Highlights Distribution Service: Providing Records of the Memorable Events in People's Lives

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This paper describes the development of Fujitsu's Highlight Scene Distribution Service. We have learned that the most popular contents on the broadband Internet are highlights in ordinary people's lives that are not covered by the mass media, but in which they play the leading role. We also found that providing such highlights on recorded disks increases people's desire to buy these highlights. Therefore, we are developing a service that allows a service provider operating in areas such as sports events and amusement establishments to extract memorable video scenes and then distribute them on demand or provide them on recorded disks that are customized for the end users. This paper outlines the Highlight Scene Distribution Service and describes an example of its application.

1. Introduction

An IDC Japan survey[1)] estimated that the domestic market size of streaming content in fiscal 2001 was only ¥8.42 billion. A Nomura Research Institute survey[2)] for the same year estimated that the market size was ¥12 billion. As these estimates suggest, there has never been an example of success among business models for pay streaming services.

This stagnation is generally believed to be due to copyrights that prevent the secondary distribution of content through conventional channels (e.g., television, movie theaters, and DVDs) and delays in the construction of billing systems that are restricting earnings made from end users.

According to a 2002 Impress survey[3)] on broadband users, however, about 60% of end users are unwilling to pay more than ¥1000 for content and as many as 27.6% are unwilling to pay anything at all.

Two types of content markets will grow, primarily in the business and educational fields, due to improved image quality on broadband networks. These types are 1) content that can utilize the interactivity of the Internet as an added value and 2) content that has already proved to be valuable to the end user. However, current content that has been "recycled" from existing media or content created by amateurs will not produce income.

Streaming business service providers rely on advertising revenues for most of their income. However, advertisers will be reluctant to shift their advertising expenditures from existing media to the Internet because they think streaming services will not attract enough subscribers to make their advertising profitable. A Dentsu survey[4)] shows that the Internet accounted for only 1.5% (¥84.5 billion) of the ¥5703.2 billion total domestic advertising expenditure in fiscal 2002. Thus, the advertising expenditure allocated to streaming content is not a very promising source of income for streaming business service providers.

In the future, therefore, to develop the streaming content business, we must pay atten-

tion to the following two challenges:

1) Providing end users with content they definitely want but cannot view on existing media in fields other than business and education.
2) Providing service providers with low-cost solutions that enable them to operate with small advertising revenues and a business model that generates revenue from a source other than advertising.

2. Customer-oriented policy for providing solutions

This section describes Fujitsu's policy for providing solutions oriented toward end users and service providers based on past examples.

2.1 Streaming content oriented toward end users

The Internet, unlike conventional media that select content based on audience ratings, enables an individual to originate any type of content they choose; for example, an individual can originate content in which he or she is the subject. On February 24, 2002, a public marathon, the 17th Fukuoka Keyaki St. Ladies Road Race (sponsored by The Nishinippon Shimbun),[5] was held at the Heiwadai Athletic Stadium in Fukuoka. In this race, we conducted an experiment in which we placed a camera at the finish line, extracted the runners' finish-line scenes (10 seconds each) based on their finishing times, and then provided them on demand within about a minute at a special booth in the stadium.

The service provided in this experiment was very popular because each of the 1105 runners could almost immediately obtain a video CD of her crossing the finish line (**Figure 1**).

From July 21 to 29, 2002, the High School Judo and Kendo Tournament for Golden Eagle and Dragon Ball Flags (also sponsored by The Nishinippon Shimbun)[6] was held at the Marine Messe in Fukuoka. The tournament consisted of 1345 matches held on 10 courts. We were contracted to record each of these matches using 10 cameras, extract highlights such as *waza-ari* (point wins) according to the camera operators' discretion, instantly distribute them on-demand at a special booth at the gymnasium, and also distribute them on-demand over a network on the following and later days. We conducted this project[7] as a service of Fstream, which is a Fujitsu streaming solution.[8]

Figure 1
Runners watching their finish line scenes at the stadium.

The highlights of the participants distributed on demand at the special booth and over the network were very popular (**Figure 2**). In fact, the participants had a strong desire to own a copy of their highlights and buy the official tournament video, which was produced by The Nishinippon Shimbun. The Nishinippon Shimbun received requests for more than 300 volumes, and one out of every four schools participating in the tournament requested a volume.

Based on this example, there is a relatively high probability that end users will want to buy content in which they play a leading role. Therefore, "you-are-the-lead" streaming content that focuses on the highlights of end users merits attention as a promising source of earnings.

Figure 2
High school fencers watching their *waza-ari* (point wins) at the gymnasium.

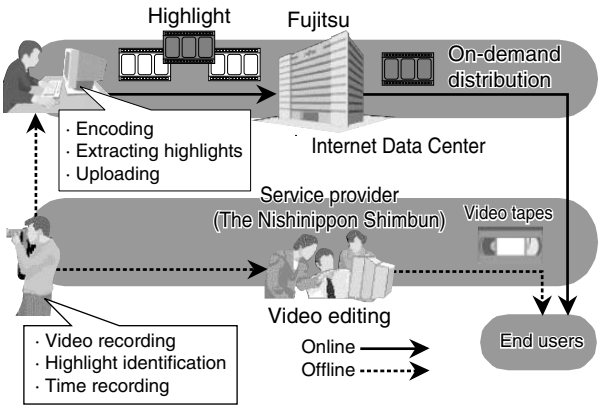

Figure 3
Tasks of a service provider and Fujitsu in the conventional service.

2.2 Streaming solutions oriented toward service providers

The judo and kendo tournament was previously covered by Fujitsu's conventional on-demand streaming distribution service. In this service, we would dispatch staff to the event to carry out the shooting, editing, and distribution to the field, which made it an expensive solution for The Nishinippon Shimbun. Regarding the distribution of video images on the Internet, the sponsor of the tournament wanted to create content according to a particular concept. The areas covered by this concept included the camerawork, selection of highlights, and other creative areas.

The Nishinippon Shimbun had difficulties meeting all the requests it received for video highlights, because the cost of the editing that was required to customize the video content for each of the participating high schools often consumed any revenue that was earned from video sales.

Our proprietary technology for marking highlights significantly cut labor costs because it eliminates the need for shooting and editing operations, which Fujitsu used to be contracted to perform. At the same time, we also provided a solution that helped realize the sponsor's concept of the tournament by allowing even amateur camera operators to select highlights using simple mouse clicks.

However, technical staff from Fujitsu are still required to prepare the highlights for distribution, for example, they need to be extracted, encoded, and then uploaded to the server. Additionally, although The Nishinippon Shimbun originally expected that producing a retail video would be a major source of revenue, it has yet to find a solution to the high editing costs that are involved (**Figure 3**).

Consequently, any streaming solution developed in the future that is oriented toward a service provider must meet the following requirements:

1) To keep the purchase price low, the service provider must be able to operate the equipment without the help of staff dispatched from Fujitsu.
2) Projections for sales of the automatically created user-customized disks must be sufficient to make the solution profitable.

3. New highlight scene distribution service

To provide solutions for the challenges described in the previous section, we are developing a new service that enables a service provider to perform on-demand distribution of the highlights

of numerous participants in an event and create and sell disks with customized content (**Figure 4**).

The core of Fujitsu's business system is the Internet Data Center (IDC),[9] which can stably provide an infrastructure consisting of multiple streaming servers and a broadband network. We will promote the use of the IDC by incorporating the services described below on the input and output sides of this business system and by developing a new streaming solution that is oriented toward end users and service providers.

3.1 A service that automatically prepares for on-demand distribution of highlights

To distribute highlights of large numbers of participants on demand, a service provider previously had to perform the complicated processes of extracting the highlights and associating them with the participants. This entailed using the graphical user interface (GUI) of a video editing tool to look for clues that identified each participant, which was a very repetitious and time consuming task.

Even if the operator obtained the time data required to identify highlights and the corresponding personal information, the operator still needed to extract highlights based on the time data in advance, encode them in the streaming format, and upload them to the streaming server. Since these processes usually required special staff, the service provider had to shoulder the costs.

To overcome these problems, we are developing a service that automatically identifies video highlights, extracts them, and then uploads them to a streaming server (**Figure 5**). All that a service provider needs to do to use this system is input the video data.

3.1.1 Identifying highlights

To automatically identify the highlights of participants from a video, it is necessary to extract the highlight events and the times when they occurred. This service records the time when a participant passes a point using a radio frequency identification (RFID) system.

Furthermore, the system can automatically perform other functions when the participant passes the point. For example, in a marathon race, each runner can wear an RFID tag so that the video clips of the runners crossing the finish line can be automatically extracted.

3.1.2 Extracting and uploading highlights

The distribution of highlights on demand re-

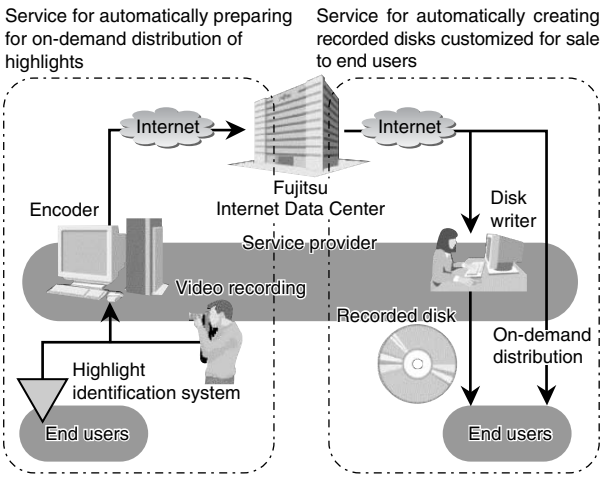

Figure 4
Outline of new highlight distribution service.

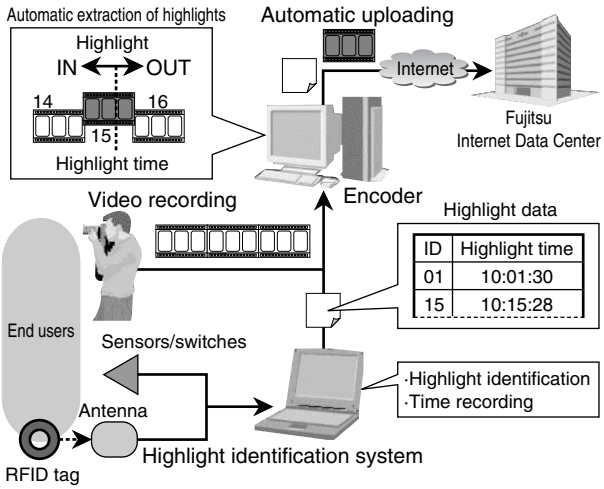

Figure 5
Service for automatically preparing for on-demand distribution.

quires the creation of streaming-format files that correspond to the highlights and uploading them to the streaming server.

This service, by accepting the input of video and time data, extracts highlights based on the time data while automatically encoding the video image in the streaming format. The operator can obtain the IN and OUT timings of a highlight directly from the time data or determine them by specifying a time range based on the time a participant passes the point.

This service creates files corresponding to highlights using file names that can be retrieved by time data and then uploads them to the streaming server.

By eliminating the need for special staff to prepare for on-demand distribution, this service can reduce the price of implementing a solution and enable a service provider to concentrate on the video shooting process.

3.2 Service for automatically creating recorded disks customized for participants in an event

To create recorded disks that are customized for numerous participants in an event, a service provider previously had to create a movie file for each end user by connecting multiple highlights using a video editing tool.

To make it easier to create these disks, we are developing a service that automatically creates a HyperText Markup Language (HTML) file containing hyperlinks to multiple highlights of a participant and writes it to a disk (such as a CD-R) together with a content playback tool that continuously plays back movie files that are Hyperlinked by the HTML file (**Figure 6**).

3.2.1 Automatically editing content and writing to recorded disks

In this service, an HTML file customized for a participant contains text indicating the participant's personal information (e.g., ID, name, and highlight time) and hyperlinks to the participant's highlights. An HTML file is created automatically by retrieving the personal information associated with the participant's ID and identifying the file names of the relevant highlights.

For this purpose, the participants' personal information is converted into the eXtensible Markup Language (XML) format and added to a database on the Web server as soon as the high-

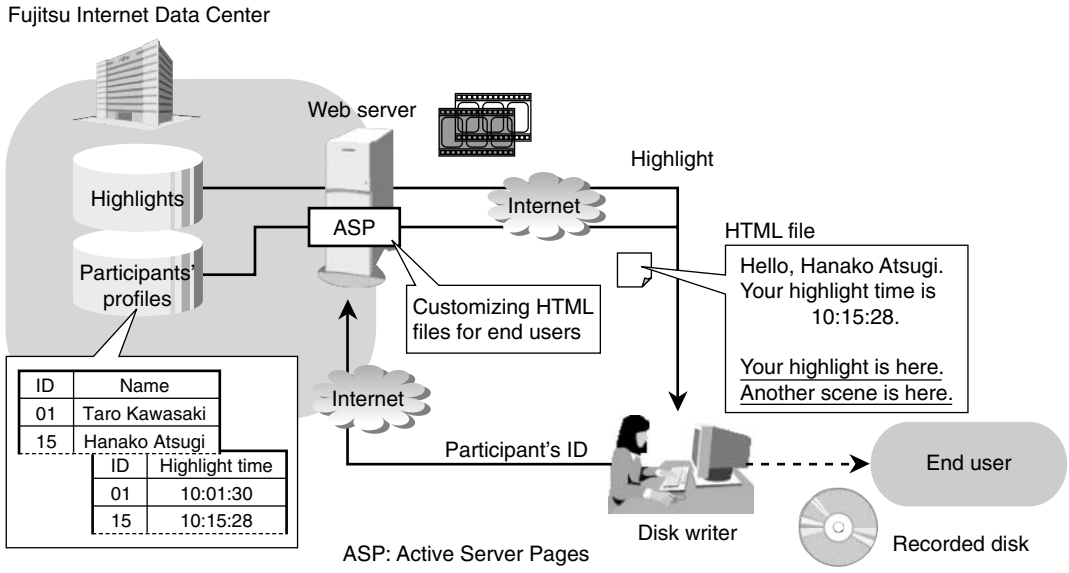

Figure 6
Service for automatically creating recorded disks.

lights are uploaded. When the ID of a participant is specified, an HTML file containing hyperlinks to highlights and personal information is dynamically created in the Web server's Active Server Pages (ASP). Then, the HTML file is sent together with the corresponding highlights to a terminal, where the content is written to a disk.

Since data is communicated using the Simple Object Access Protocol (SOAP) and can safely pass through a firewall over the HyperText Transfer Protocol (HTTP), a service provider can create a recorded disk by remotely using the IDC data.

3.2.2 Content playback tool

For an end user to continuously watch multiple highlights recorded on a disk, the movie files linked to the HTML file must be played back continuously. This is done using our proprietary Homepage Player™ [10] (**Figure 7**). If an HTML file contains hyperlinks to movie files, the Homepage Player™ automatically starts a helper application for movie playback, plays the movie file linked to the first link in the file, and then plays the movie file linked to the next link. Also, the Homepage Player™ reads out any accompanying text (e.g., personal information) using a built-in speech synthesizer.

This service eliminates the need for a service provider to edit content, which reduces editing costs. In addition, the service improves profitability because recorded disks can be created almost instantly and sold at the scene of an event, where people generally have a greater desire to purchase a record of the event.

4. Application example

This section describes the new Highlight Scene Distribution Service used in the 18th Fukuoka Keyaki St. Ladies Road Race (sponsored by The Nishinippon Shimbun)[11] held at the Heiwadai Athletic Stadium in Fukuoka on February 23, 2003. This race had 1105 finishers.

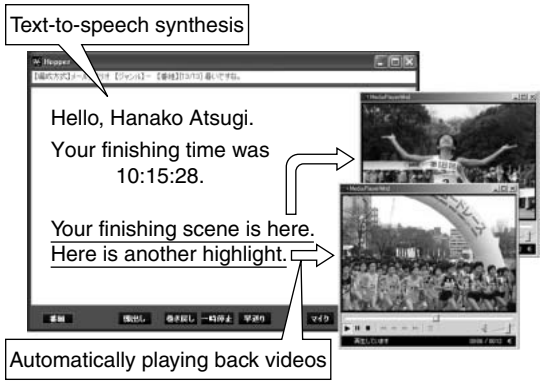

Figure 7
Content playback tool.

4.1 Equipment

The finish times of the runners in this race were measured using an RFID system. In this example, we conducted on-demand distribution of the finish-line scenes of all the runners as synchronized by the measurement system and created recorded media at the stadium. The system configuration is shown in **Figure 8**; the equipment is described in later sections.

4.1.1 Personal information of runners

The runners registered their names and other personal information with the secretariat when they applied to participate in the race, and the secretariat gave each runner a racing number.

In these races, the finish time and rank of a runner are normally determined using an RFID system installed by a special vendor. In the RFID system, each runner wears an RFID tag that contains her racing number. When a runner crosses the finish line, a radio transmitter at the finish line activates her RFID tag, which then transmits her racing number. The system records the racing number and the time when the runner's transmission is received.

The racing numbers that are set in the RFIDs are used to automatically record and extract the runners' personal information, including their names, finish times, and ranks.

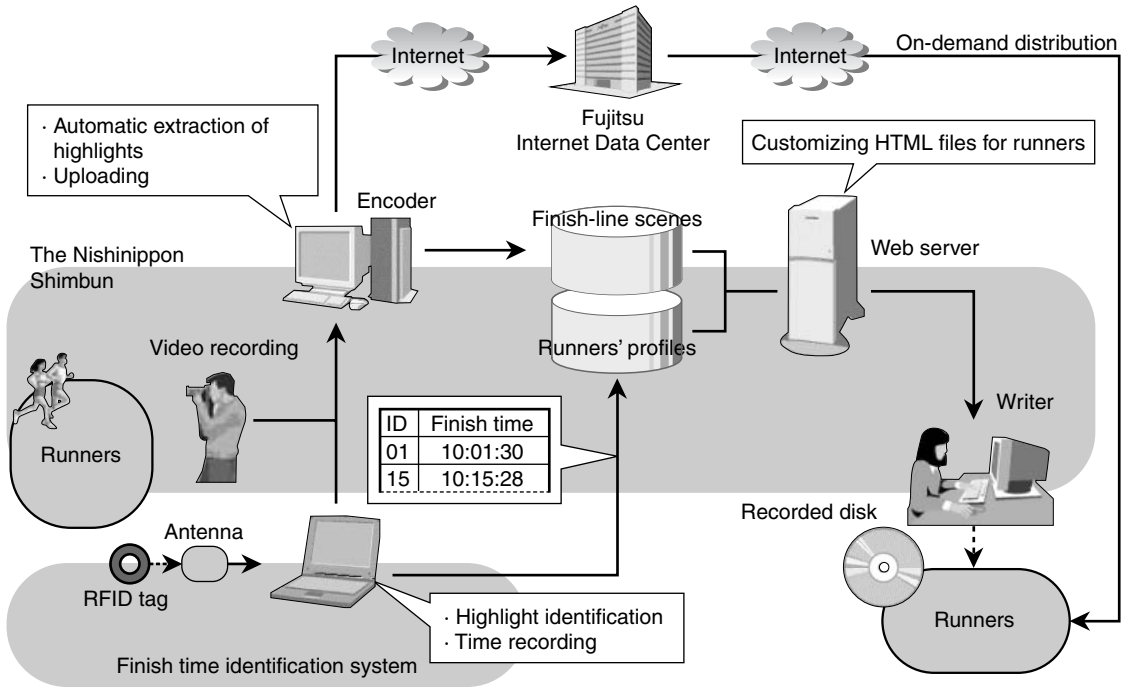

Figure 8
System configuration.

4.1.2 On-demand distribution preparation tool

The on-demand distribution preparation tool is installed at the encoding terminal. The tool extracts a runner's finish line scene, which starts 8 seconds before she finishes and ends two seconds after she finishes, from the video data based on her finish time. Then, the tool encodes the video image in streaming format, writes it to a file, and uploads the file to the streaming server.

4.1.3 CD creation tool

For this race, we decided to record the highlights on CD-Rs because their relatively high writing speed enables us to write the disks and give them to the runners within a few minutes after they cross the finish line.

The CD creation tool uses the runners' racing numbers to search for and download highlights uploaded to the Web server. The tool also extracts the runners' names, finish times, ranks, and other personal information from the database and dynamically creates an HTML file containing hyperlinks to movie files containing the highlights. In addition, the tool writes individually customized content to a CD-R. The Homepage Player™ program and the content that is common to all runners are written to the CD-R in advance. The major content items written to the CD-R and their sizes are as follows:

1) Highlights: 1 MB
2) Customized HTML file: 1 MB
3) Common content: 40 MB
4) Homepage Player™: 2 MB
5) Speech synthesis tool: 60 MB

4.1.4 Homepage Player™

When a created CD is inserted into a computer's CD drive, the Homepage Player™ displays a homepage customized for the runner. The homepage shows the runner's name, finish time, and rank. The Homepage Player™ also reads this information out using a built-in speech synthesizer.

When the speech synthesizer reaches a hyperlink, the helper application for movie playback automatically starts to play back the runner's finish line scene. The user can also view any of the

common content items as desired by clicking on a hyperlink.

4.2 Results

By using our on-demand distribution preparation tool, we were able to automatically extract the highlights of all 1105 finishers from the 60-minute video that was recorded at the finish line. The extracted material was then uploaded to the streaming server.

By using our CD creation tool, we were able to create customized CDs for each runner (**Figure 9**) that contained about 30 seconds of video.

This new service enabled the service provider to distribute the highlights on demand and create customized CDs for each runner by automatically extracting the runners' personal information and their finish line scenes.

Figure 10 shows some of the runners watching their highlights while their CDs are being created on the day of the race. With this system, we were able to show the runners their finish line scenes on the spot and instantly create and sell them a customized CD of them crossing the finish line.

5. Conclusions

We are developing our Highlight Scene Distribution Service to contribute to the growth of the streaming business. The service is designed to feature highlights of participants in an event as its content. To reduce the costs shouldered by service providers and generate profits by selling recorded disks, the system automatically prepares customized recorded disks for on demand distribution to end users.

We have developed and applied a system that performs on-demand distribution of the finish-line scenes of all the runners in a race and creates customized CDs for the runners.

In the future, we plan to implement a much wider variety of systems for extracting highlights from the real world and improve the content quality so that the system can be applied to many different types of sports events. In addition, we will pursue the development of a permanent service targeted at amusement establishments that can generate daily income by selling recorded disks.

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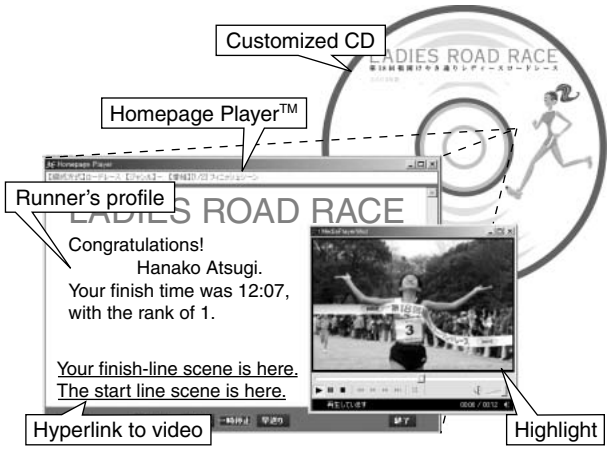

Figure 9
CD created by the system.

Figure 10
Runners watching their highlights and on-the-spot CD creation on the day of the race.

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