1. Introduction

In the present technology based society there is an explosion of information and knowledge, on the one hand, and electronical multimedia tools such as CD-ROM, Internet, World Wide Web (WWW), and video-conferencing are available, on the other hand. In these multimedia tools, the classic texts, graphics, and pictures are combined with sound and visualisation by animation, video,… To be competitive in this society, one has not only to update continuously his knowledge, but also has to be able to use the Information Technology (IT) skills. This must be offered by continuing education, using distance learning. In Figure 1, recent publications were selected in the WWW, describing evolutions of the new kind of research outputs, via interactive multimedia, which allow distance learning.

Because of this explosion of knowledge and IT, content experts should integrate the inter-disciplinary new subject matter to be implemented into the curriculum, and should also develop expert systems to support decision making. In fact, thanks to inter-university networking, a consortium of content experts in remote locations can co-operate closely to transfer progressively the teaching to a learning environment.

Thanks to the electronical multimedia tools and the networking, distance learning and interactivity are thus two new dimensions in the learning process. In distance learning, no more time and location constraints exist for the learner or the instructor and there is no more local expertise required. The other new dimension, the interactivity of the learning programs, e.g. on CD-Rom, allows the students to be more active intellectually than when listening to the teacher or reading texts. Advantages of these programs are, indeed, self-study, unlimited replay at own pace and an individualised feedback. Interactivity allows also to train problem-solving skills, e.g. via case studies. The WWW offers, furthermore, unlimited links to related topics to discover the 'big picture', but finding the relevant information and the speed of access remain serious problems.

Many faculty members report various problems related to the multimedia implementation: it is labour- and time-intensive and the universities do not yet offer an appropriate reward but even some resistance to this change. Next, the costs are high, infrastructure is still lacking and there are no universal standards for multimedia (distance) learning. Consequently, there is a risk that the commercial sector takes over the production of courseware, without the necessary quality guarantee.

Anyway, not only for the learner but for the researcher as well, the electronic tools did open new dimensions. Because these tools are better means for the fast dissemination of research results than on paper, certainly in areas where motion is essential, and because they allow on-line communication between researchers, they progressively are replacing the common written (peer reviewed) publications.
### Fig. 1: Overview of some literature, from internet, concerning new research outputs for distance learning via multimedia

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- **We are living in a world of information explosion**
- **Knowledge and information society**
- **Information tools:**
  - **Internet:**
    - **Web:** links to related topics to see the "big picture" of the topic
  - **CD-ROM:**
    - **Audio-visual:** animation, video, etc.
    - **Print:**
      - Brochures, brochures, information, etc.
      - **Print:**
        - Books, journals, etc.

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2. Kinesiological research and appropriate outputs

In the area of kinesiology of swimming, new technologies allowed to conduct inter-disciplinary research (combining biomechanics, hydraulics and anthropometry) and to develop interactive multimedia for distance learning on a CD-Rom (Fig. 2).

a. Specific kinesiological research was undertaken in a large group of swimmers at international performance level, allowing to develop a kinesiological theory, more precisely on propulsion principles and balance mechanics, taking into account the physical characteristics (body structure, flexibility and strength). Analysing the swimmer's movement resulted in clustering, e.g. the breaststrokers (N = 65), in different style variants. In addition, scoring physical abilities resulted in many more significant characteristics per specific style variant than per stroke (N = 574 subjects of at least national level). Thanks to the analysis of the water (using a visualisation method), various applications of concepts from animal locomotion could be introduced complementary to the common concepts from ship locomotion.

b. A kinesiological expert system for diagnosis and advice, based on the kinesiological research and expertise, is being developed. This allows to optimise the individual technique and dryland training and to prevent injuries. Based on the physical characteristics, the fastest individual style variant could be determined and the performance could be calculated with a mean error of 3%. To use this expert system, short courses have to be organised.

c. Interactive multimedia for distance learning were implemented in a CD-Rom (Fig. 3):
   • To explain the kinesiological theory (mainly on the movement aspect of the swimmer and of the surrounding water), computer animations were much more effective than written documents. Texts and figures are included for more information, on request. Mainly on methods, as a first step, peer reviewed written publications were necessary.
   • To familiarise with the expert system in development, diagnostic case studies of swimmers of various ages and performance groups were implemented.
Fig. 3. Interactive multimedia on kinesiology of swimming, implemented in a CD-rom


DELAMOTHE, T., SMITH, R. (1998): The BMJ’s website scales up (editorial), BMJ 316: 1109-1110. (http://www.bmj.com/cgi/content/full/316/7138/1109)


