets. It can always look at how our pet’s body is, such as whether the weight has changed, the hair is not smooth, and the skin is good. By observing and remembering the pet’s appearance for a long time, it can quickly find out whether our pet is sick or not. For example, with computer vision technology, it can see whether a pet’s fur is bright or not, whether it has lost its fur, and whether there is redness and rash on its skin. In addition, some powerful smart pet gadgets can also use other technologies, such as heartbeat monitoring and temperature measurement, and then compare them with the pictures you see, so that you can know more clearly whether the pet is healthy or not. When it is found that the pet’s body is not quite right, this gadget will immediately remind its owner, and will also give some health suggestions, telling the owner that it is time to take the pet to see a doctor, so as to ensure that our pet will always be healthy and healthy.

3.4 Pet Interactive Companionship

Artificial intelligence vision technology provides a new way and means for pet interactive companionship. Some intelligent pet robots use visual sensors to identify the position and movements of pets, and actively interact with pets through games, such as chasing and playing, to increase the sports and entertainment of pets. At the same time, the robot can also communicate with the pet owner through voice interaction function, provide the pet's life data and health advice, and realize the multi-party interaction between people, pets and machines. In addition, some smart pet cameras not only have monitoring function, but also support two-way voice call. The owner can communicate with the pet by mobile phone anytime and anywhere, so that the pet can feel the company of the owner and relieve their separation anxiety.

4. CHALLENGES FACED BY ARTIFICIAL INTELLIGENCE VISION TECHNOLOGY IN PET BEHAVIOR INTERACTION APPLICATIONS

4.1 Data Acquisition and Annotation Problems

The development of artificial intelligence vision technology is inseparable from the support of a large number of high-quality data. However, in the field of pet behavior interaction, it is difficult to obtain comprehensive and accurate pet behavior data. Pet behaviors of different breeds, ages and genders vary greatly, and pet behaviors are also influenced by many factors such as environment and mood, which are complex and changeable. In addition, tagging pet behavior data requires professional knowledge and experience, and the accuracy and consistency of tagging directly affect the training effect of the model. At present, the labeling standards of pet behavior data are not uniform, and there is also a lack of standardized data sets, which brings certain challenges to the application of artificial intelligence vision technology in the field of pet behavior interaction.

4.2 Algorithm Complexity and Computational Resource Constraints

To make pet behavior identification and analysis more accurate, complex deep learning algorithms must be used. These algorithms usually have many parameters and a large amount of calculation, which requires high computer performance. In practical use, some intelligent pet devices can't run the complex algorithm model because of the limited hardware conditions, and the recognition accuracy and real-time performance of the results become worse. Moreover, the complexity of the algorithm will also increase the difficulty of model training and optimization, so we have to find professional and technical personnel to debug and maintain, so the cost will go up.

4.3 Privacy and Security Issues

In the application of pet behavior interaction, AI vision technology will use a lot of privacy information of pets and their owners, such as the pet's activity route, living environment, as well as the owner's voice and images. If this information is not well protected, it may be leaked or misused, which will bring trouble and loss to pet owners. Therefore, how to ensure the security and privacy of data is an important problem to be solved by AI vision technology in pet industry.

4.4 Technology Popularization and User Acceptance

Although artificial intelligence vision technology has many benefits in the field of pet behavior interaction, it is not so popular now. On the one hand, some pet owners don't know enough about AI technology and have doubts about its function and effect, so they are reluctant to try those clever pet gadgets; On the other hand, some smart pet equipment is too expensive, which exceeds the budget of ordinary pet owners, which limits the promotion and application of technology. Moreover, some devices are very troublesome to use and the experience is not good, which also affects everyone's acceptance of this technology.

5. TRENDS IN ARTIFICIAL INTELLIGENCE VISION TECHNOLOGY IN PET BEHAVIOR INTERACTION

5.1 Integration and Innovation

In the future, artificial intelligence vision technology will be closely integrated with other cool new technologies, such as Internet of Things, big data, cloud computing and natural language processing, which will bring more interesting new applications to pet behavior interaction. For example, through the Internet of Things technology, we can connect all kinds of pet devices, build a smart pet ecosystem, and share and analyze the health data of pets in real time. Using big data technology, we can mine and analyze a large amount of pet behavior data, discover the rules and trends of pet behavior,

and provide more personalized pet suggestions to pet owners. Combined with natural language processing technology, smart pet devices can better understand the voice commands of pet owners and realize more natural and convenient human-computer interaction.

5.2 Expansion of Application Scenarios

With the continuous development and improvement of artificial intelligence vision technology, its application scenarios in the field of pet behavior interaction will be more and more. In addition to the existing pet behavior recognition, emotional analysis, health monitoring and interactive companionship, pet training, pet socialization and pet insurance will be used in the future. For example, we can use artificial intelligence vision technology to develop an intelligent pet training system, and automatically adjust the training plan according to the pet's behavior and training progress to make the training effect better; It can also establish a social platform for pets, which allows pets to socialize virtually through visual recognition technology and increases their chances of making friends. In the field of pet insurance, health monitoring data can be used to provide more accurate insurance pricing and risk assessment services for pets.

5.3 Deepening of Personalized Services

In the future, AI vision technology will pay more attention to providing personalized services to pet owners. Through in-depth analysis of pet behavior data, we can understand the unique needs and preferences of each pet, and then customize the pet raising scheme for pet owners. For example, recommend the appropriate pet food; according to the pet's diet and health status; Design personalized sports and entertainment plans according to the activity and interest of pets; According to the pet's emotional state and behavioral characteristics, provide targeted training and interactive suggestions. Personalized service will make pet owners have a better pet-keeping experience, and also make them more food of using smart pet devices, and improve user stickiness and loyalty.

5.4 Standardization and Normalization Development

In order to make artificial intelligence vision technology develop healthily and orderly in the field of pet behavior interaction, relevant standards and norms will be strengthened in the future. Including the collection, labeling, storage and sharing standards of pet behavior data, the function, performance and safety standards of intelligent pet equipment, and the evaluation and verification standards of artificial intelligence algorithms. Standardization and standardization development are helpful to improve the reliability, compatibility and interoperability of technology, reduce the application cost and promote the popularization and popularization of this technology.

5.5 Sustainable Development and Green Applications

While paying attention to the development of technology, the application of AI vision technology in the field of pet behavior interaction in the future will pay more attention to sustainable development and green concept. On the one hand, by optimizing the algorithm and hardware design, the energy consumption of intelligent pet equipment is reduced and the impact on the environment is reduced; On the other hand, promote the green development of the pet industry, use AI vision technology to realize the rational utilization and protection of pet resources, and promote the sustainable development of the pet industry.

6. CONCLUSION

The application of artificial intelligence visual technology in the field of pet behavior interaction has made significant progress, providing pet owners with more scientific, convenient and personalized pet care services. However, this technology also faces challenges such as data acquisition and annotation, algorithm complexity, privacy security, and technology popularization during its application process. In the future, with the continuous integration and innovation of technologies, the expansion of application scenarios, the deepening of personalized services, the standardization and normalization development, and the implementation of sustainable development concepts, artificial intelligence visual technology will play a greater role in the field of pet behavior interaction, bringing new opportunities and changes to the development of the pet industry. Enterprises and researchers related to the pet industry should actively respond to challenges, seize development opportunities, and jointly promote the wide application and continuous development of artificial intelligence visual technology in the pet sector.

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