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METHODS OF IDENTIFYING AGGRESSORS IN ARMED ROBBERIES USING THEIR PHYSICAL DIMENSIONS

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Abstract: *There are some different elements that add to the classical facial recognition and/or fingerprints which we can use for identifying people. We are thinking here about the way a person looks – simply the physical characteristics, as height, weight, limb length (arms, forearms, tibia etc.) – and the way that person moves. In this article we will discuss the first elements, identifying people using their physical dimensions.*

1. INTRODUCTION

Lets take the example of an armed robbery in a financial institution which benefits from video surveillance – the aggressors will wear masks, gloves and eventually clothes or different accessories which will mask somehow their identity, considering that facial recognition is the prime method of identifying villains in the case of video surveillance institutions. Even more, if we consider that the robbery usually implies an accomplice from inside, everything happens very fast. As an example, recently in Romania there was a robbery at a bank in the record time of approximately one minute and a half, the attackers knowing what and where to look, in this case the existence of the accomplice from inside being more than obvious. The police can't rely on almost any classical means to when it comes of identifying attackers, even if they were caught on camera.

2. DATA GATHERING USING CAMERAS

The main idea that we assume is that a villain who plans to rob a store, financial institution or anything like that will have to visit the place before, dressed like a civilian (no gloves/mask etc) to get an idea about the place and to set up the proper strategy for the attack. We will record some identification data which represent the body dimensions of everyone who visits the institution, in order to compare them to those of the attacker's (recorded when the robbery takes place).
The system which we present is based on three photographic cameras which we will preferably install before the main door (or eventually in a narrow corridor where only one person can pass at a time). Considering that we install them before the main door, the three cameras will be positioned one on the ceiling aiming vertically down, one frontal on the main door facing the outside and one lateral. When a person passes through the main door heading inside, the system will automatically launch and the three cameras will simultaneously take the photo of the subject (somehow similar to the fixed radar cameras if you like). Ideally, for a person to enter the main door would have to be activated using a button, in this way making us sure that the person which will enter the institution will spend the necessary amount of time (pushing the button and waiting for the door to open) to be caught on the three cameras in the perfect position and place.

Figure 1: The subject is caught on camera in front of the main door, simultaneously with all the three cameras. In this case we show the collection of the data from the frontal camera, such as the distance from the base which we set (a relative height) and the distance between shoulders

3. DATA PROCESSING

The three photos will be then automatically processed using software which determines (based on some fixed criteria) the physical dimensions of the person who passes through the control point. We can determine the height and the width using the frontal and the lateral cameras, the distance between shoulders using the frontal camera and the camera from above and the dimensions of the head using the lateral and frontal cameras. All this data is then written in a database as recordings to which the date and hour are added. If we want, we can improve the system especially if it is set up in front of the main door and the visitor is forced to spend some time in a fixed place to push the button and to wait for the door to slide open. On the floor exactly in front of the main door we can set up a masked weight sensor (very cheap and easily to install) which is able to automatically send the collected data to the software which records it in the database, in this way gaining one more criteria for identification.

Table 1: Identification data for the visitors who entered the store between 9 AM and 10 AM, X, Y, Z and T being the measurements for the distance between shoulders, height to the base point, width and the distance between the ears

Date	Hour	X	Y	Z	T
08.10.2009	09:00	516	915	321	152
08.10.2009	09:15	590	1044	350	203
08.10.2009	09:18	477	1012	408	171
08.10.2009	09:32	490	915	253	194
08.10.2009	09:33	524	822	320	148
08.10.2009	09:48	433	890	312	213

Practically, for every person who enters the store or the financial institution we will have a recording in the database containing the date, hour and the physical dimensions of that person. When a robbery is taking place, the aggressor will have to enter the store and he will have his data salved also. From that point, considering that the villain visited the store before without the mask and dressed normally, we can search in the database in order to establish eventual matches between the villain's data and the data of all people who entered the store lately. There will not be a perfect match, the query is expected to return many results, all of those representing subjects (known faces) which being sent to the police.

4. CONCLUSIONS AND LIMITATIONS

The system which we propose has some disadvantages, it can be exploited if its presence and modus operandi are well known – the physical dimensions could be intentionally altered using different accessories like weights or high heel shoes or wearing extra voluminous clothes etc. On the other hand all these extra preparations are extremely disadvantageous to the villains, firstly they heavily draw attention and they create a great discomfort in their „work".
We must specify that our system is very well suited mostly for the low-to-medium sized stores and financial institutions, where the number of visitors per hour is not very high. The idea of the sliding door activated using the button and the time that everyone needs to spend to do that (even if it's 2-3 seconds) cannot be used if we talk about the mega stores and the big bank headquarters where the client traffic is in the number of thousands per hour. On the other hand, those big banks and stores usually can afford extra security and are not the target of armed robberies.
Another problem which we must discuss is an ethical one and it refers to respecting the privacy of the clients. It is debatable if recording of personal data (and we can assume that the physical characteristics of someone is personal data) is correct and legal. Moreover, as we expect multiple results (as we said, there cannot be a perfect match), many of the harmless store's clients will end up being watched by the police as suspects, which is not comfortable.

5. FUTURE WORK

The system is not yet physically implemented, for now is just in a project state. After its development we plan to improve the methods of identifying villains in armed robberies using movement identification techniques. We consider that every person has his specific walking motion, an information which can be used (exactly as retina scan or fingerprints) as an extra identification technique by the police.

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