Application for Determination of User Interaction with the Objects Using a Camera

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Abstract—Monitoring the implementation of the restricted access to the nodes of the equipment at the enterprise is an urgent task. One of the ways to solve this problem is to monitor staff and identify moments of contact with equipment nodes. The paper presents a software tool for monitoring the working area. Application allows you to determine the availability of personnel in the area and staff contact with equipment nodes.

Modern enterprise equipment is a complex electro-mechanical device with many different nodes. Access to nodes is demarcated and strictly regulated. For example, a machine operator does not have access to an electrical cabinet or to motors. In case of need (for example, failure of the equipment unit), qualified personnel with a permit is invited to perform specific work (for example, an electrician). However, often unqualified personnel try to gain access to equipment nodes bypassing restrictions. Such attempts may result in equipment damage or personal injury.

The simplest way to restrict access is the use of cupboard / boxes with locking devices and opening sensors. However, in practice, not all components of the equipment can be placed in cupboards. Thus, the actual task is to determine the situation of personnel interaction with equipment nodes.

The paper presents a solution based on the image analysis from the camera. The camera continuously captures the production site and transmits the image for analysis. In the course of the image analysis, people and equipment nodes found on the site are identified. In the case when a person is close enough to the equipment node, a contact event is generated.
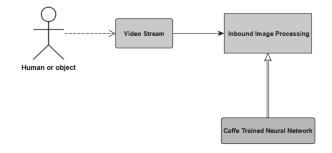
The overall architecture is shown in the Fig. 1. To identify the objects, the opencv library [1] and neural networks [2] are used. The neural network makes it possible with some probability to identify parts of the human body in the case when it is not fully visible.

As a result, the application notes personnel and equipment components found in the image and displays the status of the interaction event (see Fig. 2).
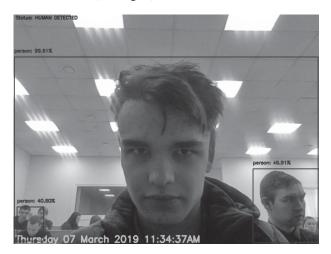

Fig. 2. Common architecture

REFERENCES

[1] "Opencv library," Feb. 2019. [Online]. Available: https://opencv.org/
[2] "Caffe — deep learning framework," Feb. 2019. [Online]. Available: http://caffe.berkeleyvision.org/

Fig. 1. Common architecture