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Abstract of PhD Thesis

Title: Human actions recognition with modular neural networks
Author: Veaceslav Albu
Supervisor: Prof. Svetlana Cojocaru
Institute: Institute of Mathematics and Computer Science, Academy of Sciences of Moldova, Chişinău
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The main purpose of the dissertation is elaboration of a multimodal method for real time classification of human reactions (joining emotions and actions) into typical and non-typical in a certain environment, that ensures an effective functioning of systems destined to human actions monitoring in real time. This kind of classification task is very useful in different applications, where the number of gestures of the human is limited, such as: customers at the various types of automated machines, drivers, assembly line workers, hospital patients etc.

The proposed tool provides statistical observations and measurements of human emotional states during an interaction session with a software product (or, optionally, with a hardware plus software complex). Using computer vision and machine learning algorithms, emotions are recorded, recognized, and analyzed to give statistical feedback of the overall emotions of a number of targets within a certain time frame. Similarly, the actions of human subjects, which a user can perform during the interaction with a piece of software/hardware complex were classified. The feedback, produced by the proposed system, can provide important measures for user response to a chosen system.

The core part of the system consists of two main architectures: modular neural network architecture and deep learning architecture. An application example of this research is a infrared camera system embedded in a machine that is used frequently, such as an ATM. We use camera recordings to capture the emotional state of customers (happy, sad, neutral, etc.) and build a database of users and recorded emotions to be analyzed later. For the purposes of the study, a hardware complex was developed and tested, which was used for psychological experiments.