OBJECT RECOGNITION VIA CCTV BY NEURAL NETWORK USING

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Abstract

One of the major issues in processing large amounts of video information is the detection of certain objects or events that interest us. Monitoring by a human operator the video streaming information does not always lead to good results. This problem can be solved by using neural networks for video recognition.

This paper describes an opportunity for objects recognition by using the neural network and Closed Circuit TeleVision (CCTV) in industry, disasters, household and medicine. A block diagram for images recognizing using a neural network and operation algorithm are proposed. Forest fire detection is performed and the obtained results are presented.

Keywords – CCTV, objects to recognition, neural network

1. INTRODUCTION

The video surveillance systems are very often used in practice. Monitoring by a human operator systems are not as effective as automated systems. Automated systems recognise better very small, unclear or emerging objects.

Neural networks are widely used for object recognition [1], [2]. Their adaptability, noise resistance and efficiency make them preferable in a wide area of applications such as face recognition, digits recognition, object classification, etc.

This paper describes an opportunity for objects recognition by using control system that consist of Closed Circuit TeleVision, neural network and signalling and control device. The system can be used in security, video surveillance, industry, medicine, and more.

2. SYSTEM BLOCK DIAGRAM

Figure 1 shows the system block diagram. The each element choice is important and can affect the performance of the entire system.

The video camera selection is most often done based on its resolution. This parameter specifies the ability to capture tiny details that may have a crucial impact in object recognition. The image high resolution should be kept also when records one, otherwise the camera advantage may be lost. In other words to create a high-quality database, the compression method for image recording is no less important than the resolution of the camera.

The type of neural network, the number of neurons in its layers, and the learning algorithm that is used are important elements in its selection and have a direct impact on the learning quality.

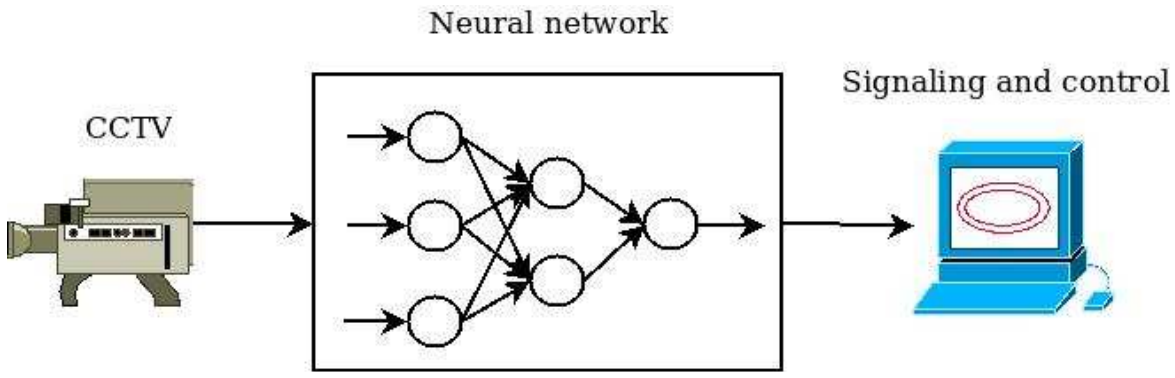

Figure 1. System block diagram

The signalling and control device configuration is last but not least by importance. Its choice have an impact on the timely signalling and the adequate system control.

The algorithm (fig. 2) starts with database creating. The database includes positive (fig. 3) and negatives objects. The two categories are described in separate files. The next step is a vector file creating [3], [4], [5].

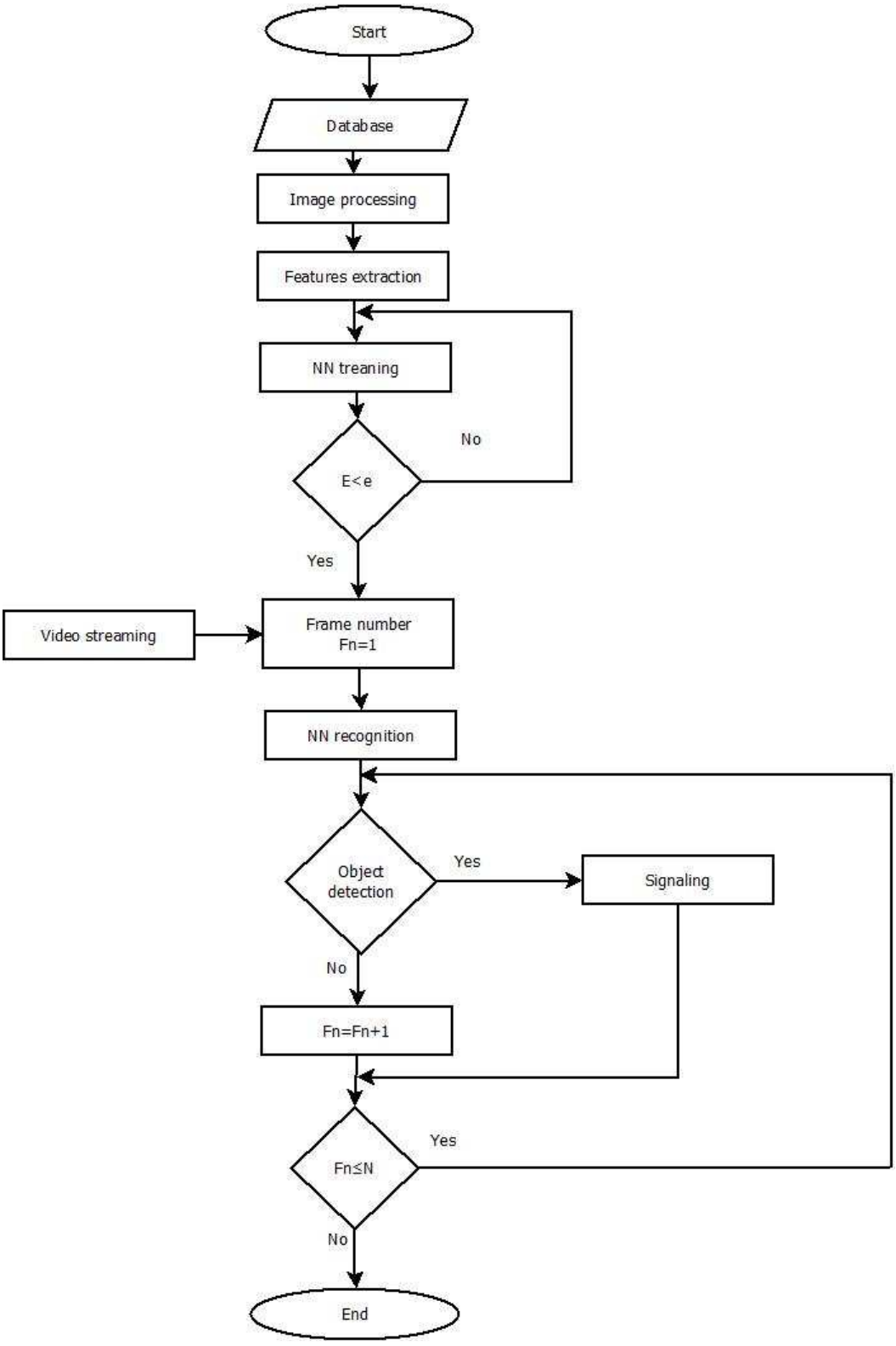

Figure 2. Object recognition algorithm

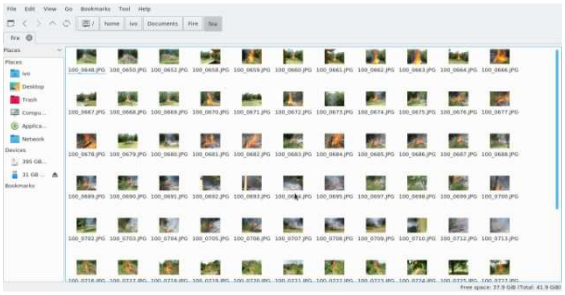

Figure 3. Data base of positive objects

3. OBJECT RECOGNITION ALGORITHM

For some applications preliminary image processing is needed. The most appropriate preliminary image processing is selected experimentally by the lowest neural network learning error.

The extracted image characteristics are passed at the neural network input, then the neural network is trained. The most commonly used criterion for stop neural network training is the least square error. The training of the neural network continues until the error value e is not reached.

Once the neural network is trained, the recognition phase follows. The captured film is fed to the neural network. By means of the **Fn** constant the frames are fed one by one on the neural network. Each frame is checked for the presence of the object that is searched. When the object is detected, the system for signalling and control is activated. After this recognition process continues with the next frames. When the last frame **N** is reached recognition process stops.

On figure 4 and figure 5 are shown a correct recognized object and few false recognized objects. It can be seen that false object recognition occurs in areas of sharp change in brightness. The number of false recognized objects decreases with data base increasing. Not only the number is important, but also the type of the samples. They have to be chosen so that to train the neural network of all possible variants of the object. The choice of the samples in the negative database is also important too. Some of them should contain details of the surrounding environment of the positive ones. The right choice of the system components, the proper database selection, and the correct implementation of the neural network training algorithm ensure object recognition without false recognized objects (fig. 6).

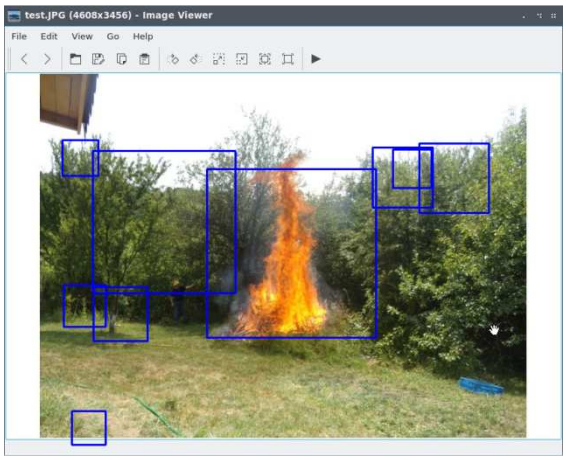

Figure 4. Fire recognition with a correct recognized object and few false recognized objects

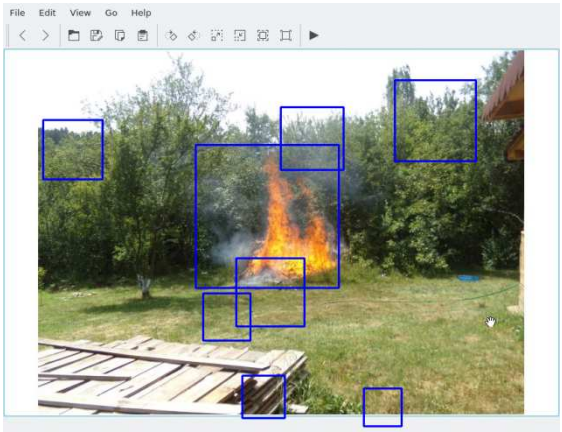

Figure 5. Fire recognition with a correct recognized object and few false recognized objects

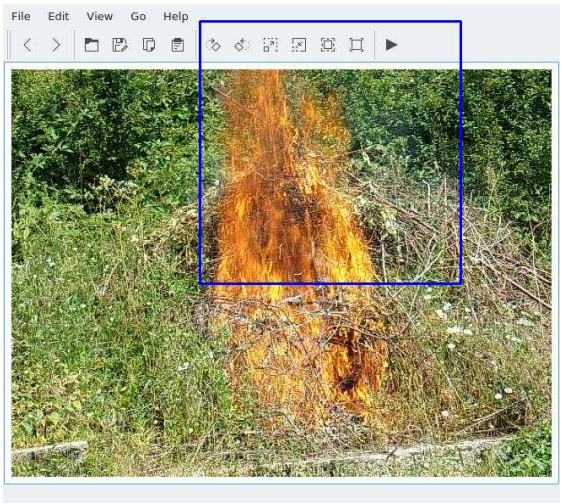

Figure 6. Fire recognition without false recognized objects

4. CONCLUSION

A control system using objects recognition is describe in this paper. It consist of Closed Circuit TeleVision, neural network and signalling and con-

trol device. A block diagram of the system and operation algorithm are proposed. The requirements of the system components choice, the database selection, and the neural network training algorithm are considered.

This system can be used in wide area of application: security, video surveillance, industry, medicine, and more.

References

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