



Solutions for the ViSiCAST Broadcast Synchronisation Problem

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Introduction

In the beginning the ViSiCAST project focused in several work-packages on how to create, transfer and to display motion data. We are sorry to state that until now we have totally neglected that apart from the data a video and an audio contribution exist. Today, in an advanced phase of the project, a solution has to be found, which is compatible with the existing broadcast environment. This means that there is a need for reusing the hardware as well as the software in a studio environment in order to reduce costs. This is, or rather should, also apply for man power and the editorial infrastructure. One has to be aware of the fact that all broadcasters are constantly working under severely competitive conditions, and that additional costs are only accepted provided they are low, and the benefit of the new service is considerable. The requested solution should cover a practical, robust method for the daily use of the ViSiCAST broadcast system.

In the effort to find answers to these requirements IRT turned to teletext subtitle editorial centres. There problems there are very similar to those of ViSiCAST broadcast. The technical equipment within the studio can be reused, and trained staff is available who will find the new tasks challenging. Moreover, ViSiCAST may very well be regarded as a means to add value to the work of this TV service.

After a period of long discussions and careful considerations within the IRT, our experts worked out the following proposal for a solution that I am pleased to describe briefly herewith. We think that we found a solution which fulfils all requirements mentioned above satisfactorily and can easily be adapted to a wide field of existing broadcast environments. Moreover, our solution is adjusted to the existing environment in TV studios and carefully balanced between effort and effect.

The Solution

(or: The different stages of ViSiCAST motion data – from creation to consumption, from birth to death)

Motion data go a long way from their creation to the screen of the end user. Generally speaking, the lifecycle of ViSiCAST motion data can be divided into 3 stages: the creation, the storage and the broadcast stage. Let us start with the creation of the data.

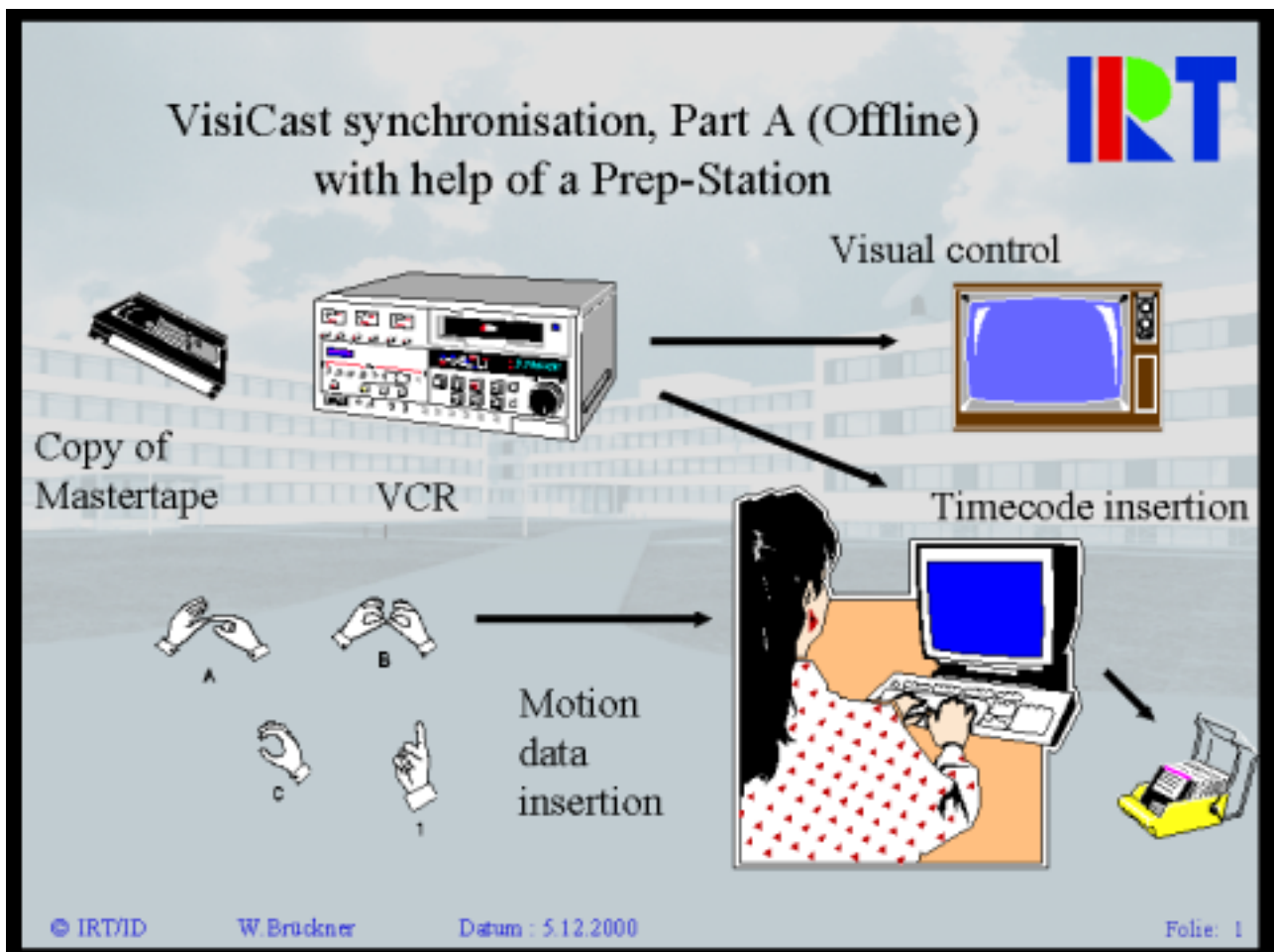
At the moment there are two main streams in data captioning of motion data: the use of data gloves and body suites, which is what the UEA and Televirtual Ltd. are doing, and the use of video captioning systems, which is the way the INT is following. Both methods create files which can be stored on any data carrier, e.g. CD-ROMs. In the first case they

are called mask-vr files, in the second case bap-files. When the project will have come to an end, other ways will certainly be available, using methods to convert speech or text into motion data.

As far as broadcasters are concerned, they are solely interested in the possibility of the existence of stored data that have already been pre-recorded.

Offline Preparation of ViSiCAST Motion Data

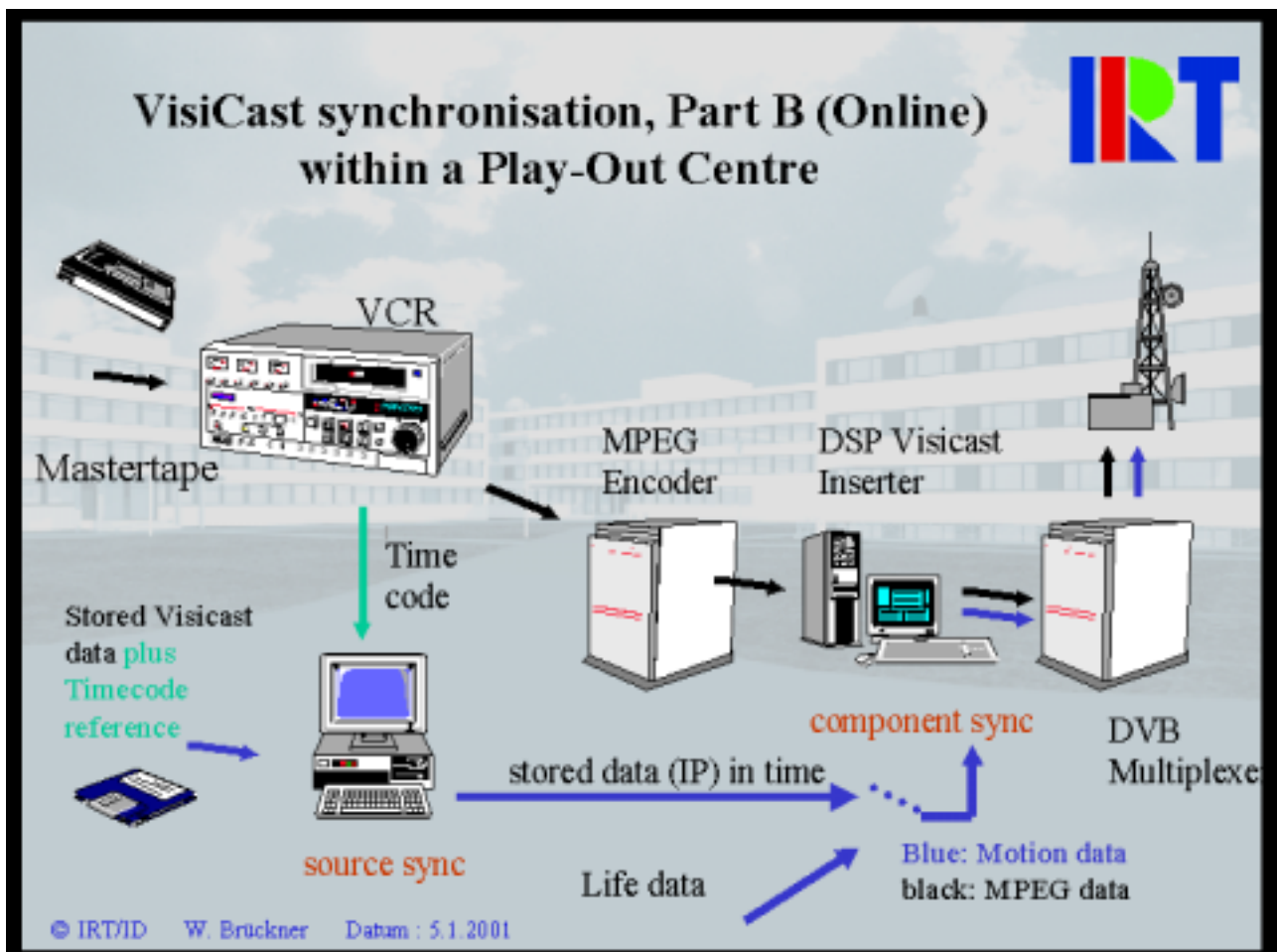
Looking at picture 1, we now step into a typical subtitle editorial centre. The motion data are stored on a hard disk on a so-called "prep station", usually a standard PC. The missing link is a reference to a video/audio event which is stored on another media type, the mastertape; this will be sent at a later time, due to the schedule of the TV-station in question. In fact, this tape will not be the original one, but a copy of the mastertape. All studios are equipped with tape recorders providing a so-called timecode. This timecode has the format hh:mm:ss:frames. This means that the precision of synchronisation can achieve frame accuracy, i. e. 20 milliseconds in the European TV world and 16 milliseconds in the US TV world. This timecode is under visual control of an operator, and will be added to the motion data. This timecode will then be restored on e.g. a harddisk or even a floppy disk. This is possible because the prep station is equipped with a timecode reader. At this moment the first stage ends, i. e. the motion data are equipped with a timecode reference to the master tape. This means, video/audio and ViSiCAST motion data now have a fixed relation to each other through the duplicated timecode information which is stored together with the ViSiCAST motion data.



One has to take into consideration that a timecode reference thus created is only valid for this particular tape, and for no other tape. Nevertheless, the method described corresponds with all subtitle techniques hitherto existing, and it has proved to work well. Furthermore, the already existing subtitle computer could be reused for ViSiCAST purposes when equipped with a software update for working with motion data. This means, no further hardware costs occur, only the relevant software has to be written for and implemented on these specialised computers. We may now take the second step:

On-line Preparation of ViSiCAST Motion Data

Up to now, we worked offline, the ViSiCAST data have not yet been transmitted via broadcast links. But the data were prepared and passed to a so-called "play out centre". Please regard now picture 2, called "ViSiCAST synchronisation, part B, online". You will notice a much more complex environment. Let us assume the right time has come for a mastertape to be transmitted. The decision to set off such a transmission is regularly under control by the so-called "Senderegie". This is a daily changing schedule for all transmissions, starting the mastertape in a tape recorder. This tape recorder is also equipped with a timecode output which feeds a further computer containing the subtitle and ViSiCAST motion data for the video/audio mastertape. The tape in question must be the same as the one used for the off-line preparation. The timecode coming from the tape/VCR is now compared with the stored timecode of the ViSiCAST motion data (plus timecode reference). Provided the timecode from VCR equals the timecode reference, the motion data will then be passed to the ViSiCAST inserter.



The computer (usually a PC) is already present in most broadcast studios doing subtitles. Again I should like to stress the necessity to reuse an equipment already present on the site of the broadcaster. No additional hardware costs will occur, excepting the costs for a special software needed.

Meanwhile, the video/audio content has been MPEG-2 encoded and is on its way to the DVB multiplexer. But before reaching the multiplexer, the video/audio content, together with the subtitle and ViSiCAST motion data content, has to pass a further inserter which is itself PC-based. Generally speaking, every data inserter on the market could be used for this purpose, but the IRT developed a hardware of its own based on a DSP layout. The advantage of this DSP hardware is that it assures a rapid and precise insertion. It is adjustable to any possible delay concerning the connection between video/audio and data. Other hardware inserters on the market bring about individual delays which must then be compensated individually in each broadcasting studio. The IRT DSP assures a tailored solution for ViSiCAST, and, moreover, is equipped with additional features, such as a Logo-insertion, should a broadcasting company request it.. For broadcasters wishing to do ViSiCASTing in this case **only** occur some moderate extra costs.

Another advantage of this overall solution is, that life data can easily be inserted at this stage for life captioning for special cases (life video). However, this will only be done by way of exception. The normal case will surely be the insertion of pre-recorded motion data.

The ViSiCAST data have now been transmitted, and are appearing on the screen of the viewers. We are at the end of the chain, and very much hope to have shown you a convincing way how to deal with the ViSiCAST synchronisation problem.

IRT, January 08, 2001, Werner Brückner
Translation: Marianne Hörlein