iTV Scenarios

Chapter Objectives

- How is iTV better?
- What types of iTV programs are possible?
- What are the issues involved and their ramifications?

This chapter presents classes of scenarios that were used to drive the development of many of the specifications of proprietary system designs, as well as iTV standards. Not all the scenarios can be implemented within the framework common to all standards, but each one of the scenarios can be implemented within the framework of at least one standard. The ranking of the scenarios according to return on investment is beyond the scope of this chapter.

There are countless issues that need to be addressed when producing enhanced content, generating the transport stream, and designing receivers. This chapter serves as an introductory overview rather than a complete reference. It presents issues implied from scenarios of electronic program guides, video on demand, advertising, games, interactive game shows, interactive drama, interactive news, interactive sports, trading, gambling, and auctioning.

2.1   Advertising Scenarios

Interactive television provides marketers with the means to personalize and collate customer data, and the opportunity to engage with the customer for more than the traditional 30-second spot. Niche TV channels mean better targeting of consumers and the ability to measure individual customer response. Some researchers expect the majority of iTV advertising to be interactive and the total iTV advertising revenues to be in the billions.

iTV advertising encourages viewers to access the personalized content. Targeted audiences are directed to a Web site displayed on a portion of the screen while the advertisement video clip is playing in the background on the TV. The iTV Web site provides a range of additional information that cannot be contained within the format of the video clip. As an example, it allows consumers to receive detailed information and order directly using the remote. These video clips may need to be scaled, and there may be custom side or top panels associated with the advertisement.

An interesting report of effectiveness of iTV ads (iAd), called the Advertising Confidence Index (ACI), is available from Myers Reports Inc., at *www.jackmyers.com/research/myersreports.htm* [ACI]. This report was compiled in June 2001 through surveys of more than 150 media buying executives. Although the ACI index for all media continues to hover around 49.40, iTV buys ranked a 52.13 on the Index, online sponsorships rated 60.82, and banner ads were 49.09. In comparison, network broadcast TV rated only 39.25 and consumer magazines rated an ACI of 46.35. The latest ACI report is available from Myers Reports at *www.jackmyers.com/research/ adconfidence9-02.htm*.
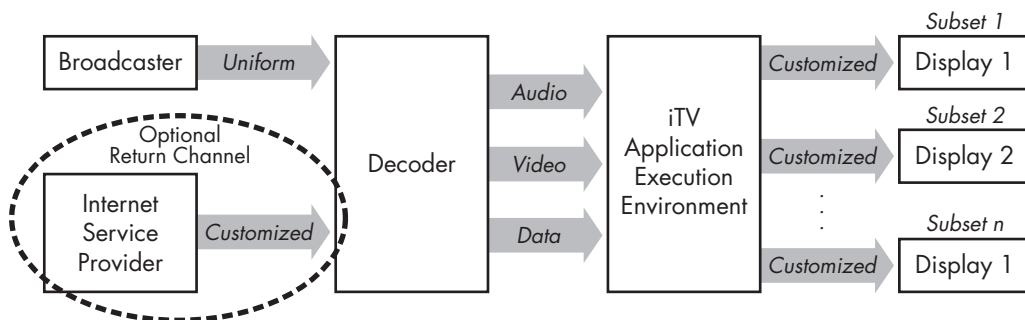
2.1.1   Mass Customization

With the advent of the Internet, the opportunity of customizing content to the individual preference of millions of viewers became apparent, as the major Internet players (e.g., Yahoo!) derive a significant portion of their revenue from such mass-customization capabilities.

iTV enables advances in the area of user-selectable content to be used in conjunction with traditional broadcast distribution. Today, many market researchers believe that iTVs will ultimately deliver commercials targeted specifically to an individual household. For example, a home with young children would receive toy and detergent ads, whereas that of a retired couple would see health care related commercials. They will also allow parents to have far more control than they currently do over the TV programming their kids can watch.

The primary method for achieving mass customization is through the use of channel changing. The ATSC Directed Channel Change (DCC) enables the broadcaster to indicate when the viewing experience can be enhanced by a change of virtual channels within or between physical channels. The requested channel change may be unconditional or may be based on geographic, demographic, or categorical broadcast programming content selection criteria specified by the viewer.

The DCC relies on the DCC table, which contains a list of structures that permit the ability to specify zero or more tests to be performed to determine whether or not a channel change can

Figure 2.1 Mass customization achieved through subsetting.

be effected. These tests may include determination of whether a viewer's DTV is located within a particular postal code region, whether the viewer is a member of a particular demographic group, or whether a program's content rating value results in a viewing block. In addition, when the viewer specifies the appropriate preferences, the tests may customize content according to age group or content type using 141 Genre Codes (see ATSC A65/A PSIP, Tables 6.19 and 6.21).

Mass customization can also be achieved by combining customized subsetting of a single uniform broadcast, with customized data pull from the Internet using an ISP to fit the preferences of individual viewers (see Figure 2.1). The unexpected result is a simultaneous increase in the advertisement effectiveness and time capacity, both of which are critical revenue drivers for broadcasters.

Many believe that one of the biggest stumbling blocks for iTV is fear that the technology will compromise viewers' privacy. The use of subsetting without Internet pull avoids sending data out of the set-top box. Specifically, this technique prevents the transmission of preferences stored in iTV receivers back to an outside server.

Customization of ad-sequences (whether using DCC or subsetting) to an individual viewer's preferences is very powerful, as it simultaneously increases the total advertising revenues for broadcasters and the return on investment for advertisers. The total advertisement capacity increases as the total number of advertisement streams increases. Instead of having a single advertising stream, broadcasters could transmit multiple streams, that can reside in transport streams other than the main program transport stream. Although each of these streams is less likely to be viewed, its effectiveness is higher. Therefore, the cost of each ad slot is lower, but the total value of all advertising slots is higher. This directly benefits advertisers because it results in a reduced cost of each individual advertisement and increased effectiveness through targeting. Broadcasters benefit because the cost of an advertisement is reduced by a factor that is less than the total number of advertisement tracks, and each appearance is much more targeted.

To customize advertising sequences there is often a need to access multiple video streams or files, and switch the display during pre-determined discontinuity points. When such a need arises, VOD servers could be used to deliver custom advertisement sequences. To achieve the

desired switching of advertisements, an iTV application consults viewer's preferences to determine the best advertisement subset to display. The advertisement video clips may be delivered using either IP-based or MPEG-based protocols through the main broadcast or via a return channel; in either case, bandwidth must be allocated carefully.

The push-pull mass-customization model utilizes bandwidth shared among millions of viewers to push a uniform broadcast which then pulls content customized to the individual preferences of each of these viewers. This essentially pushes advertiser selected Web pages onto targeted groups of millions of receivers simultaneously. The ISP benefits from such an architecture as it eliminates network traffic that would otherwise be needed for the transmission of the uniform content, resulting in a better response time and improved customer service. Broadcasters benefit as they can customize their broadcasts to individual preferences. Further, broadcasters may sell bandwidth to operators of high-traffic Web sites or ISPs so that traffic to their hot-spots will be reduced.

Interactivity has pitfalls as well. When viewers enter an interactive mode, they may be prevented from watching advertisements. Advertisers interrupting an interactive (e.g., email) session may be achieving negative impact. This issue could be addressed by adding, within the GUI of interactive programs, ad regions within which image and video advertisement can be scaled to fit.

2.1.2   Traditional Ads Enhanced with Data

General industry wisdom suggests that it is not recommended to innovate in more than one dimension. Therefore, as the first step, it is expected that iTV advertisements will innovate along a single dimension: enhancement of existing video ads with data services, rather than authoring of a new type of ad.

In an enhanced advertisement scenario, the viewer watches a television program selected without regard to anticipation of the advertising to be shown. At some point, a sequence of short video commercials starts. About half way through the period of a commercial, when it is enabled for interactivity, an on-screen indicator alerts the viewer. From that point until the end of the commercial's time slot, the viewer is able to select the most relevant information using the remote control. If the viewer does not interact by making selections, the content of the commercial will make sense to the most general of the possible audiences and will appear to be a normal advertisement. If the viewer does interact, that interaction must occur when the options appear on the screen. Interaction with such an advertisement enables the viewer to learn more about one of some special differentiating features of the product or service. At the very end, the viewer may be given the opportunity to learn additional information, customized based on ZIP codes and other household preferences. As an example, this customized information may include a photo of a local retail outlet, its location and map, phone number, or Internet address.

This scenario is sometimes referred to as the two-phased commercial (see Figure 2.2). During the first phase, the commercial's data service, namely the advertising application, is downloaded and decoded. During the second phase, interactivity is enabled and the iTV enhancement application is launched. A number of variations on this theme can achieve tighter receiver resource
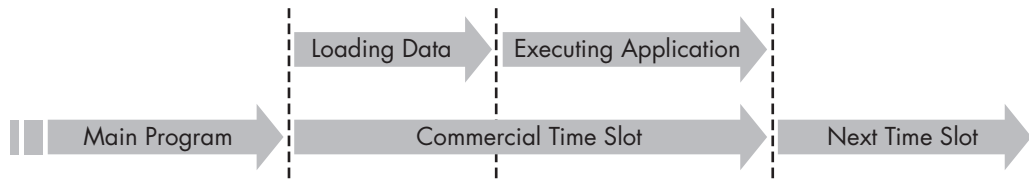
Figure 2.2   Two-phased processing of existing advertisements enhanced with iTV applications.

Figure 2.3   An example of a video advertisement enhanced with customized information.

management. For example, the loading of the data for the next commercial could be performed in the second phase of the first commercial, and can be impacted by viewer selections.

The interactive application could present the viewer with localized customized information (see Figure 2.3), where the address of the nearest local dealer is displayed. The additional information provided upon selection of the *more info* button may contain information about the product, as well as information about other clients having a similar profile as the viewer and who use that same product.

The enhanced ads scenario induces a number of technical system requirements. The data needs to be transmitted, received, and decoded during the period of the commercial. The commercial needs to self-configure to execute on receivers with limited capabilities. To handle channel surfing, interactivity should be disabled in case tuning is performed in the middle of the commercial.

2.1.3   Data-only Ads

Another type of iTV commercials are those that do not contain video. These ads are less expensive for both advertiser and broadcaster because they require very little bandwidth (compared to video ads) and can be seamlessly tacked onto regular video broadcasts; in fact, they are not related and typically detached from the video. They transition in and out using some sophis-

ticated animation. They could further pull relevant localized advertiser information from an Internet connection, or a return channel.

During the TV program (not in a commercial break) a small graphic transitions in using some animation. It is placed on a predesignated (possibly inactive) area of the display and persists for some duration (e.g., 30 to 90 seconds). During that time period, the viewer is presented with an indication that the content is interactive without indicating whether the interactivity relates to the main program or is a separate advertisement. When the application is fully loaded and decoded, it is enabled for interactivity, and an on-screen indicator alerts the viewer. If the viewer does not interact by making selections, the content of the commercial will make sense to the most general of the possible audiences and will blend with the background video. If the viewer does interact, that interaction must occur when the options appear on the screen. On selection, the advertising application may record that event (e.g., by adding a bookmark) and enable the viewer to inquire about products at some later time. It is also possible for data-only advertisements to blend with the video (e.g., home-shopping network) or to divide the screen into two parts, one of which contains the regular video and the other of which enables TV-commerce (e.g., submission of a direct order).

Such data-only ads can be used by broadcasters to announce events on affiliated channels and enable the viewer to select a program in advance, either for viewing or for recording. As the program becomes available, the viewer is given an option to automatically tune to that program and possibly record it for later viewing.

When an Internet connection is available, a data-only advertisement may utilize links to Web sites related to the advertised product. One possibility is that when the viewer selects the *more info* button, a bookmark is automatically added, reminding the viewer, at a later time, to review that link.

Data only advertisements should utilize a variety of animated transition and rendering techniques such as dissolves, fades, wipes, flying/scaling graphics, rotating 3D graphics, and other creative animated appearance and disappearance techniques.

Data only commercials induce a number of requirements. These commercials may not significantly obscure the video. They should be presented with loose synchronization when their timing is of marginal importance. In the case of a banner-ad containing a live video preview, the TV programs referenced must be transmitted simultaneously and can be tuned to using a second tuner. In the case that an ad contains an Internet bookmark, a Web site must exist that is accessible through the receiver's return channel at the time that the commercial appears.

2.1.4   Ads Enabling Financial Transactions

iTV commercials may enable financial transactions immediately on activation (impulse purchases) or at a later time (iTV shopping cart). When such a commercial arrives, the viewer is presented with an indication that it is interactive. On selection, such commercials may present the viewer with a purchase option. On activation, the viewer is presented with an advertiser-supplied graphics requesting the viewer to fill in the details of an order. Some iTV receivers may

feature an automatic data fill or defaulting option that is similar to the auto-fill feature of state-of-the-art Web browsers. This graphic form contains an order submission button, which upon selection, verifies the order information and performs the financial transaction. On successful completion, a conformation is presented to the viewer. An option should be given to the viewer to have the confirmation emailed or a hardcopy mailed.

This scenario implies a number of requirements. The advertiser must coordinate with both the broadcaster and the interactive service provider (see Figure 2.4). The commercial must have some graphics (e.g., flashing icon) indicating it is selectable (Figure 2.5 left). The application within the broadcast must be able to initiate and process a financial transaction. The order-details form may be transmitted either via a broadcast or a return channel (see Figure 2.5 right). The
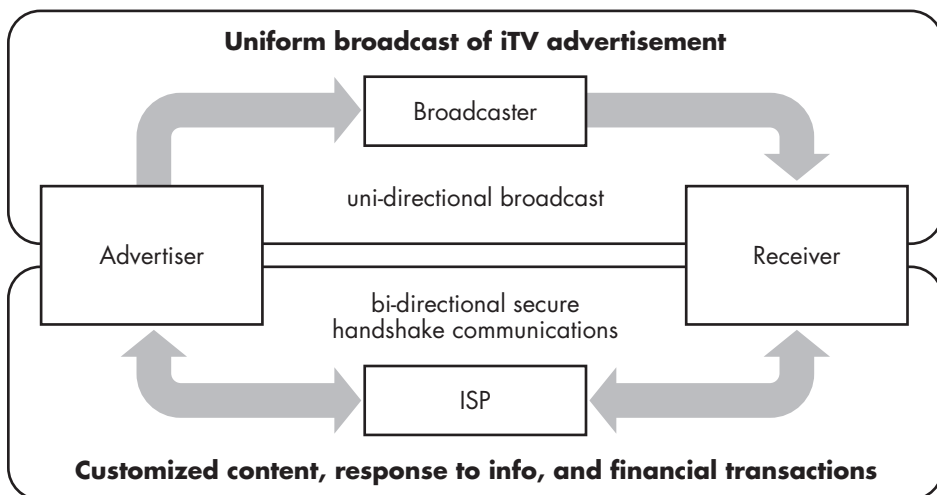
Figure 2.4 The relationships between the advertiser, broadcaster, ISP, and receiver.

Figure 2.5 Pizza ordering page courtesy of Microsoft (Web TV platform) [MSTV].

logic that requires performing the financial transaction (e.g., working against clearinghouses) could be implemented by the downloaded application (i.e., at the receiver) or by a server-side software application, hosted by some ISP on behalf of the vendor. During the period of interactivity, the numeric pad of the remote control passes events to the commercial and does not cause a channel switch.

2.2 Electronic Program Guide Scenarios

Today, millions of viewers use their EPG for around 10 to 15 minutes per day, exposing them to more than 10,000 impressions per year. As audiences fragment across a flood of new digital channels, EPGs are well on their way to become the last stand of mass-media marketing.

EPGs are usually controlled and prepared by a listing service provider that controls a dedicated EPG virtual channel. Typically, the list of available programs includes only those channels affiliated with the owner of the EPG channel.

While there are a wide range of expectations from EPGs, some minimum functionality is expected. An EPG should enable at least a search grid display and detailed information display (see Figure 2.6). The search mode lists the various time slots and places in each slot a few words describing the type of program scheduled for that slot. On selection of this time slot, the viewer is presented with a detailed view of the specific program scheduled for this slot.

2.2.1 Browsing and Search

With the availability of hundreds of channels and thousands of programs, a search tool becomes the only viable method for selecting content. Search screens could be presented as menus overlaid on top of a customizable video background such as pastoral nature scenery (see Figure 2.8). Search can also be performed by typing key words (see Figure 2.7 left) or by brows-

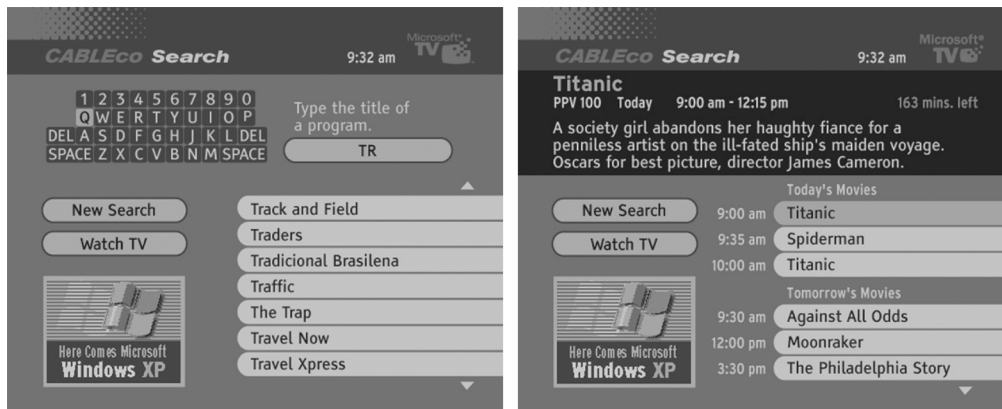**Figure 2.6**   An example EPG courtesy of Microsoft TV [MSTV].

Figure 2.7   An example search feature courtesy of Microsoft TV [MSTV].

Figure 2.8   An example of overlaid menus and EPG display courtesy of TVC Multimedia [TVC].

Figure 2.9 An example menu-driven program browsing tool.

ing (see Figure 2.9 right). The two search methods can be combined utilizing the key-word search for an initial selection, and following up with a browser presenting only options similar to the initial selection.

2.2.2 Miniguides

Miniguides are yet another powerful search tool. They minimize disruption to the viewing of the current program while providing the search functionality. Typically, a miniguide appears on the bottom third of the screen (see Figure 2.10). During the display of the miniguide, the arrow keys on the remote affect the guide selection and the channel up, down, and volume keys affect the video displayed.

Figure 2.10 An example miniguide courtesy of Microsoft TV [MSTV].

2.3 Video on Demand Scenarios

Interactivity in video distribution is increasing and new ideas for services are emerging. With VOD services, viewers can choose programs at any time they want. VOD may play a key role in driving the transition from analog TV to digital TV, as it converts the iTV receiver into a personal video rental store front. As significant demand is expected for these services, leading vendors have aggressive plans to deploy VOD services across the vast majority of platforms in all major metropolitan areas.

With typical selections of hundreds of movies, a key challenge is to allow viewers to navigate and select movies. This challenge is addressed by VOD guides, whose role is similar to the role of EPGs. The movie selection process can often be abstracted into a four step process:

1. **Search:** The viewer selects for display a movie search page, containing a form for specifying attributes of the desired movie. A common approach is to use a keyword matching method, using several predefined key words such as drama, comedy, rated-R, etc. Keywords could be entered without a keyboard using a variety of remote control techniques. The keywords may be refined iteratively until the viewer is happy with the list of selected movies.
2. **Preview:** The viewer selects a candidate movie and would like to view a description and a trailer. To increase the likelihood of selection, the preview could be customized based on the keywords presented by the viewer during the earlier search step.
3. **Selection:** The viewer has the option of selecting the previewed movie or going back to the search screen. If the previewed movie is selected for purchase, a VOD session is invoked, possibly following a transaction confirmation screen, and the process proceeds to step 4. Viewers should be given an option to cancel a purchase within the first few minutes of the program. Such cancellation backtracks to the search screen, causing the search results and keyword selections to be restored.
4. **Viewing:** The viewer is presented with a fully functional VOD session. The receiver enables controlling the video presentation through a return channel (e.g., using the Real-Time Streaming Protocol (RTSP) communication protocol [RTSP]). The video is transmitted to the receiver over the high-bandwidth forward channel (e.g., using Real-Time Protocol (RTP) or MPEG-2 transports).

VOD guides could be implemented by either pushing the guide using a broadcast, or pulling the guide from the Internet through an ISP. Although the latter may introduce delayed responses, it can achieve more manageable and cost-effective interactivity, pushing many service providers to deliver guides over the Internet. Migrating delivery of guides to push technologies that utilize local interactivity implies migrating the responsibility of the guide to be transmitted to the owner of a dedicated virtual channel. The video and data streams feeding the video trailer could be encapsulated in a dedicated elementary stream that differs from the elementary stream used to transport the HTML and image content. The (low-bit-rate) trailers are typically transmit-

ted in a group of transport streams carrying the VOD EPG, which is separate from the transport carrying the actual video program(s).

2.3.1   VOD Search Applications

The viewer selects the VOD service and the list of all available movies is presented, each associated with a title, its rating, an icon of the content originator, and some short text describing its content. The Graphical User Interface (GUI) of the application provides a search panel, enabling the viewer to enter keywords. Once the search condition is entered, the list of movies is filtered to contain only those movies that match the key words specified by the viewer. The set of keywords can be iteratively refined until the viewer is happy with the list of remaining movies.

At any time during the search process, the viewer can browse up and down the list. The application should highlight a single movie selection at a time. On selection of the highlighted movie, the search application should automatically tune to the virtual channel carrying the trailer of the selected movie, effectively terminating itself and launching the trailer.

Once a movie is selected from the search results, the receiver automatically launches the trailer of the selected movie. The viewer is presented with a trailer application GUI that is launched automatically upon tuning to a trailer virtual channel. The GUI layout could be divided into three sections: title at the top, trailer to the left, and preview to the right. The title is a horizontal section across the top of the screen. The trailer section is further divided into two horizontal parts: the video display area and the selection buttons. The preview section is further divided into three horizontal parts: a movie poster, summary text, and preview images.

In its simplest form, the trailer application is resident at the receiver and only the data it uses is broadcast; a more complicated scenario permits the broadcast of the application's code as well. The trailer video is broadcast using a low bit rate, to allow multiple trailer videos. Each trailer is in a different virtual channel, to be broadcast in a single physical channel of a fixed bandwidth. The images and text data should be transmitted using a broadcast data carousel model that repeatedly retransmits utilizing low bandwidth as well.

The VOD concept essentially utilizes the TV as a virtual video rental store front. The combination of a search engine with a trailer application is much more effective than a traditional video store front. With a simple click of the remote control, viewers have the freedom to select from a large catalog of movies, can view trailers, and enjoy real-time VCR-like features, all in their private home.

2.4   Game Scenarios

Although games for use on wireless and personal digital assistants (PDAs) are mainly targeted at a single player and one viewer, designing good iTV games often proves challenging because of TV's communal nature. The hunt for new and ingenious ways to create large audiences for iTV games is already elevating game developers to new heights.

In many scenarios, the viewer tunes to a dedicated games channel and is asked to enter a user-name that identifies the user's game profile. Subsequently, a list of games is presented.
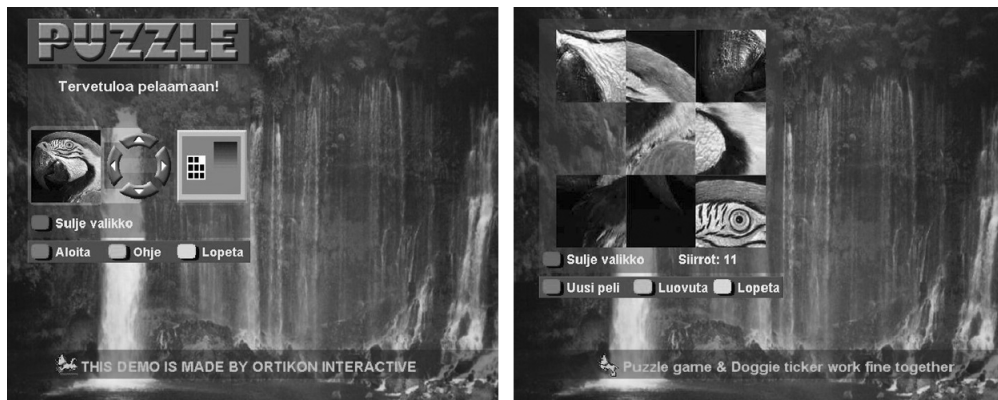
Figure 2.11   Sample perk quiz and puzzle application courtesy of Ortikon (*www.ortikon.com*).

Those games are classified according to single-player and multiplayer games. In the game index, each game may have a short preview animation as well as some text describing its rules. When applicable, on selection of a game, the viewer is given the option to resume a saved game. During the game, an option is given to save the game. On completion of a game, the viewer's score is compared to the list of published high scores for that week. In some cases, the viewer may join an ad hoc group of players competing against another group of players. If the score is sufficiently high, the viewer is offered some perks (e.g., air travel miles) or the option of recording his or her score for a small fee.

Checkers and puzzles, pinball and golf, are examples of games that are simple to play using a remote control (see Figure 2.11). These kinds of games are often played impulsively, for example while waiting for a television program to begin or while waiting for a long download. These games could thus fill gaps at times when viewers can't find anything to watch. The threshold to play these games could be designed to be so low that even people not familiar with the subject can participate, for example, by adding hints and advice that can either be presented per viewer's request or appear automatically after some time-out.

This scenario implies several requirements. The game channel should deliver a data service that presents a game-index application that serves as a dispatcher of the game applications. That dispatcher should probably be maintained by the broadcaster. On termination of a game, an option is given to exit the game and return to the index. Multi-player games may require interaction among several viewers simultaneously receiving a uniform display and whose interactions are time-stamped. In such scenarios, the dispatcher may be complicated.

2.5   Game Show Scenarios

Some believe that the most popular game types will be those linked to a TV game show, generating revenues through sponsoring or by charging for participation. Game show scenarios have

numerous variations. The most challenging and intriguing are those scenarios that arise when presenting a contest among viewers of a live game show or replaying a recorded game show.

Consider, for example, replaying an episode of Hollywood squares (see Figure 2.12) or some trivia game show. At the beginning of the replay, the viewer can select to activate a play-along option. If that option is not selected, the show is replayed without interactivity. If that option is selected, then at specific applicable time periods, the viewer is presented the question before the participant and given the option to select an answer before the participant can answer that question. Once the participant answers the question, the viewer selection option is disabled. If the viewer selected the correct answer, his or her score is updated accordingly. When applicable, and depending on the rules of the game, an incorrect answer may suppress subsequent questions until a new session begins. When the score achieved by the viewer is sufficiently high, that viewer may be given some award.

Allowing competition among viewers adds some sizzle to this scenario. If a live show is enhanced with play-along features, it is possible that a real-time comparison between viewer responses could be enabled. The name of the viewer with the fastest response time or the best answer could be broadcast and perks could be granted; viewers may be rewarded (and get very excited) by having their name broadcast as winners in real time during the show. When play-along mode is applied to a pre-recorded show, the response time or scope could be recorded in a central database for evaluation at some later time.

The viewer experience is assumed to be as follows. During the replay of the program, prior to the presentation of a question to a contestant, the appropriate pop up question's text transitions in smoothly. If the viewer did not select an answer before the contestant did, the question transitions out smoothly. If the viewer selected the wrong answer, some indication is presented and the question transitions out smoothly. If the correct answer is selected in time, the score and perks awarded are displayed. The accumulated score is displayed continuously at the bottom of the screen. Additional trivia questions could be presented during the commercials. At the end of the program, the list of perks awarded is displayed, accompanied by a URL where this list could subsequently be accessed.

Figure 2.12   Hollywood squares courtesy of Microsoft (Web TV plus) [MSTV].
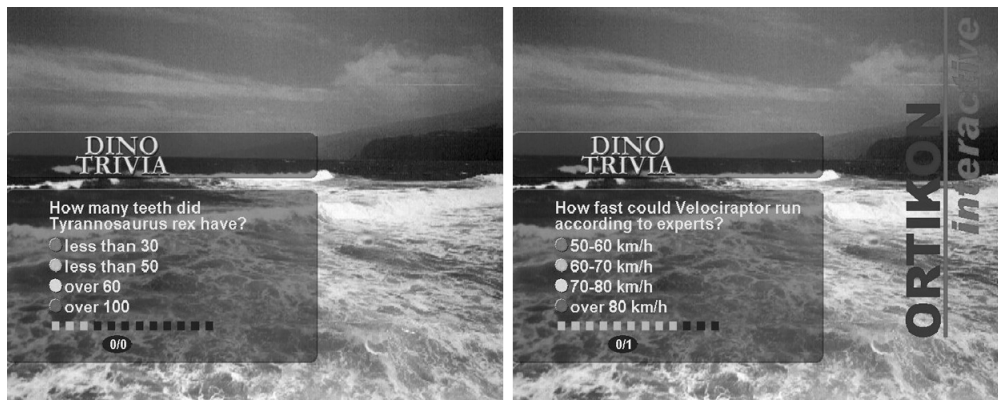
Figure 2.13   Sample game show applications courtesy of Ortikon (*www.ortikon.com*).

Otrikon has successfully implemented DinoTrivia (see Figure 2.13). ABC has iTV versions of its blockbuster show *Who Wants To Be a Millionaire?*, as well as of Monday Night Football, Sunday Night Baseball and Football. The Enhanced TV (as opposed to iTV) implementation of the *Millionaire* game show allows viewers to play the same game as the contestants on TV. When the four potential answers to a question come up on the screen, the viewer can choose one of the answers. A leaderboard link enables cross country iTV competitions. Further, viewers can join a *fastest finger* contest: The faster the viewer answers correctly, the more points are granted.

Such scenarios entail several requirements. The questions in the game show should be sufficiently short to communicate using short text. The answer periods expire before the show participants answer. The questions should be multiple choice questions with answers that can be easily selected from a remote control. During the period of interactivity, the numeric pad of the remote control passes events to the application and does not cause a channel switch.

2.6   Interactive Music Programs

Music programming (e.g., MTV, VH1), fund-raisers, and live shows are often broadcast on TV. Such programs lend themselves to be extended by interactivity because, when compared to other types of programs, viewer experience places significant emphasis on the audio portion of the program and is not as tightly embedded in the video portion of the program.

Except when live shows are broadcast, to which this scenario does not apply well, it is reasonable to assume that interactivity could be introduced offline using stored material. Such interactivity could enable selection of a video component from a collection of possibly synchronized video components. It could also introduce hot spots selectable at specific times during the video. See Great Performances DTV Demo for examples [ETVCOOK].

2.6.1   Multi-camera Enhancements

As the viewer watches a performance or live concert, a small semi-transparent icon entitled *cameras* appears on the screen indicating that various camera angles are selectable. On selection of that icon, the viewer is presented with the currently selected camera angle enlarged on the top-left portion of the screen, as well as a list of smaller views of other available camera angles; all the videos displayed are synchronized.

The viewer uses the up and down selectors in the remote control to select one of the camera angles. Typically, the views are organized in a matrix. When a view is selected, then that view is enlarged to occupy a full screen view. Some systems have primary and secondary views. The primary view occupies the full screen, and the secondary view is a smaller picture overlaid on a corner of the primary view.

It is possible that only selected portions of the program will be associated with multiple camera angles. During that time, the interactivity icon may flash periodically to indicate the availability of these options. When a selected camera angle video is terminated and is no longer available, the display switches automatically to the default camera angle; if a switch is made from multiple cameras to a single camera, the display switches automatically to the available view. See Great Performances DTV Demo for examples [ETVCOOK].

This scenario makes a strong assumption that the camera angles are delivered by multiple distinct video streams that are synchronized. Another important assumption is that multiple video decoding pipelines are supported by the receiver or player. A video pipeline requires dedicated hardware that may not be available in low-end receivers. Two decoding pipelines are likely to be available in all receivers, for example, to enable picture-in-picture capabilities. Three or more decoding pipelines are likely to be available only in high-end receivers.

2.6.2   Selectable Video Regions

As the viewer watches the music video, a small semi-transparent icon entitled *spots* could appear on the screen indicating that various hot-spots are selectable. On selection of that icon, the viewer is presented with highlighted regions whose selection provides additional information. The viewer uses the up and down selectors in the remote control to select a region of interest. Typically, selecting a highlighted region pauses the main video and presents supplemental information in an overlay page occupying a portion of the display. A second selection enlarges that page to occupy the full screen and the video is paused. When the information page is closed, main video resumes from where it left off. Alternatively, selection of a hot spot presents the information in a small window overlaid on the main video, using a picture-in-picture format. For examples, see the Hot Spot Video in the Great Performances DTV Demo [ETVCOOK].

This scenario makes strong assumptions about the ability to define regions, the selection of which is meaningful during long periods containing several hundreds of frames. The transport or program needs to contain tight frame-level synchronization of the presentation and removal of the hot-spot on the screen; this synchronization must survive pausing of the program.

Yet another assumption is the accurate alignment of the highlighted graphics with the video. This highlighting is likely to be presented by an application and not be part of the video. Such applications display on a graphic plane that is different from the video plane, requiring appropriate configuration and alignment of the two planes. Such alignment is easy to break in case the target display format is different from the display format to which the program was optimized. As a result, authors may need to prepare a different version for each target display format.

2.6.3   Music Distribution Models

As the viewer watches the music video, a small semi-transparent icon entitled *download* appears on the screen indicating that audio files are available for download. On selection of that icon, the viewer is presented with an interactive TV application, which allows the viewer to purchase their favorite music CD anytime of day using a 24-hour-a-day interactive music shopping service. The application presents a list of available music downloads and their prices. Download items include individual songs as well as collections and albums. Each item listed includes the duration and availability schedule.

After selection of a download item, the viewer is presented with a form requesting the entry of billing information. On (manual or automatic) completion of this form, the viewer selects the *buy* or *download* option, which in effect schedules a future download during the specified time window. After the download, a financial transaction is completed by the receiver on behalf of the viewer; no charges should be posted until the download is complete. Once the audio content has been downloaded, it can be used by the viewer whenever he or she pleases.

This scenario makes the assumption that, during prime time, there may not be sufficient bandwidth or it may not be economically viable to insert the downloadable music files. Some music libraries would require long hours to download. However, during off-peak hours, such as over night, such music file insertion may be economical.

Another important assumption of this scenario is that the receiver is able to present the viewer with some reasonable capability to store and organize the music files and assign them meaningful names. Without such an interface, it may be very difficult to identify the music files without listening to them.

An example of a successful music service is MTVi in Europe. It is an iTV application that enables viewers to interact directly with MTV, allowing them to cast their vote for award nominees in each category while simultaneously being entered into a prize drawing to win a trip to New York. The service also features alternative voting categories and commentaries for the awards, a daily quiz to win merchandise, and access to event information, news, and gossip.

Launched for the MTV Europe Music Awards 2001, the iTV service saw over 1 million votes cast on the Sky Digital platform alone, establishing new revenue streams as well as adding a new dimension to the MTV viewer experience. The service increased MTV's ratings and viewing session lengths, securing the awards their highest ever ratings in the UK.

2.7   Interactive Educational Programming

2.7.1   Interactive Documentaries

As the viewer watches the documentary video, two small semi-transparent icons appear entitled *language* and *animation* indicating that an alternative language audio is available, and that an animation (or simulation) of the topic is available. It is possible that the two icons are presented at different times.

On selection of the *language* icon the viewer is presented with a list of languages for which alternative audio tracks are available; a single audio track is expected to be active at any point in time. The video continues playing in the background during the presentation of the language menu and the subsequent selection. The audio track is switched at the exact location that corresponds to the switching time. Subsequently, the *language* icon should not reappear until the end of the audio track and the subsequent recurring availability.

This scenario assumes encoding of the time periods during which alternative videos are available and presentation of the icon only during those time periods. It further assumes that a program timeline is maintained and used to synchronize the rendering of the selected audio with the main video.

After selection of the *animation* icon, the video is paused, and an animation (or simulation) application is launched and enlarged to full-screen mode. The viewer then interacts with the application and experiences the animation or simulation (see Figure 2.14). During the interaction the viewer can create bookmarks or other shortcuts that enable revisiting this animation or simulation in whole or in part. On completion, as the application is closed, the video is resumed from the point at which it was paused. See *ETV Cook Book Guide to Enhanced TV* [ETVCOOK] for additional examples.

The introduction of commercials during documentaries complicates this scenario. The integration of commercials can be simplified if the broadcaster ensures that applications that they broadcast are required to include advertising slots (or a display area) in which they display a small (e.g., picture-in-picture) version of the commercial video when the application is running. With that capability, resuming the program without regard to commercials missed does not diminish the value provided to the advertiser.

Figure 2.14   Golf animation by Tyee Euro & Proteus on a Microsoft TV platform (courtesy of Microsoft) [MSTV].

This scenario assumes loose synchronization of the presentation of the animation with the time periods during which a simulation is relevant. At any given time, a single animation should be applicable; this is the animation activated on selection of the icon. After an animation has been activated and closed, the icon should not reappear until a different animation is available.

In addition to animations, the same technique could be used to embed electronic books or other reading material in the documentary. For example, an astronomy video might contain markup pages or interactive book material about relevant analysis of a star life cycle with various degrees of details and complexity, including animated illustrations and presentation of mathematical formulas.

2.7.2   Online Courses

For the purpose of this discussion, online courses are viewed as similar to documentaries, with the exception that they may be more focused on a specific topic, and likely to include one or more teachers guiding the presentation. The important aspects of online courses is that their final goal is the transfer of a skill rather than present a general overview. This means that interactive courses should be made amenable to repeated replay by viewers from storage or recording equipment.

As an example, we consider an online cooking course. The viewer can interrupt the video at any time and obtain a textual presentation of the recipe. Additional information can be provided on specific items, including vendors that provide supplies or tools; purchases can be made directly from the program. Section breaks could be used to mark specific steps or replay segments. Multiple camera angles can be used effectively to present a window zooming in on the hands of the chef or to present videos with multiple variations on a single concept.

Online course authors may find it useful to introduce interactive quizzes into the video for purposes of self-evaluation. These quizzes could contain links to locations in the video in which the answers are found. Results of such quizzes may be communicated through a return channel to a group of vendors for marketing or other purposes.

2.7.3   Instant Polls

iTV instant polls are conducted as follows: During the program, at key time points, a blended multiple-choice question pops up on the bottom of the screen. The viewer can select an answer, which can be combined with the answers of other viewers in a certain geographic location to provide a statistical report indicating the percentage of responses in each category. A real-time update of the results is displayed next to the question.

This scenario implies the following assumptions. The poll question is in context only within a specific time period. Each viewer can respond exactly once; this is ensured by the polling application. Although poll questions pop up at specific time points, they need not be tightly synchronized. Polls are limited to geographic regions defined by broadcast coverage, and no coordination is required (but is allowed) among multiple emitters broadcasting the same poll.

The viewer experience is as follows. A pop-up poll question is presented with some animated transition and the poll results are updated continuously next to each possible answer to
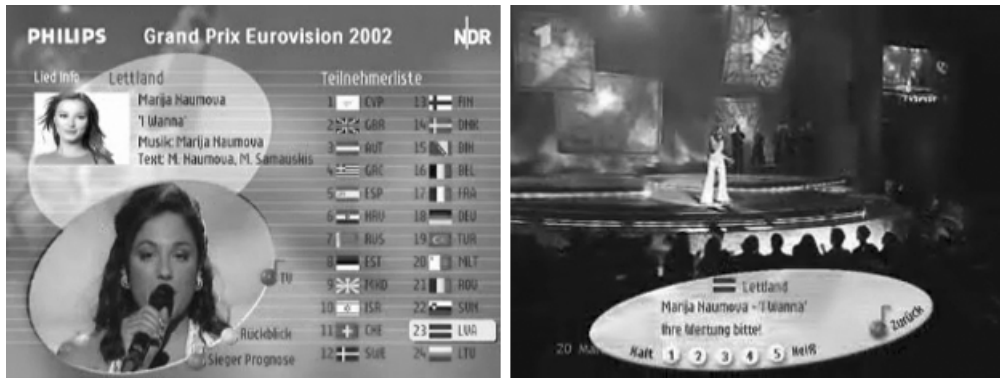
Figure 2.15   The iTV broadcast of the Eurovision Song Contest [EUROVISION].

that question, until the question expires. Some graphics are provided to indicate that a response is requested; this indication should disappear once the question is answered. The question remains displayed until an answer is selected or until the poll expires. Once a selection is made, the question transitions out. Once the question expires, its display transitions out. Subsequently, a menu option may be presented which displays the results of previous questions in the poll. This menu option expires and transitions out as well.

An interesting variation on instant polls was produced for the broadcast version of the 2002 Eurovision Song Contest [EUROVISION] (see Figure 2.15) which was powered by Platform-I technology; a similar approach could be taken in similar frameworks (e.g., popular beauty pageant or fashion shows). The iTV service was enhanced with information on the participants, real-time voting, and live score and results updates. As an example, at the end of the playing of all the songs, the panel of experts in each country voted on the scoring order of all other countries (i.e., not allowed to score itself). The scores were reported using graphics that contained a digital scoreboard, with a thumbnail version of that country's flag.

In another example, the application in Figure 2.16 was available during October 22–27, 2001 to SkyDigital viewers, activated by the red interactive button. *Watch Your Own Week* allowed kids to vote every half hour between 8 a.m. and 8 p.m. for the program they wanted to see on Nick next. Nickelodeon anticipated a total of 100,000 votes during the whole week using the interactive TV application; this goal was reached in two days. In total for the week, 293,403 votes were cast using the iTV application, which was developed by NDS. Nickelodeon received a total of 578,000 votes during the full seven days: 293,403 using iTV, 58,000 using Short Message Services (SMS), and 180,648 using telephone.

Figure 2.16 *Watch Your Own Week* voting application [NICK].

2.8 Quizzes

During the program, possibly at beginnings of scenes, a multiple-choice question transitions in on the bottom of the screen. The question has a single correct answer that refers to the sequence of events leading to the scene. The setting may be similar to riskless gambling. Loyal viewers who know the answer to these quizzes receive perks such as coupons or raffle tickets.

In these scenarios, the viewer is presented with a pop-up quiz question and the perk associated with the correct answer. The pop up has some animated transition. The question remains displayed until an answer is selected or until it expires. Once a selection is made, if the answer is wrong, the question transitions into the correct answer, which then transitions out smoothly. If the correct answer is selected, the question transitions into a display of the perk awarded, which subsequently transitions out (after some delay). At the end of the program the viewer is presented with the list of perks awarded, as well as a URL at which this list could be accessed at a later time.

This scenario makes the following assumptions. The quiz question is in context only within a specific time interval. There is exactly one correct answer. Selection of the correct answer is communicated back to the broadcaster. Quiz questions pop up at specific time points but need not be tightly synchronized.

If some of Europe's leading children's television channels are to be believed, kids are voting overwhelmingly with their fingers for more iTV. Many children's traditional programs are already enhanced with interactive content. This ranges from encouraging phone-in voting through to pressing the red button on the zapper to gain access to an interactive session. The cost to take part in kids' iTV sessions currently runs at about 0.33 Euros per phone call.

The latest ventures by leading children's channels CBBC, Cartoon Network, and Nickelodeon in iTV have all been a resounding success. There are numerous games online and on-screen. Success appears to be driven by high scores, multiple-player games, simple and addictive design, and regular new launches.

An example of a very successful quiz application is a service by Nickelodeon, the leading children's channel. This service offered viewers the chance to test their knowledge of *Sabrina The Teenage Witch*, a popular live action teen series. It follows the rites-of-passage experiences of a 16 year-old girl who moves in with her aunts, discovers that they, and she, are all witches with a black cat, Salem, that can talk. The Nickelodeon *Sabrina Magic Spell Game* is multiple choice and ran from 4:00 PM to 6:00 PM daily around the advertisement breaks. At the end of the break, viewers are asked a question about Sabrina, responding with the remote control. The correct response and individual viewer's score are then displayed before the beginning of the next show. Eight games are broadcast per day that allow accumulating points gained for each correct answer. Final scores can be entered into a prize drawing. The system enabled interactivity through a Web site, SMS, and touch-tone telephones. It pulled in one million viewers over just 25 days.

2.8.1   Winning Perks

During a sports event a *bet now to win* icon appears on the screen. The viewer selects that icon and joins an existing group of viewers to bet on, for example, the number of minutes in penalty box, the number of points scored by a team during a specific period, or betting on the top three stars of the game. Viewers win points each time they win a bet (see Figure 2.17). When enough points have been accumulated, they are invited to order a pizza.

BBCi utilizes its i-bar application as a gateway for a number of interactive TV application [BBCiCable] [BBCiSat]. On December 1st 2002, the BBC added a competition quiz called *Christmas Countdown* to its i-bar (see Figure 2.18), accessible by pressing the *text* key followed by the green button on the SkyDigital remote. Once visible on the screen, the miniapp poses a

Figure 2.17   A Coca-Cola quiz with perks commercial.

Figure 2.18 BBCi's *Christmas Countdown* competition quiz.

daily question about a BBC program. Viewers could answer the question via bbc.co.uk, Web on TV, digital cable, send Email, or using SMS messaging. There were daily prizes, as well as the chance to win a wide-screen TV. The text-based competition is supplemented by a daily item of Christmas trivia and a joke. New content categories on the i-bar also include Showbiz News, Top of the Pops news, games charts, horoscopes, lottery results, soap news, and gossip. A Travel section allows the viewer to check the state of London roads live over the TV via 70 traffic cameras, and also provides up-to-the minute rail, road, ferry, and London Transport information.

2.9   Interactive News

2.9.1   Enhanced Video

During a news video, additional headline text scrolls from right to left (for roman languages) on the bottom of the screen. The selectable headlines scroll until the viewer starts browsing them using the remote control. When browsing is active the browsing of the viewer controls scrolling. During the browsing the main video and related data continues to display uninterrupted. If the viewer does not browse within several seconds, browsing is deactivated and autoscrolling resumes. On a selection of a headline, the display switches immediately to view the selected story, as if it was a channel selection (see Figure 2.19).

To enable this scenario, an updated list of selectable headlines needs to be transmitted and displayed. Selection of a headline triggers an event that is captured by an interoperable downloadable application, which displays the referenced program; that program may be either live in some channel or stored in the receiver.

2.9.2   Interactive Weather Report

In these scenarios viewers typically switch to a dedicated weather channel. The video of a reporter is presented (typically transitions) in the top-right corner of the screen. The broadcast
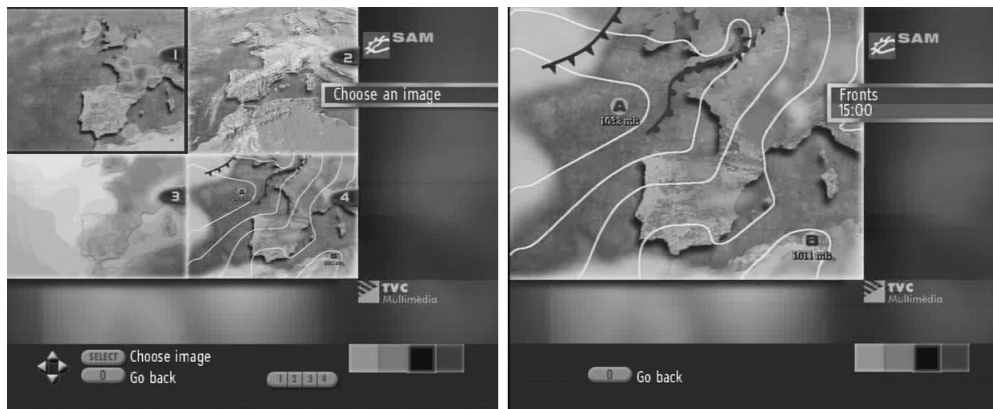
Figure 2.19   Sample news application courtesy of Alticast (*www.alticast.com*).

contains a downloadable weather application and weather data. The application enables the viewer to display desired weather information and maps.

Figures 2.20 and 2.21 present sample graphic layouts of the weather reporting applications. The three key components are: (1) the weather data panel containing a table and an animation, (2) a small video panel, and (3) the information selector. Each one of these panels may be a different application and may be customized according to the viewer's profile. For example, video may be accompanied by Spanish audio and the temperature may be reported in degrees Celsius.
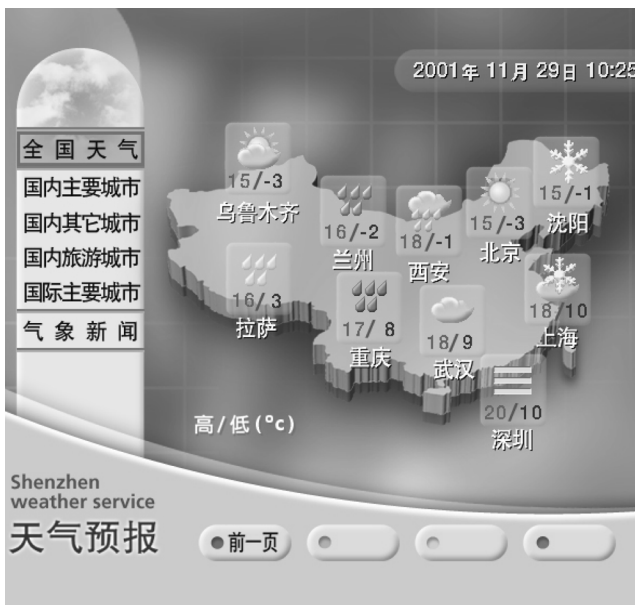
Figure 2.20   Sample weather service applications courtesy of Alticast (*www.alticast.com*).

Figure 2.21 Sample weather service application courtesy of TVC Multimedia [TVC].

2.9.3 Enhanced Emergency Alert System

During a regular TV show, the program is abruptly interrupted to report on a new storm developing in the area, or an imminent terrorist attack. The emergency alert is accompanied by maps and detailed interactive guides that enable each viewer to extract the specific details applicable to him/her.

2.9.4 News Pages

During a news video, a flashing *More Information* selection appears on the screen, typically at the bottom. On selection of this option, the display switches to display text pages, which are similar to today's news Web pages. Some of these pages have instant response, but others may require access through a return channel. The operation of these pages is similar to today's Web browsing, with one exception: A hot-key on the remote control enables switching the display back to the video news channel.

In this scenario, news is delivered using markup content pages; this may require some transcoding from a news Web site. Font and other graphic resolution issues are resolved either by the transcoding process or by the receiver. The content pages not pushed in the broadcast are pulled through a return channel. If a return channel is not available, links to pages not accessible to the receiver can be automatically removed.

The viewer selects pages and scrolls down and up using the remote control. Video clips embedded within the page could be selected and displayed either in full screen, or in the full size of the video (in case it is smaller than the screen); during the display of the clip no other video or text is visible.

2.10   Interactive Sports Scenario

2.10.1   Multiple Cameras and Statistics

The viewer watches a televised sporting event. The viewer first identifies the sporting event he or she wants to watch (e.g., via an EPG), selects the event (see Figures 2.22, 2.23), and then directs the TV to view the event (see Figure 2.24). Once tuned to the game, the viewer chooses to review his or her viewing preferences saved from the last viewing of the program. These preferences include choices such as which and how many cameras his TV is to render (e.g., pitcher cam, catcher cam, network cam, and dugout cam), and what type of statistics is to be presented (e.g., pitcher name, runner name, at bat, RBI, errors, outs, and balls) in an information window. The viewer modifies the camera angles he wants to view and what statistics the application will render. Viewers may choose to temporarily switch the primary camera to the pitcher cam. As the game progresses, the viewer can request more specific information on certain players (see Figure 2.25).

2.10.2   View Highlights

The viewer would like to shorten the length of a game by viewing plays only and skipping time periods during which no action occurred; under typical broadcast conditions, this could significantly reduce the duration of a game. At the end of each play, a *Skip* option is presented, the selection of which fast-forwards the video to the next play. If the entire game is recorded and stored at the receiver, some simple play start logic could often be executed at the receiver to automatically
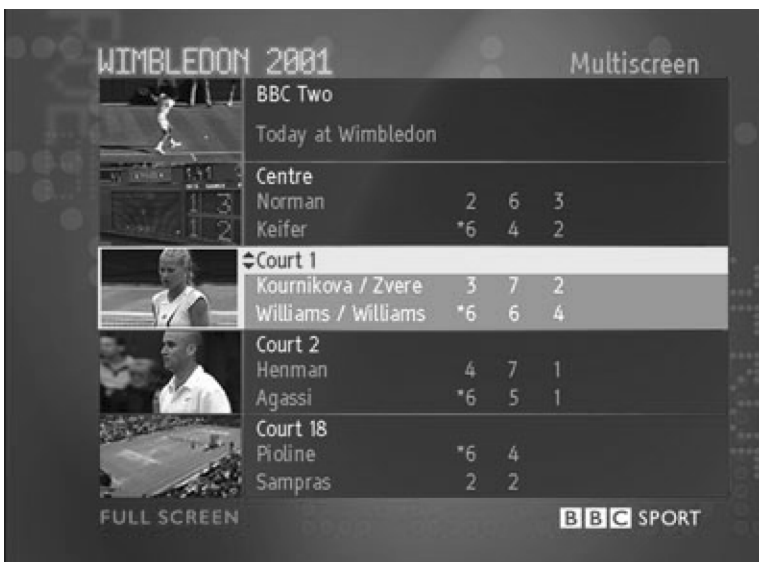

Figure 2.22   Sample interactive Wimbeldon application from BBC Sport.

Figure 2.23 Sample interactive Olympic application courtesy of Microsoft [MSTV].

Figure 2.24 Sample interactive soccer application courtesy of Alticast (*www.alticast.com*).

Figure 2.25   Sample SkyLife Interactive Soccer courtesy of Alticast (*www.alticast.com*).

detect the beginning of a play. If the game video is not stored at the receiver, the broadcaster (or cable program provider) may perform preprocessing of the program to contain plays only.

This scenario could be enhanced to provide effective multi-camera angles for plays only. This reduces bandwidth consumption as it transmits multiple video streams for a small fraction of the game's duration (e.g., usually about 25% of a football game). A variation on this scenario provides play library services, in which a library of plays by the same player or having similar properties is made available to viewers. This scenario and its variants could be implemented using VOD, or using large video storage (e.g., see TiVo receivers).

2.10.3   Sports TV-Commerce

During the sporting event, the application offers the viewer the opportunity to purchase various team and sponsoring products. A passive advertisement might be something like text or an icon linking to something like the Team's online sports store. An active advertisement is where the iTV application asks the viewer whether to make certain purchases.

Some issues exist. During the program, full screen advertisements may interrupt the game, and in addition, smaller less obtrusive banner advertisements may be presented. During the presentation of an advertisement, the viewer may interact only with that advertisement. After such advertisements terminate, whether full screen or otherwise, the viewer resumes his interaction with the sporting event application in the same state as before the interruption.

2.10.4 Fantasy Football

Periodically (e.g., once a week), a private group of people may play in a fantasy football league, assembling virtual teams by selecting players from a variety of NFL teams. Each game earns them points against other players within their group.

This scenario is as follows: This group decides that while they are watching the Sunday and Monday football games, they would also like to set up a private group on iTV to bet against each other for more real-time entertainment value. One member of the group agrees to set up the group. They turn on their TVs and go directly to the sports channel that will be hosting the game. They click on the icon, which says *bet now to win* and opts for *create a private group*. They add their friends from their buddy list. They all receive notification when they turn on their TVs and join in. The group spends the entire game making bets and posting messages to the group members. At the end of the game, players click the *Email results now* button that sends an email to allow printing of all the bets along with the standings of each member of the group. There are a large number of variations to this scenario.

2.11   Transportation Scenarios

In Europe, interactive TV is popular for performing a variety of online reservation and scheduling tasks. In particular, iTV applications are useful for making reservations and monitoring schedules of trains, buses, and flights.

2.11.1 Airport Flight Monitors

One popular application is the broadcast of flight monitor data providing real-time arrival and departure information, the same information that traditional airport terminals provide (see Figure 2.26). With this application, the viewer selects the service and chooses from a menu of possible displays. The search and resulting display could be organized according to arrival or departure times, airlines, flight numbers, or destinations. The viewer can select the next or previous screen or go back to the menu screen.

2.11.2 Maps and Driving Directions Scenarios

Internet-based maps have become reliable and popular, and numerous Web sites now offer a driving direction service. These services could be migrated to interactive TV. Maps can be broadcast (see Figure 2.27), or may pulled from the Internet using a return channel.

Maps are commonly used as means of advertisement. Viewers may enter their intentions, and the data service will filter out all irrelevant landmarks leaving a small subset of interest.

Maps may be customized or personalized (e.g., with directions and restaurant locations), by combining broadcast with a return channel. To obtain a customized map the viewer selects a dedicated virtual channel. On selection, an application is launched, presenting a form for entering location information such as address. Optionally, the viewer can enter a second location regarded as the destination location. On submission of the form, the viewer is presented with a
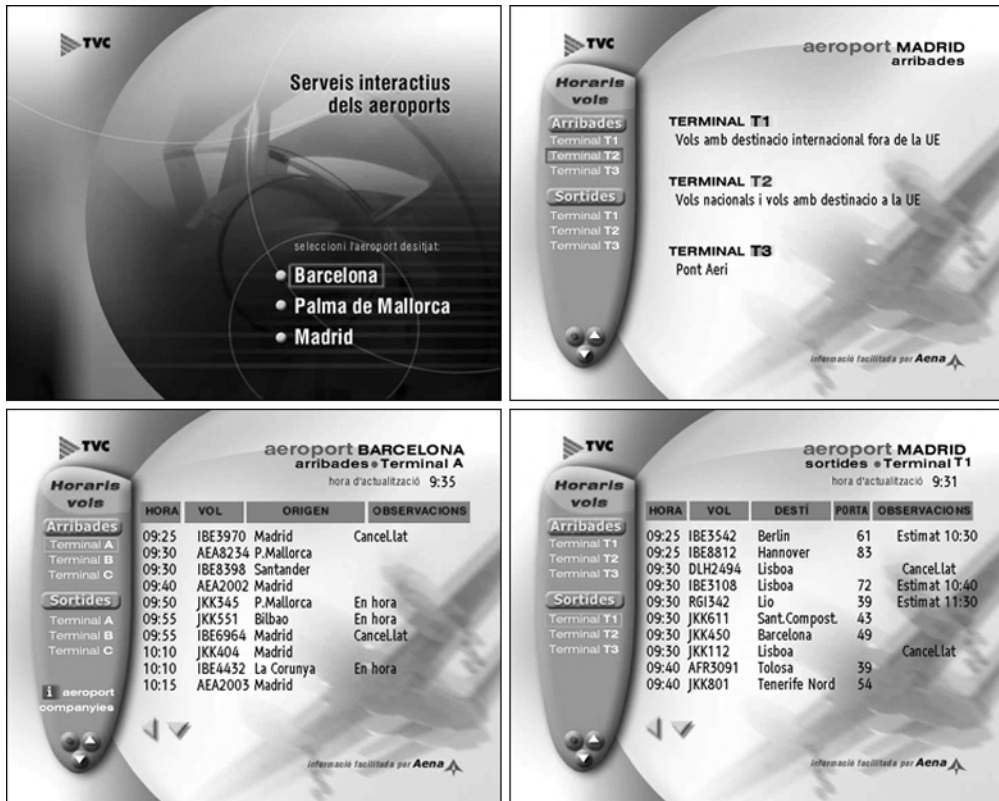
Figure 2.26 An Airport Application courtesy of TVC Multimedia [TVC].
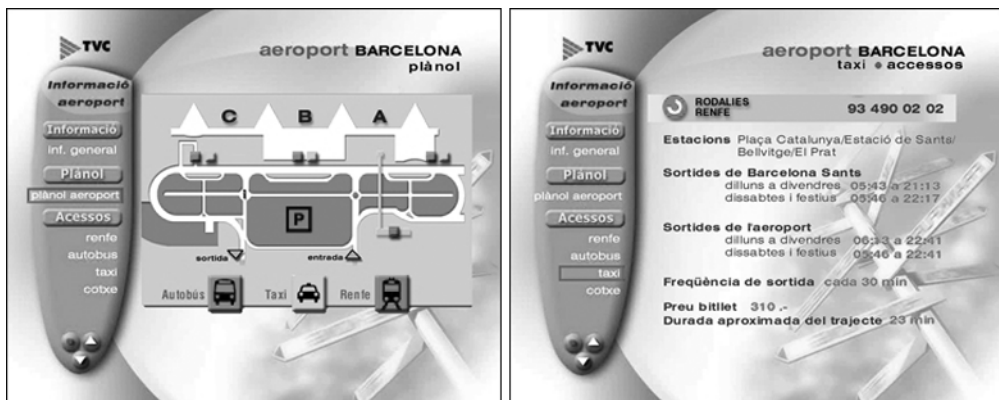

Figure 2.27 An airport parking and taxi application courtesy of TVC Multimedia [TVC].

response, which is a map customized to the requested location. If a destination location is also specified, the response contains a marked route and the corresponding driving directions.

2.12   Trading Scenarios

Viewers are given the option to access, through a dedicated trading service, their accounts with an online brokerage firm via an interactive TV application. The application enables trading stocks, checking account balances, and obtaining real-time stock quotes. This type of application can be transmitted with either a live TV program or an advertisement. An interactive stock ticker may also be part of the application.

It is assumed that a channel will carry services provided by a single brokerage firm. The viewer is authenticated before access is granted. The static pages are retrieved from the local receiver's cache, and the dynamic pages are retrieved from the return channel. All financial transactions are secure. Confirmation of transactions arrives through the return channel.

Initially, the viewer is likely to tune to a financial news or other channel and receive an indication that an interactive stock trading application is available. On selection of the icon representing the application, the receiver automatically tunes to the trading channel. The viewer then provides identification information, probably in the form of a user name or account number, and password. This identifying information will be transmitted to the brokerage firm's system. If this information is correctly authenticated, then the stock trading application is started.

The presentation is likely to be similar to brokerage Web sites. However, the video for the underlying financial news TV program will probably occupy a rectangular area in one of the corners of the screen. The user will be able to navigate to pages that provide the ability to check account information, retrieve quotes for stocks, and enter trade orders. Quote information can be delivered in near real time during market hours.

2.12.1   Home Shopping

On a dedicated lifestyle channel, home-shopping programs may demonstrate how various products can be used to enhance the viewer's lifestyle. Infomercials present the viewer, in addition to the traditional toll free phone number, with an *Order* button that enables consumers to perform a purchase directly. On selection, the top part of the screen continues displaying the video, while the bottom part switches to display an order form. The order form is partially filled with the details of the product advertised at the time of selection. After completion of the order details, a credit card or back account is directly charged.

When the online order option is enabled, the video occupies only the top part of the screen, and the bottom part contains order information such as phone number or Email address. The viewer is presented with the order option at specific time intervals during the video. On selection of the *Order* button, the order form shows up immediately. When the form is being filled in, the tuning controls are disabled to prevent accidental tuning.

The order form presented to the viewer is vendor specific. Further, the iTV data broadcast contains loose synchronization information that indicates how to fill the form to order the product presented at the time of selection. Confirmation of transactions arrives through the return channel.

A different product may be targeted during each time slot. The vendor of each product can send the applicable order form to the broadcaster as part of the data enhancement of the home-shopping video.

2.12.2 Home Banking

Home banking applications allow use of a TV for simple review of financial transactions (see Figure 2.28). The TV screen is more friendly and easier to use than a computer or ATM interface. As an example, small LCD TV screens could be placed in kitchens and may use key-pads that are attached similar to what is used in microwave ovens. These LCDs could be used to serve a wide range of applications, from grocery shopping to home banking.

In this scenario, the viewer uses a virtual keypad to select the home-banking application. Next, the viewer is presented with a login screen for authentication. Once logged in, several menu options are available, including an activity review option. After selection of the activity review, the list of transactions is presented. Viewers browse the list using up and down controls. Selection of a list element brings a detailed view of the corresponding transaction. During the operation of this application, the background video could be a news channel, cooking program, or any other program selected by the viewer.

2.12.3 Auctions

An iTV-based peer-to-peer auction application extends the popular garage-sale concept to iTV. Viewers are given the option to access their auction accounts with an online auction firm using an iTV application. The application enables the client and viewer to list items for auction, bid on other items, check the results of previous auctions, check the activity in auctions that are underway, search for specific items listed for auction, and check account balances. This type of application can be transmitted with either a live or pre-recorded TV program.
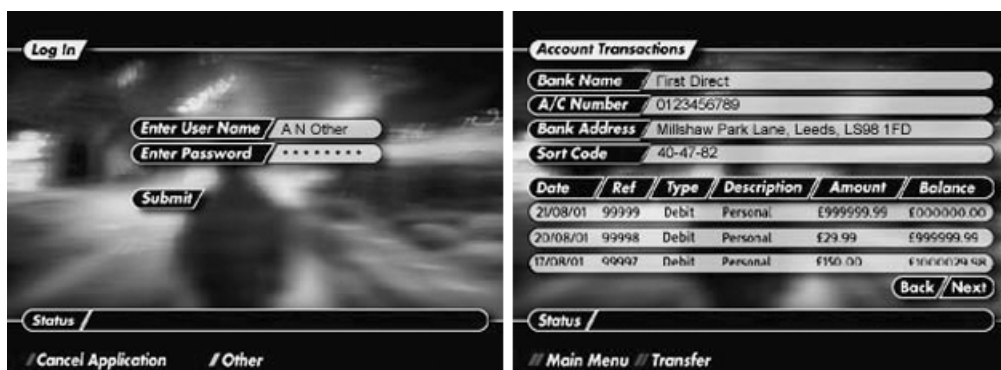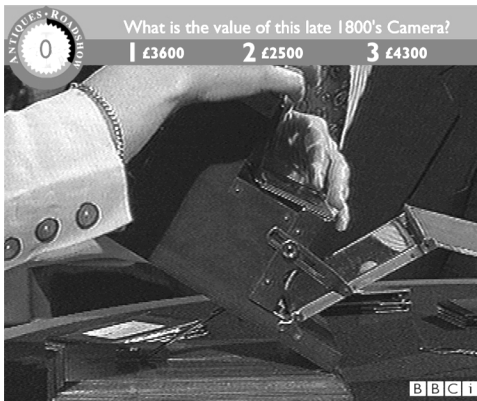

Figure 2.28 A Home Banking application, courtesy of Mindhouse (*www.mindhouse.co.uk*).

Figure 2.29   Sample Antiques Roadshow application (BBCi).

To use these applications, the viewer tunes to a dedicated shopping or auction channel and receives an indication that an interactive auction is in progress and an application is available. After selection of the icon representing the application, the viewer is asked to provide identification. If valid, the auction application is then started.

The presentation to the user can follow a multiple choice format (see Figure 2.29), where each choice is a specific price, or use a format that is similar to auction Web sites (e.g., eBay). Video from an underlying TV program occupies only a part of the screen. The user can navigate to pages that provide the ability to list items for auction, bid on items that other users have listed for auction, check the activity in auctions that are already underway, search for specific items listed for auction, and check their account information. To deliver the excitement of live real-time auctions, such applications need to have synchronization capabilities. For non-real-time auctions, these applications can rely on Web pages that allow a viewer to contact other viewers about items that are being bought and sold and for arranging payment for items. For example, a page might be provided to access escrow services to ensure timely reception and payment for goods auctioned.

2.12.4   Gambling

Many believe that iTV gaming and gambling has the potential to generate multibillion-dollar revenues. The availability of video and audio greatly enhances the gambling experience beyond what is feasible using today's Internet. Many gambling application scenarios can be envisioned such as horse racing, sports betting, lottery, and virtual casinos. Of course, the legality and availability of gambling applications are regulated by various levels of government. However, this type of application may be the "killer app" of interactive television. Table 2.1 lists a few examples of possible sports bets.

Table 2.1   Possible Specific Sports Bets

Type	Specific Gamble
Las Vegas	Horse racing games
	Blackjack and similar games
	Online slot machines
Football	Number of yards run by a certain player per game
	Score of game at end of each quarter, half, or end of game
	Number of points scored by a certain player per game
Baseball	Number of strikeouts per game
	Number of home runs per team per game
	Number of RBIs per inning
Hockey	Gamble on the score of the game
	Number of minutes spent in the penalty box by a team or certain player
	Number of points scored by a certain player
NASCAR	Driver receiving opportunity to be placed in the racing field
	Driver being benched, which means in the pits for the next game
	Relative difference between starting and finishing positions
Golf	Number of birdies per hole
	Number of eagles per hole
	Top *n* scorers

2.12.5 Horse Racing

A horse racing application will give the viewer the ability to view the current lines or odds for a variety of sporting events, place bets on sporting events of their choice, review the results of previous bets placed, check the scores of past sporting events, and check their account balance.

During a wagering phase, the video shows the race track and presents interviews. The countdown timer (to the end of the wagering period) is continuously displayed. The viewer can navigate through horse, jockey, and odds pages, which are continuously updated by the broadcast. Until the countdown time expires, the viewer can adjust the wager using the up and down keys, and can place the wager using the select. The return channel is used to transmit the wager. The end of the wager period can either be decided by the receiver's timer or by receipt of a synchronized trigger signal broadcast on that channel.

During the race phase, the video shows the race, and the race time is displayed prominently. Viewer interaction is not allowed in this phase. At the end of the race the race time freezes. After some delay, the beginning of the next wagering phase can be signalled by the receiver's local timer or by a trigger signal broadcast on that channel.

This scenario requires a data broadcast service that provides the presentation of a live video and audio service with associated, synchronized data in the form of time and the horse leader board. It also provides an interactive capability that allows the viewer to place a wager. Finally, it has an asynchronous data display that provides current odds during the wager phase.

This scenario requires overlay of video and data to enable navigation to data page wager screens with current odds, plus daily information. More complex variations on this application could involve static frames of the paddock, horses, jockeys, and multiple camera angles.

The presentation to the user would likely be similar to many of the offshore sports betting Web sites. However, the video for the underlying sports TV program would probably occupy a rectangular area in one of the corners of the screen. A page would be provided to allow the client to increase his or her account balance by use of a debit or credit card. A similar page can provide the ability to request payment of winnings to be sent to the customer. Users should be able to navigate to pages that provide the ability to check odds, check scores of past sporting events, check their account balance, check the results of previous bets, and place bets on sporting events in the future.

Various media components need to be produced to implement this scenario. A live video source is needed. A mechanism for inserting events into the transport indicating when the application should become active or make its presence known to the user. There is also a need for some equipment that is capable of combining the video source with iTV applications and wagering data to generate an enhanced live broadcast.

2.13   Conclusion

There are countless opportunities for enhancing traditional TV through interactivity. The list of scenarios in this chapter is by no means complete. An excellent survey of screenshots can be fount at *www.itvt.com* [ITVT]. Each of these scenarios is associated with important assumptions bearing technical and business model implications. All the scenarios presented in this chapter were implemented to some degree, either as demos, prototype, experimental deployments, or full scale deployments. Some of these scenarios have proven to be economical successes. It appears that for specific (possibly local) markets a successful specific variation emerges through creative thinking, detailed tweaking, persistence, and some degree of luck.

2.14   References

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