C42   Soft Computing Application to Anthropological Automatic Characterization in Forensics

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The goal of this presentation is to discuss technical methodologies to support forensic anthropology for the identification of the perpetrators of robberies in stores, using video surveillance cameras shots.

This presentation will impact the forensic science community by showing how a modern approach, using a soft computing methodology, can be utilized. In particular, the anthropological correlation is made using fuzzy logic. This allows combining the power typical of non-linear computing methods with the possibility to represent reality using a language similar to the human one.

Forensic anthropology can be used, today, for the identification of the perpetrators of robberies in stores, using video surveillance cameras shots. Literature reports that the most relevant anthropometrical methodsare mainly based on: (1) proportional ratio between height of human figure and of internal furniture items and those displayed on recorded imagery; and (2) observation of subjects characteristics, such as postural poses caused by skeletal pathologies and/or facial details, so that they can be highlighted even though individuals have the face distorted by sunglasses, balaclava, etc.

In many cases, anthropometrical investigation used a fundamental ability to identify people, using video surveillance equipment. Some considerations have to be made: (1) the horizon line (image upper margin) and the ground line (image lower margin) of the perspective representation are drawn on the image shots; (2) The distance between the two lines confirms that the camera vision is from top to bottom; and, (3) The observer position (camera lens) is highlighted when the lines, arranged on the furniture items, reach the horizon line in a point, where the vertexes of the optical cones are.

The human eye perceives things through an imaginary optical cone or visual pyramid, making objects appear greater in the foreground than those in the background. The dimensions of the internal reference structures (furniture) of the crime scene are shown as colored segments. Those drawn on the human figure in the same picture are equivalent to the measurement of the height of the accused subject. It is the anthropological and anatomical correlation that, when defined by the somatic type of the examined subject, makes him absolutely different from others that superficially examined might be considered similar.

A soft computing methodology was proposed to help with the described procedures. In particular, the final anthropological correlation is made using fuzzy logic. The related principle is known as the incompatibility principle. It states that, as the complexity of system increases, the possibility to obtain a precise description of it in quantitative terms decreases. The use of fuzzy logic allows combining the power, typical of non-linear computing methods, with the possibility to represent reality using a language similar to the human one. It appears as a simulating theory to represent phenomena, more or less complex, through a definition of a certain number of fuzzy sets, elaborated with appropriate connectives. The cause-effect connections, regulating the process, are described through fuzzy implications (rules).

Anthropological Characterization, Fuzzy Logic, Soft Computing