TOWARD A BETTER INTEGRATION OF NEW TECHNOLOGIES AT THE SCENE OF CRIME: THE CONCEPT OF WEARABLE COMPUTER

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ABSTRACT: The integration of new technologies at the scene of crime is often seen by managers as providential: more traces of higher quality will be collected in less time, without increasing human resources. It generally takes the form of devices of different shape, size and weight that help to recover and collect traces, as well as to remotely interrogate databases.

However, each tool can also reduce mobility, necessitate specific knowledge and be used in hostile conditions (humid, dirty, cold…); the simultaneous use of several devices amplifies these difficulties.

Thus, in order to successfully employ latest technologies, it is suggested that the traditional Business Process Re-engineering practice should:

– provide a global perspective that take into account pragmatic constraints, rather than focus on individual tool,
– use the concept of wearable computer as a framework for further developments.

KEY WORDS: Investigation tools; Crime scene; Communication; Computing.

Problems of Forensic Sciences, vol. XLVI, 2001, 64–67
Received 5 April 2001; accepted 15 September 2001

INTRODUCTION

A questionnaire has been submitted to the members (25) of the forensic unit of a Swiss Police agency. All these professionals can be considered as experienced crime scene investigators.

This limited empirical study led to the perception that new Information Technology (IT) will:

– enhance the global efficiency at the scene of crime,
– increase complexity and lead to strong educational needs,
– make the human "disappear" behind the tools.

Despite the worries to be replaced by machines, practitioners recognise that New Technologies of Information and Communication (NTIC) have to be considered as a mean to improve their performance. They will help to collect more relevant traces of higher quality, often directly in a numerical form; it will reduce time and effort needed to exploit computerised databases and will globally improve investigative and intelligence processes. Already available tools, like scanning devices, seem to provide a good confirmation to this point of view.

However, when the number of these devices increases, they become obstacles rather than an aid. They can reduce mobility, even when transported with a specifically designed vehicle, and their simultaneous use at the scene is sometimes impossible. Moreover, the specialised knowledge needed to make this technology works is based on few general principles. This lead to the accumulation of training programs whose validity is limited in time and focused on the technology rather than on the nature of crime scene investigation.

A way to integrate those individual devices within a framework that take into account the complex set of (pragmatic) constraints faced by crime scene investigators should be found; it will guide and co-ordinate further developments and help to design a general strategy for educational programs that escape from isolated and very specific technologies.

A POSSIBLE SOLUTION: THE CONCEPT OF WEARABLE COMPUTING

As a first tentative, it could be tried to connect different devices to one single laptop. The advantages of this approach are straightforward: less processing power embedded in the sensors and the diminution of specific hardware. Moreover, the centralisation of the treatment will stimulate the reflection about general concept as the different pieces of software aimed at piloting the devices will have to be integrated on one machine.[1]

However, this strategy will not eliminate one of the main obstacles: the typical way of using computers creates a screen between reality and the user. The crime scene investigator has to direct his attention to the computer and the captors to make the system works; all his energy is concentrated on the technology; in particular, with a laptop, one needs a chair, or at least to stop walking... in the same way, arms are occupied and the wires connecting the devices to the computer causes other troubles.

[1] Prof. Mann's personal web site is worth visiting to find more resources about WearComp, on the web: http://wearables.about.com/gadgets/wearables/cs/education/index.htm. There is also a site at Toronto University: http://www.wearcam.org.

One step further is needed in order to reach a better degree of abstraction from the machine. In that perspective, recent years have been the time of numerous experiments on human computer interfacing. Professor Steve Mann is recognised as a precursors in the field that is now called wearable computing. His work on the concept of personal imaging allowed to define the contours of the "ideal" wearable computer (WearComp). Roughly, it is designed to be worn, rather than carried, and must have four principal qualities:

– integration with clothes,
– miniaturisation,
– autonomy,
– hand-free use.

The concept has been validated through operational tests, has been concretised in different forms and is even implemented in production environment. For example, wearable computers are used in various domains such as computer network maintenance, medical emergencies, nuclear facilities monitoring and repairing, as well as aeronautical education and training.

WEARCOMP AT THE SCENE OF CRIME

The four qualities mentioned above (integration with clothes, miniaturisation, autonomy and hand-free use) meet obviously crime scene investigator's needs.

One of the main strength of such an approach is the transparency of the human-computer interface. The use of a device like a head-up display, allows the non invasive presence of the interface. It does not create an obstacle

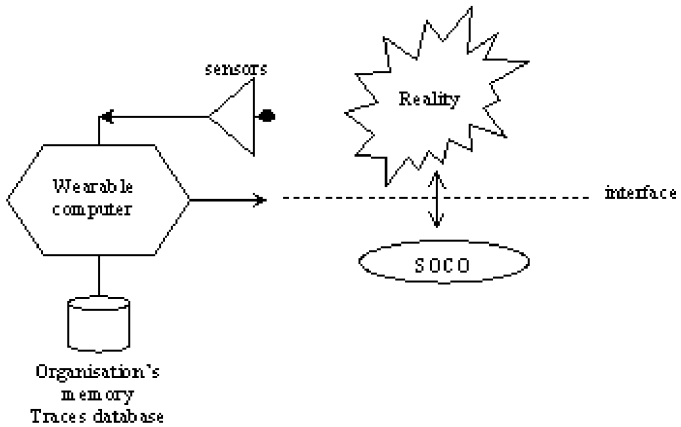

Fig. 1. Organisations memory traces database.

between the investigator and his direct environment. Moreover, information is available at any time, when needed. Thus, the introduction of such a computer in the daily work of the organisation will limit the behavioural changes usually generated by a new technology.

Augmented reality is another concept frequently associated with WearComp. Its interface allows the enhancement of perception, for instance through integrated optical devices, and enable a real-time access to pieces of expertise that can be physically distributed. "Tele-cooperation" will change teamwork, as a truly virtual collaborative workspace can be implemented through an information system designed around specialised networks and WearComps. However, care must be taken in order that enriched perception does not become biased perception.

Different architecture are obviously possible. The search for the best design, based on the principles mentioned above, constitutes actually the real challenge: a wearable computer should make possible the capture of heterogeneous data, enhance perception, provide real-time access to expertise without deviating the attention from the scene of crime investigation.

The integration of these concepts should follow a methodology based on rapid prototyping. The developed devices will then be tested in the field to see how they resist in a real environment. Concrete results will increase the involvement of investigators and errors as well as unanticipated parameters will be soon detected.

Police forces can take advantage of this approach in other domains. For instance, patrols vehicles could be equipped following the same ideas.

CONCLUSION

As a framework, WearComp can guide the conception of future sensors in a global perspective. New useful devices will then be built in order to make evolve an homogenous practitioner's toolbox. Such developments will enhance the performance at the scene of crime, without dramatically influencing practical behaviours. Thus, technology will complement knowledge and experience.

The development of prototypes is essential in order to validate the approach, as the complexity of constraints imposed by the environment makes impossible the detection *a priori* of all the relevant parameters.