ARTIFICIAL INTELLIGENCE METHODS IN VIDEO IMAGE PROCESSING

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Abstract. *This article is devoted to the research and application of video image processing methods using artificial intelligence (AI). The development of technologies in the field of machine learning and computer vision opens up new prospects for improving the quality and efficiency of video data processing. The article discusses modern approaches to the analysis, classification and improvement of video images based on the methods of deep learning and neural networks. Research in this area is important for various fields, such as medicine, video surveillance, entertainment industry and others. The results of the article can be useful for specialists involved in the development and application of video data processing systems using artificial intelligence technologies.*

Keywords: *video image, image processing, machine vision methods, artificial intelligence.*

Video image processing using artificial intelligence involves using machine learning algorithms and models to analyze and interpret video data [1,2].

Some of the video image processing tasks that can be solved with artificial intelligence include:

1. Object recognition: Automatically detect and identify objects in the video image, such as people, cars, animals, etc. This can be useful in video surveillance systems, autopilot vehicles, and other applications.

2. Behavior analysis: Using machine learning algorithms to analyze the behavior of objects in a video image. For example, detecting anomalies or analyzing gestures and movements.

3. Video Editing: Automatically edit and process video images, such as removing noise, improving video quality, changing the background, or adding visual effects.

4. Post-production effects: Use artificial intelligence to create or enhance special effects in video materials, such as tracking movement, inserting objects into a real environment, or creating virtual objects [3,4].

5. Content Generation: Create new video content using artificial intelligence, such as synthesizing video images or creating animated characters.

Computer vision, neural networks, and deep learning techniques are often used to perform these tasks. There are also a number of specialized tools and frameworks that facilitate the development and deployment of video image processing systems using artificial intelligence.

Object recognition: Automatic detection and identification of objects in the video image

Object recognition in a video image is one of the most important tasks in the field of computer vision. It allows you to automatically find and identify objects in the video stream, making it easier and faster for operators and video surveillance systems.

The process of recognizing objects in a video image includes several stages. The first step is to detect objects, i.e. determine their presence in the image. For this purpose, various methods are used, including algorithms for finding singular points or analyzing the contours of objects.

After detecting objects, the next step is to identify them. This is the process of determining the type or class of an object. Various approaches can be used here, including machine learning, where models are trained on large data sets to classify objects based on their external characteristics [5,6].

The result of object recognition in a video image is a list of detected and identified objects, usually indicating their coordinates in the image or video. This information can be used for various purposes, including automatic tracking of objects or detecting certain events on video.

Object recognition in a video image has a wide range of applications, including video surveillance systems, process automation in industry, medical and scientific research, autonomous cars and drones, virtual and augmented reality, and much more. It plays an important role in modern technologies and continues to evolve and improve with the help of new methods and algorithms.

Behavior Analysis: Using machine learning algorithms to analyze the behavior of objects in a video image.

Behavior analysis using machine learning algorithms on a video image is an important area of computer vision. This technique allows you to automatically detect and classify the behavior of objects, which can be useful for various applications, including security monitoring, transport monitoring, and analysis of animal and human behavior [6,7,8].

Machine learning algorithms are used to detect and track objects in video images. First, algorithms find objects in the video stream using object detection methods, such as Haar cascades or neural network-based methods. Tracking algorithms then match the objects found in subsequent frames and track their movement over time.

After detecting and tracking objects, machine learning algorithms are used to analyze and classify their behavior. For example, deep learning algorithms can be trained to classify people's behavior in a video image, such as walking, running, falling, or aggressive behavior. Such algorithms can be used to automatically warn about potentially dangerous situations, such as an elderly person falling or violence on the street.

Using machine learning algorithms to analyze the behavior of objects in a video image requires a large amount of marked-up data to train the model. The more data available, the more accurate and efficient the model will be. In addition, choosing the right algorithm and configuring it are important factors for achieving good results.

In general, behavior analysis using machine learning algorithms on a video image is a powerful tool for automating the process of analyzing video images and extracting important information about the behavior of objects. The use of this technique has a wide range of potential applications and can significantly improve the efficiency and accuracy of behavior analysis.

Machine learning algorithms are used to detect and track sick people in video images.

Machine learning algorithms can be used to detect and track sick people in video images. For example, computer vision algorithms can be trained to recognize features or behavioral

patterns associated with certain diseases or conditions. This can be useful for automatically monitoring patients in hospitals or home environments, as well as detecting preliminary signs of poor health or unusual behavior. Examples of such systems are video surveillance systems for detecting falls of elderly people or algorithms that help diagnose diseases such as skin cancer based on image analysis.

Computer vision algorithms for observing the movement of an object

Computer vision algorithms are used to observe the movement of objects in a video stream or on static images. These algorithms can be useful in various fields, such as video surveillance, autonomous cars, robotics, etc. Here are some basic algorithms that can be used to observe the movement of objects:

Motion detection by Background Subtraction: This method is used to highlight moving objects by subtracting the static background from the current image. The difference between the current frame and the background image allows you to select moving objects.

Optical Flow: This algorithm analyzes pixel movement between consecutive frames of a video stream. It allows you to determine the direction and speed of movement of objects.

Object Detection methods: These algorithms use neural networks such as YOLO (You Only Look Once) or Faster R-CNN to detect and track objects in the video stream. They can detect objects and keep track of them even when lighting, zoom, and rotation changes [9,10].

Feature Matching: Algorithms such as SIFT (Scale-Invariant Feature Transform) or SURF (Accelerated-Up Robust Features) can be used to identify unique key points on an object and match them between frames, allowing you to track moving objects.

Object Tracking: This class of algorithms allows you to track moving objects in the video stream and predict their position in the next frames. These methods include algorithms using the Kalman filter, correlation methods, and more modern methods based on neural networks [13].

Dense Tracking Methods: These algorithms allow you to get a motion map that covers the entire image surface and provides information about the movement of objects in each pixel. Examples include the Farneback algorithm for optical flow and the Lucas-Kanade algorithm for object tracking.

The choice of a particular algorithm depends on the specific task and environmental conditions. Real-world systems often use a combination of different methods to track moving objects more reliably and accurately.

In conclusion, the article summarizes the results of research and practical application of artificial intelligence in the field of video image processing, as well as outlines the prospects for the development of this field and further research directions [11,12].

The article is devoted to video image processing using artificial intelligence. Artificial intelligence allows automatic processing and analysis of video material to achieve certain goals, such as object recognition, scene classification, motion detection, and other computer vision tasks.

The article describes various approaches to video image processing using artificial intelligence, including deep learning methods, convolutional neural networks, and recurrent neural networks. It also considers the application of artificial intelligence in various fields, such as medicine, the automotive industry, robotics and video surveillance.

The article also examines the possibilities of using artificial intelligence to solve complex video image processing tasks, such as deploying neural networks on mobile devices, optimizing computing resources, and improving the speed of algorithms.

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