International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

Technical Paper

(11 July 2014)

SERIES H – AUDIOVISUAL AND MULTIMEDIA SYSTEMS
Infrastructure of audiovisual services – Communication
procedures

HSTP-DS-UCIS
Digital signage: Use-cases of interactive services

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Summary

Digital signage (DS) is a screen media showing contents such as advertisements and notifications, which is expected to become a promising market going forward. To improve the effectiveness of notifications from users, DS services combined with interactive services have attracted attention; they also add value by providing interaction for the consumers of such services. This Technical Paper describes various use-cases of interactive DS services and explains their scenarios, functions and information flows.

Keywords

Digital signage, use-case, interactive service, category of interaction, interaction interface, interaction trigger, DS terminal device, audience, mobile terminal device

Change Log

This document contains Version 1 of the ITU-T Technical Paper on "*Digital signage: Use-cases of interactive services*" approved at the ITU-T Study Group 16 meeting held in Sapporo, Japan, 30 June – 11 July 2014.

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Digital signage: Use-cases of interactive services

1   Scope

This Technical Paper describes various use-cases of interactive digital signage (DS) services which are relevant to ITU-T H.780 "Digital signage: Service requirements and IPTV-based architecture". The interactive use-cases focus on input/output interfaces and communication methods for technical considerations. There are two interactive aspects: 1) communications between a fixed DS system and an audience; 2) communications between a fixed DS system and an audience via a variety of terminal device.

2   References

[ITU-T H.780]   Recommendation ITU-T H.780 (2012), *Digital signage: Service requirements and IPTV-based architecture*.

3   Definitions

3.1   Terms defined elsewhere

This Technical Paper uses the following terms defined elsewhere:

3.1.1 content [ITU-T H.780]: A combination of audio, still image, graphic, video, or data.

NOTE 1 – Variety of formats is classified as the "data" (e.g., text, encoded values, multimedia description language introduced by [b-ITU-T H.760])

3.1.2 digital signage (DS) [ITU-T H.780]: A system that sends information, advertising and other messages to electronic devices (e.g., displays, speakers) in accordance with the time of day and the location of the display, or the actions of audience. Contents and their relevant information such as display schedules are delivered over networks.

3.1.3 multimedia [b-ITU-T T.174]: The property of handling several types of media.

3.1.4 terminal device (TD) [b-ITU-T Y.1901]: An end-user device which typically presents and/or processes the content, such as a personal computer, a computer peripheral, a mobile device, a TV set, a monitor, a VoIP terminal or an audio-visual media player.

3.2   Terms defined in this Technical Paper

This Technical Paper defines no term.

4   Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AR	Augmented reality
DS	Digital signage
I/O	Input/output
IR	Infrared
LAN	Local area network

LED	Light emitting diode
NFC	Near-field communication
NLP	Natural language processing
PC	Personal computer
QA	Question answering
QR	Quick response
TD	Terminal device
TV	Television
URL	Universal resource locator

5   Conventions

The keyword "functions" are defined as a collection of functionalities. It is represented by the following symbol in the context of DS architecture:

```
┌──────────────────────┐
│                      │
│      Functions       │
│                      │
└──────────────────────┘
```

6   Overview of interactive DS services

6.1   Necessity of interaction over DS

DS is expected to emerge as the fourth screen media following TV, PC and mobile device. These screen media have respectively their own position to provide information as shown in Figure 6-1.
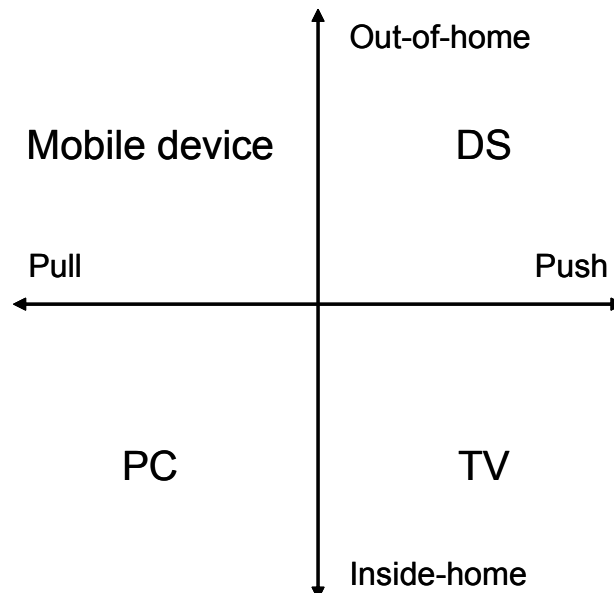

Figure 6-1 – Positioning of the four screen media including DS

DS targets out-of-home users and its distribution is mainly to push contents. DS has the important role of displaying information for users in a public space and also has the following business roles:

−   Improved customer satisfaction: enhance site appeal and increase repeat traffic

–   Effective advertisement measurement: investigate the relationship of displayed contents and sales of goods, and understand its effectiveness

–   Sales promotion: promote sales by providing additional suggestions on the original retrieved information

To realize the above benefits, it is important to deploy and enrich the interaction function of the DS system.

In [ITU-T H.780], interaction-related DS service examples are described as:

1)   Basic interactive services:

  –   user interaction for service navigation such as finding a nearest restaurant;

  –   information presentations based on audience measurement;

  NOTE – Interactive DS service is a type of service provided by a service provider to enable interaction of audiences with a content provider.

2)   Advanced interactive services:

  –   Context awareness: Messages are delivered to the terminal devices according to the attributes of an audience (e.g., subscribed specific services, location, date, age)

6.2   Combinations of terminal devices

It is assumed that interactive services can be provided by using the following multiple types of terminal devices simultaneously [ITU-T H.780]. :

1)   Wall screen: wall-mounted/ceiling-mounted/projector;

NOTE 1 – Several physical displays can be treated as one logical screen.

2)   Self-standing screen;

NOTE 2 – This type of the terminal is often set in a kiosk for outdoor installation

3)   Mobile terminal: Mobile phone, portable information terminal.

6.3   Categories of interaction

6.3.1   Interactive interfaces between DS system and audience

Figure 6-2 shows the model of input/output interfaces and communication methods. This figure shows four logical boundaries between functionalities:

–   IF-a: interactions between an audience and manipulation devices/sensors of a DS terminal device (interactive device functions);

–   IF-b: interactions between a terminal device owned by an audience (other terminal device functions) and DS system;

–   IF-b': interactions between a terminal device owned by an audience (other terminal device functions) and other service systems (content provider functions/other business functions);

–   IF-b": interactions among terminal devices;

–   IF-c: internal connections between functions in a DS system (terminal device functions and application functions);

–   IF-d: external connections between a DS system (application functions) and other systems (content provider functions or other business functions).

For technical considerations of interactive services, two interactive aspects are important: IF-a) direct communication between a DS system and audience; IF-b) indirect communication between the DS system and a terminal device.
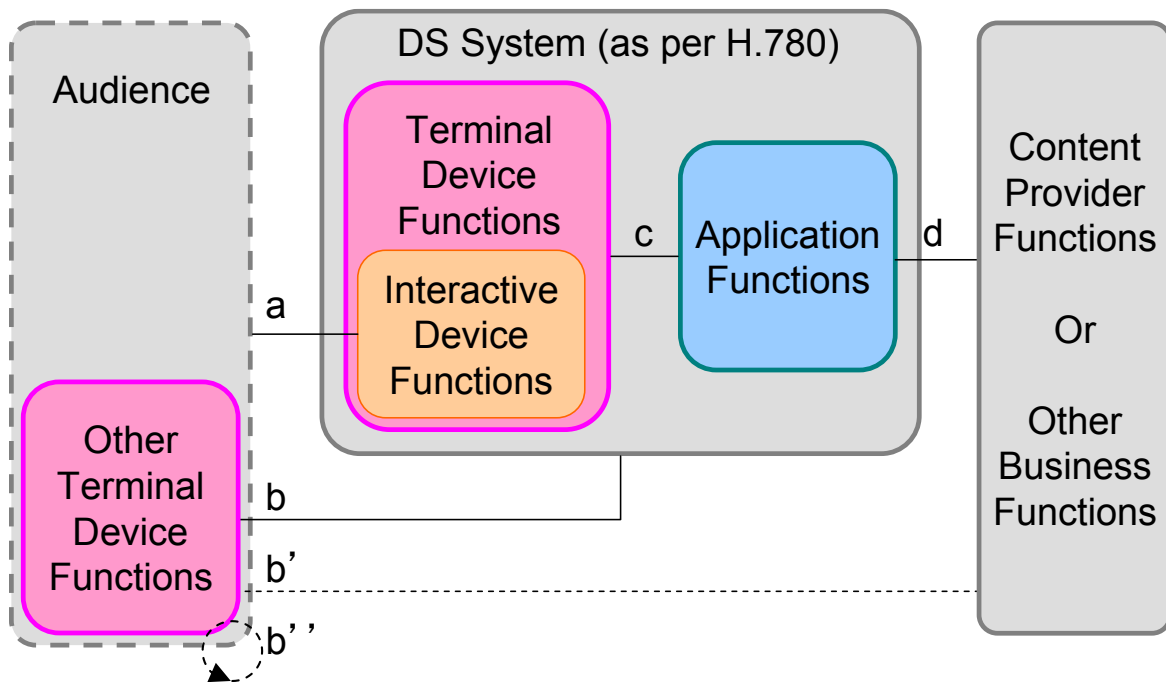
Figure 6-2 – Communication boundaries for interactions

NOTE 1 – Details of the linkage between device and other function (IF-b'), or inter-device linkage (IF-b") are not described in this technical paper.

NOTE 2 – Interaction between the DS system and audiences is focused in this Technical Paper, so that IF-c and IF-d is not well explained in the use-case descriptions,

According to these two interfaces, there are two types of communications between a DS system and an audience:

Type 1-1:   Direct communications between a fixed DS system and audience (using IF-a);

Type 1-2:   Indirect communications between a fixed DS system and audience via a terminal device (using IF-b).

Moreover, Type 1-2 can be categorized according to the operation patterns of mobile/handheld terminal device such as the following:

Type 1-2-1:   Interaction to copy or transfer the whole or a part of the current content from a DS terminal device to a user's mobile device;

Type 1-2-2:   Interaction with a user's mobile device as an input device of the DS terminal device for interaction services;

Type 1-2-3:   Interaction with a user's mobile device as a sensing device of the DS terminal device for context-aware services;

Type 1-2-4:   Interaction to provide related contents of DS terminal device to a user's mobile device for the personalized interactive services (e.g., coupon, supplementary services.

6.3.2 Interaction request trigger

The interactive services must have the input/output methods as shown below. From a systematic point of view, it is effective to illustrate the use-cases from the aspect of I/O methods.

1. Input method

    (i) Audio input

    – Speech recognition: recognizes commands or languages/keywords

    – Audio recognition: recognizes the audio signals such as clapping hands or knocking

    (ii) Visual input

    – Gesture recognition: recognizes the motions of a hand or human body from video image

    – Attribute recognition: recognizes the attributes of materials or clothes, gender, expression of each user from video image

    – Optical tag recognition: recognizes optical tag codes such as QR codes or bar codes

    – Pattern recognition: recognizes characters or text

    (iii) Operational input

    – Operation recognition: recognizes user operations on touch panels or buttons

    – Motion recognition: recognizes device motion from sensors such as accelerometers

    (iv) Input by data communication

    – Wireless communication: communicates with other devices by wireless networks (e.g. wireless LAN [b-ISO/IEC 8802-11], Bluetooth [b-IEEE 802.15.1] or Near Field Communication (NFC) [b-ISO/IEC 18092])

    – Optical communication: communicates with IR remote controller

2. Output method

    (i) Audio output

    – Speaker: provides sound information from a DS system

    (ii) Visual output

    – Display monitor: shows the information from a DS system

    – Sign board: shows the information on auxiliary devices such as LED display boards

    – Printer: provides printouts of information

    (iii) Physical output: indicates information by light, water flow, or fragrance

    (iv) Output by data communication: same as the input methods

There is another type of two aspects for starting interaction between DS system and audience regarding audience's operation of DS terminal devices including external devices with these I/O methods:

Type 2-1:   Trigger with input to DS system whose interaction requests audience's actions or external data inputs;

Type 2-2:   Trigger with output from DS system whose interaction originates from DS system itself.

6.3.3   List of the use-cases of interactive services

For a better understanding of use-cases of interactive services in this technical paper, the use-cases shown in clause 7 and 8 are listed with the categories in Table 6-1.

Table 6-1 – List of the use-cases of interactive services

Clause	Title	Interface	Trigger
7.1	Touch screen information services	1-1	2-1
7.2	Collaborative touch screen information services	1-1	2-1
7.3	Automatic vending machine	1-1	2-1
7.4	Question answering interactive service	1-1	2-1
7.5	Virtual fitting using augmented reality	1-1	2-1
7.6	Disaster information service	1-1	2-2
7.7	Parking guidance service	1-1	2-1
8.1	Traffic information services	1-2-4	2-1
8.2	Interactive coupon services	1-2-4	2-2
8.3	Automatic vending services	1-2-4	2-2
8.4	Local tourist information service	1-2-2	2-1
8.5	Interactive services based on wish lists	1-2-1, 1-2-4	2-2
8.6	Remote control by a smartphone	1-2-2, 1-2-3	2-1
8.7	Real-time event post and push service	1-2-4	2-2
8.8	Zone-based personalized advertisement service	1-2-4	2-2
8.9	Game coupled advertisement service	1-2-4	2-2
8.10	Content adaptation service	1-2-1	2-1

7   Use-cases of direct communication using IF-a

7.1   Touch screen information services

(1)   Overview

A DS system which has a touch screen display provides additional information through interaction, see Figure 7-1. It can provide digital catalogues for customers in a shop or it can provide guide information in a shopping mall.

(2)   Interaction scenario

−   Bob wants to find his desired shop in the shopping mall. He finds a touch screen DS terminal device which shows a map of the mall.

−   If he selects the button of the shop he wants to find through touching actions on the DS terminal device, he can get detailed information such as goods offered by that shop and he can decide what to do next.

(3)   Contents provided to users by interaction

–   The detail information about the shopping mall including store maps, digital catalogues that a user wants to know

(4)   Used function and information flow

–   Information is displayed on the DS terminal device for users through IF-c and IF-a.

–   User can retrieve detailed information by interaction with DS terminal devices through IF-a.

Figure 7-1 – Touch screen information service with DS

7.2   Collaborative touch screen information services

(1)   Overview

Some kinds of touch screen displays provide interaction capabilities to be simultaneously manipulated by more than one audience. See Figure 7-2.

(2)   Interaction scenario

–   Olivia is seeking a baby goods shop in a mall by navigating a big touch screen display showing a directory of the mall. She cannot easily find the goods, and husband Peter is impatient about her seeking.

–   Peter also touches the screen simultaneously, and then the realm of information on the screen is separated to two areas. He begins to look for the shop independently in the opposite side of the mall.

(3)   Contents provided to users by interaction

–   Same as clause 7.1

(4)   Used function and information flow

–   Separation of realm of a screen;

–   Separation of IF-a relevant to each realm;

–   Audience can retrieve detailed information by interaction with the DS terminal device through each IF-a.

Figure 7-2 – Service scene with collaborative touch screen

7.3 Automatic vending machine

(1) Overview

A DS system combined with an automatic vending machine shows not only product information but will also allow purchases to be made. See Figure 7-3.

Figure 7-3 – Vending machine with DS

(2) Interaction scenario

− Alice is a young girl and she is walking around. She finds a drink vending machine that uses a DS terminal device to display drink information.

− When she approaches, the vending machine changes the drink list to that suitable for a young girl. She becomes interested in tea and buys a can by touching the button on the DS terminal device as a vending machine.

(3) Contents provided to users by interaction

− The recommended list of products from the user's attributes (e.g., age, gender) extracted by sensing devices such as a camera

− Payment information of the selected product

(4)   Used function and information flow

− Recommended list of products and payment information is displayed on the DS terminal device through IF-c and IF-a.

− User can retrieve detailed information by interaction with the DS terminal device through IF-a.

7.4   Question answering interactive service

(1)   Overview

Question Answering (QA) is an advanced function to generate answers for the user's question using natural language. The response generated by QA can be in any form such as text, graphics, video, voice, etc. that can assist the user to understand the answer. Many systems in the future are expected to be equipped with QA functions for advanced user experience. Although a QA system may not be able to provide satisfactory answers to the user when in an open domain, it can be practical when used in a predefined environment, such as the case for DS terminal in shopping mall. Figure 7-4 illustrates the concept of QA system, where a DS user requests information on shoe stores to the QA system which is located in the shopping mall. More detailed description of QA system with its core function, Natural Language Processing, is provided in Appendix II.
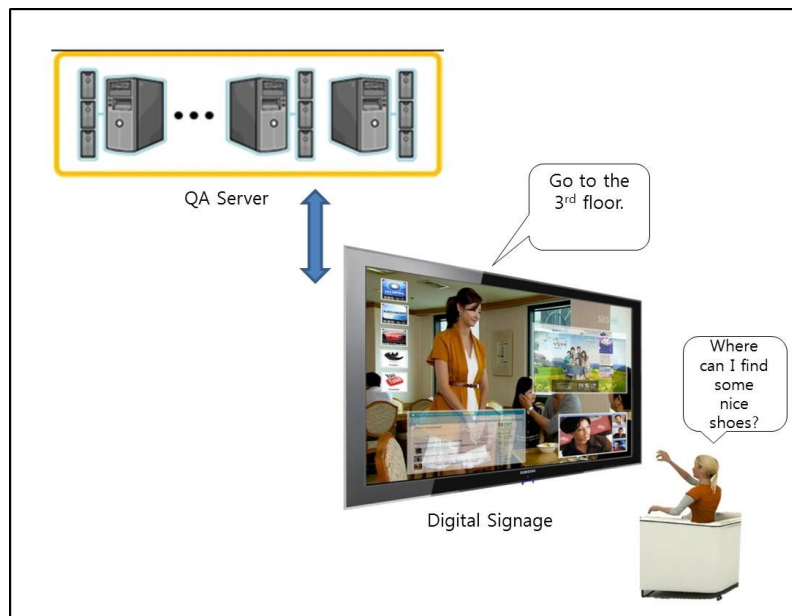
Figure 7-4 – DS with QA function: at the mall

(2)   Interaction scenario

− Michelle visits a shopping mall in Paris. There is a DS terminal device in the front of the mall. The DS terminal device's displays information about shops in the mall. It has QA functions to answer to visitors' questions on the shops in a natural language.

− Michelle asks "Where can I find some nice shoes?" The DS system understands the question by speech recognition and answers, "Go to the 3rd floor."

− The DS terminal device provides more information about the shop in the mall as well as providing answers to questions such as shop hours. The answers can be presented in a text or graphical form at the DS screen or provided in a spoken form by speech synthesis.

(3)   Contents provided to user by interaction

− Answers in text, graphical, or in a spoken form to the user's verbal question

(4)   Used function and information flow

–   Question from the user passes to the QA module in DS system through IF-a

–   Answers from the QA module in DS system are sent to the user through IF-d, IF-c and IF-a

7.5   Virtual fitting using augmented reality

(1)   Overview

DS terminal devices can provide virtual fitting experience by use of camera and augmented reality (AR) technologies. Augmented reality (AR) is a composite view of the physical, real-world environments (images, video, etc.) whose elements are augmented (or modified, diminished) with a virtual scene generated by the DS services. See Figure 7-5.

Figure 7-5 – Virtual Fitting Services with AR

Through the virtual fitting service, customers can view themselves on a monitor wearing or holding a product for sale without actually wearing or holding it. It is possible for the customer to choose and order products regardless of them being in stocked. This kind of terminal devices can be installed inside or outside a store. It is also possible to maximize user experience by presenting virtual fitting with the real sized display.

(2)   Interaction scenario

–   Mike wants to buy some shirts, and Iris wants to by some hats and accessories that match the new dress she is wearing. They stop by a store that has a DS terminal device that provides a virtual fitting service in front of the store.

–   Mike manipulates a control panel that supports touch interface or gesture recognition to select the shirts he likes. He sees himself in the screen wearing the shirts for sale. He changes the colours and design of the shirts through the virtual fitting service.

–   Meanwhile, Iris uses another terminal to show her virtually wearing the selected hats to see which matches best her new clothes and accessories.

–   Mike and Iris try as many variations as are provided by the store through the virtual fitting service.

(3)   Contents provided to users by interaction

–   Contents of virtual fitting with augmented reality

– Information on products such as price, colour, size, weight, etc.

(4) Used functions and information flow

– User chooses products through virtual fitting by the touch interactions or gesture recognition. Detailed information on products will be delivered to application functions through IF-a and IF-c.

– The DS terminal device provides virtual fitting by projecting a captured video of the user as well as mixing the image of products. This provides an immersive experience to user. This information will be delivered through IF-c and IF-a.

7.6 Disaster information service

(1) Overview

If a disaster occurs in the department store, DS terminal devices which are placed in the affected areas can be used to show urgent information about the disaster that have occurred in the mall, guidelines regarding evacuation, and safety procedures. People in the department store can get the detailed information of the disaster situation and also the route to the safe emergency exits from DS terminal devices. DS terminal devices will need to provide barrier-free presentation functionality of the disaster information for the audio-visual disabled. DS terminal devices can also provide barrier-free presentation functionality of emergency communication for the disabled person.

Meanwhile, for situations in which there is no person in the disaster area, DS terminal devices can have a sensing device such as a thermometer or a camera. DS terminal devices can have a disaster perception function. If DS terminal devices recognize such a disaster, DS terminal devices can send automatically the perceived information to DS server. The DS server will provide disaster information and route to safety emergency exit information.

NOTE – This use-case expands the interaction model of audiences including their environment. DS terminal devices do not directly interact with audiences but senses their environment information even without audiences.

(2) Interaction scenario

– There are various types of DS terminal devices within a shopping mall. Some of them are used as directory maps showing detail information of the department store, which is placed at the entrance of the mall. Some are used as a sign board which is placed on top of a wall indicating various signs such as restrooms and directions to emergency exits.

– If a disaster such as a fire occurs in a department store, DS terminal devices which are placed in the affected areas can be used to show urgent information about the fire in the mall, guidelines regarding evacuation, and safety procedure. For example, in case of a fire, DS server sends a command to DS terminal devices located near the affected area to display the detailed information and safety guidelines related to the fire.

– People in the department store can get the detailed information from DS terminal devices of the disaster situation and also the route to the nearest emergency exit. Routes regarding safe emergency exits are statically stored in DS terminal devices and are prepared for each disaster situations.

– DS terminal devices will need to provide barrier-free presentation functionality of the disaster information for the audio-visual disabled. For example, DS terminal devices can display the disaster information in a form of a narration or in sign language, etc.

– DS terminal devices can provide a telephony service for the person who first discovers the disaster and that person can make an emergency call to the DS server or emergency service which can trigger other DS terminal devices to display the emergency information.

- DS terminal devices can provide barrier-free presentation functionality of emergency communication for the disabled persons. For example, DS terminal devices can be provisioned with emergency communication accessibility in the form of a speech, motion, gesture recognition, etc.)

- For situations in which there is no person in the disaster area, DS terminal devices can have sensing devices such as a thermometer or a camera. DS terminal devices can have the disaster perception function such as identifying the temperature exceeding a certain level, or recognizing flames through a camera. If DS terminal devices recognize such a disaster, DS terminal devices can send the perceived information to DS server automatically. DS server will provide disaster information and routes to the safe emergency exits.

- In case of electrical shortage, DS terminal devices will need to control light brightness for people to be fully aware of disaster situation and to provide routing information to safe emergency exits. In case of the electrical outages, DS terminal devices will need to maintain the last display presented regarding routing information to the emergency exit.

(3)   Contents provided for users by interaction

- Information regarding disaster route to the emergency exit

(4)   Used functions and information flow

- Disaster information is displayed on DS terminal devices for users through IF-c and IF-a.

- User can retrieve detailed disaster information and route for emergency exit by interaction with DS terminal devices through IF-a.

7.7   Parking guidance service

(1)   Overview

For guiding drivers to find their parked cars in a parking facility, the DS system combined with parking guidance system can provide information such as images and location of the parked car, and a detail map of the parking facility, since it always provides advertisements to be viewed by drivers before drivers use the parked car search function on DS terminal devices. See Figure 7-6.

Drivers can see the exact location of the car by entering the license plate number or any information that can be used to identify the driver's car. Interactive DS terminal devices such as self-standing kiosks can help the drivers to be informed about the current situation of their parked cars with touch-screens operation.
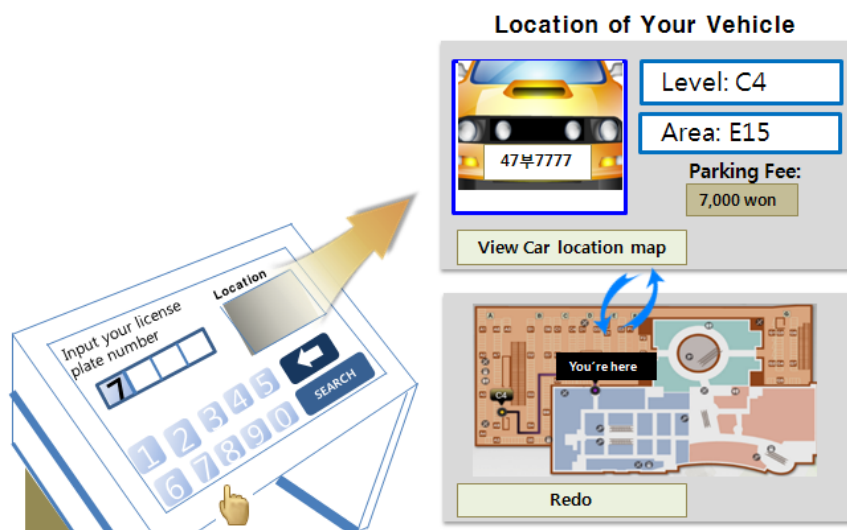

Figure 7-6 – Parking guidance system with DS

(2)   Interaction scenario

–   Joon forgot where he parked his car at a mall parking because the parking facilities of the shopping mall are very crowded and unorganized. He does not remember where he parked his car. Fortunately, the parking lot of the shopping mall has interactive DS terminal devices that can be found at several locations throughout the mall. The DS terminal device shows advertisement as well as the additional information icons within its display area.

–   He selects a "parking guide service" icon displayed on the screen of the kiosk. An operation console is shown on the screen. To use the parked car search function, he briefly watches a short advertisement on the screen of the kiosk.

–   Joon is presented with the parked car search function. He enters his license plate number using the touch-screen of one of the DS terminal devices that are installed at the entrance and exits of parking facilities at the mall. The DS terminal device displays the image and location of his parked car. Also, it displays the best route to get to the parked car and the expected parking fee.

(3)   Contents provided to users by interaction

–   The image and location of driver's parked car

–   The route from the kiosk to the location of the parked car

(4)   Used function and information flow

–   Information is displayed on the DS terminal device for users through IF-c and IF-a.

–   User can retrieve detailed information by interaction with the DS terminal device through IF-a.

8   Use-cases of indirect communication using IF-b

8.1   Traffic information services

(1)   Overview

When a delay has occurred in a transportation system due to vehicle breakdown or traffic accident, the DS system placed at a bus stop or train station shows the current service information. Moreover, in combination with a mobile terminal device, the DS system interacts with the mobile device operated by a user and provides detailed information of the situation or possible alternative routes (see Figure 8-1).

(2)   Interaction scenario

–   Alice wants to go to Aosaka station by taking the bus for Higashi-Aoyama and Aoyama line subway. She comes to Higashi-aoyama-icchoume bus station and finds, via the DS, that the Aoyama line has stopped due to signal failure.

–   She picks up her mobile terminal and connects it to the DS with a wireless network. The DS sends detailed information of detour routes to the mobile terminal that suits her destination. She is informed that it is faster to get Aosaka station with the bus for Nishi-aoyama than with the bus for Higashi-aoyama. She can change the transportation method and happily reach Aosaka station.

Figure 8-1 – Traffic information services

(3)   Contents provided to users by interaction

–   Traffic situation information

–   Delay information of each traffic system

–   Alternative route of the user's intended destination sent to the user's mobile terminal device

(4)   Used functions and information flow

–   Traffic information control function (other business function) provides current traffic situation information through IF-d.

–   Traffic information is displayed on the DS terminal devices for users through IF-c and IF-a.

–   User can retrieve detailed information such as detour information by direct operation with DS terminal devices (IF-a) or by using his/her mobile terminal device connected to DS (IF-b).

8.2   Interactive coupon services

(1)   Overview

When customers pass the coupon gate DS system at the entrance of a shopping mall, the DS system that shows shopping information distributes a personalized coupon to their mobile terminal after estimating their gender and age, etc. from the video image captured by the video sensor connected to the DS system (see Figure 8-2). The customers who receive a coupon can be guided to the shop by another DS system placed in the shopping mall. They can, of course, use the coupon to get a discount at the time of payment.

Figure 8-2 – Interactive coupon gateway services

(2)   Interaction scenario

– Bob comes to the shopping mall. He finds that the DS is passing out coupons. He sets up his mobile terminal to get as many coupons as possible.

– When he walks through the gate near the DS, he can get the coupons automatically as determined by the DS according to his gender and age and estimated interest. After entering the mall, he is guided to the shop with his mobile terminal device which interacts with other DSs on the way. When he buys his desired item, he can redeem the coupon for a discount with the DS in the shop.

(3)   Contents provided to user by interaction

– The coupon(s) suits the customer's attributes

(4)   Used function and information flow

– DS terminal devices provide guide information through IF-a.

– Attributes of the customer are sent for processing to other business functions through IF-a, IF-c and IF-d.

– The coupon provided to the customer is selected by another business function and is sent to the mobile terminal device through IF-d, IF-c, and IF-b.

– The coupon is used in the shop through IF-a or IF-b.

8.3 Automatic vending services

(1) Overview

At the station or the airport, customers download newspapers, magazines and movies, etc. to their mobile terminal from the DS system, which works as an automatic vending machine. For example, on the way to the office, the digital news stand which is a DS system with a vending machine function provides electronic newspapers and magazines with e-cash payments to the mobile terminal; free contents can also be easily transferred. Moreover, at a digital movie stand which is also a DS system, customers can download the latest movies and television programs, etc. into the mobile terminal and subscribe to a movie for home use as a streaming service. It is possible to pay by e-cash. This is illustrated in Figure 8-3.
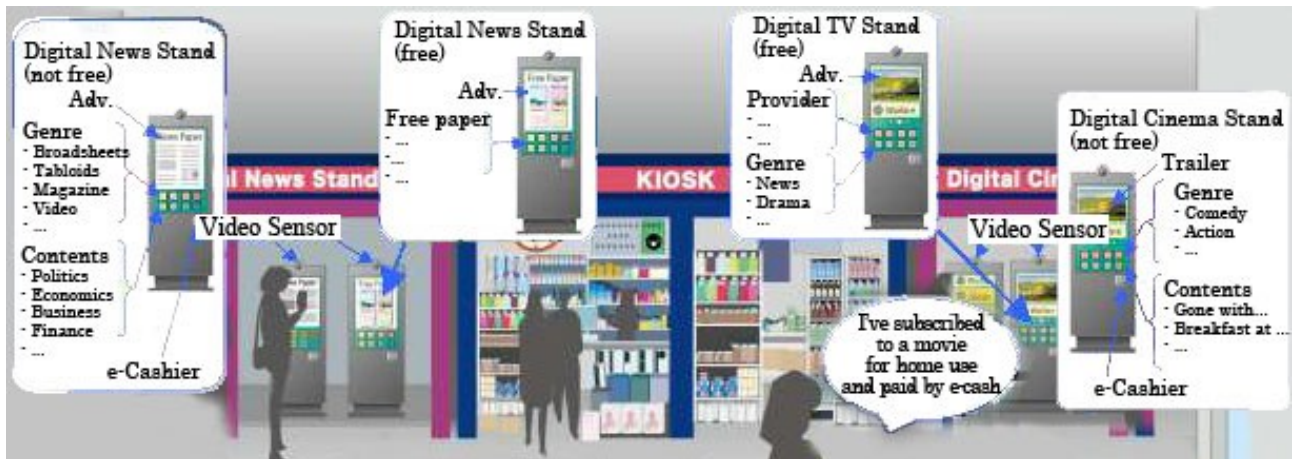

Figure 8-3 – Automatic vending services

(2) Interaction scenario

– Alice wants to read a latest electronic newspaper that is delivered only in the train station, every morning with her mobile terminal on the way to her office.

– When she arrives near a digital news-stand of DS system, her mobile terminal downloads the newspaper from the nearest DS system, because she contracts in advance with the DS to buy the latest newspaper every day.

– Tom needs to take a two-hour train journey to meet his friend. In the train station, he saw a digital cinema stand of DS system with varieties of latest movies and television programs.

– When he approaches the DS terminal device, the terminal senses his attributes from the video sensor as he is a young boy and shows a list of movies suitable for a young boy. He selects a movie from the list and pays for the movie. Tom used pre-paid e-cash for quick transactions.

– The DS terminal device downloads the selected movie to his mobile terminal. Tom gets on the train and watches the downloaded movie on his journey.

– Alice and Tom also get the local information near the station from the DS terminal device at the same time of their content downloads. Such information is provided as an advertisement from the DS terminal device owner.

(3) Contents provided for users by interaction

– Local contents such as those specific to the place

– Digital newspaper automatically downloaded to the subscriber's terminal device.

– Video contents downloads to user's terminal device

– Payment through E-cash transaction.

(4)   Used functions and information flow

–   Various guide information contents are provided by other business functions through IF-d and are shown through IF-c and IF-a.

–   Audience attributes are checked by DS terminal device's video sensor (IF-a).

–   Advertisement selection is done in DS application function. Thus, it is sent through IF-c and presented in the DS terminal device by IF-a.

–   Payment are done by IF-a, and settlements are done by IF-b (NFC, etc.)

–   Content downloads are done by IF-b (for the mobile terminal device by wireless networks or fixed network in the case of home stay).

8.4   Local tourist information service

(1)   Overview

DS terminal devices can be installed in the public transportations such as buses or subways, to provide guided information to the people using such means of transportation. It is tourist information to help the visitors using the public transportation to easily get to tourist attraction of interest. With use of location detection technologies, it is possible to detect the current location of the public transportation. DS terminal devices installed in the transportation can be used to provide tourist information of the next stop. With coordination with DS terminal devices installed in the bus stop, tourists can be provided with more information needed to get to the tourist attraction. Tourists can use their mobile terminal device to store the detailed information and links regarding the tourist attraction. See Figure 8-4.
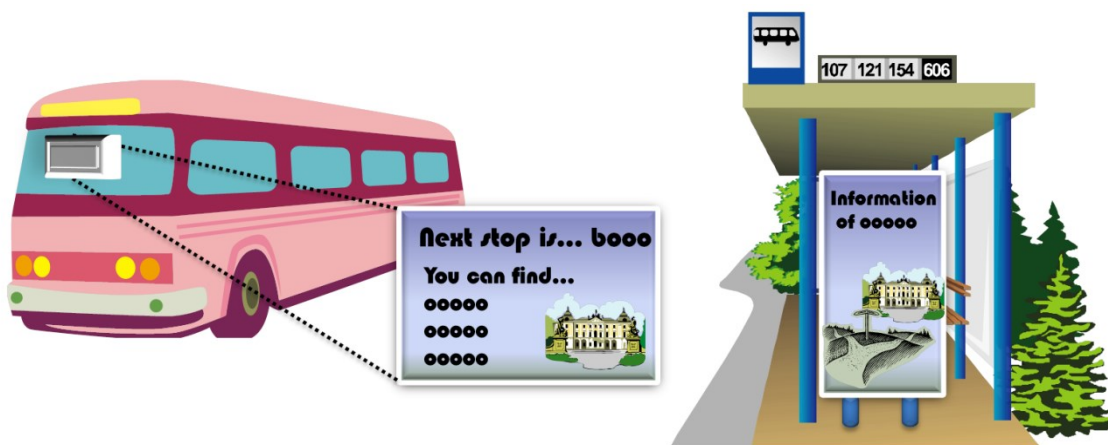

Figure 8-4 – DS terminal in the bus and bus stop

(2)   Interaction scenario

–   Alice is currently on a vacation visiting a city renowned for many historical sites. She wants to visit a small castle that has a beautiful garden located inside a quiet neighbourhood, which is not easily found by the outsiders.

–   She took a bus that would get her to the castle. Since the city has many historical sites, the public transportation system uses the DS systems to provide local tourist information to the public.

–   The DS terminal device in the bus shows list of historical sites and other tourist attraction that can be found in the next stop. The tourist attraction also includes shows or events that are being held or will soon be held near that location.

–   Alice is near-sighted and could not see the bus monitor clearly. She requests synchronization with the bus monitor to her mobile device. Thus, she can in her mobile device whatever is displayed in the bus DS terminal device.

–   Alice looked at the monitor of her mobile device and saw that the next stop contained the name of the castle where she was headed. She got off the bus at the proper stop with the help from the DS terminal in the bus. Alice saw that the bus stop was in a quiet neighbourhood where she could not find any person that could help her to get to the castle which is located about on kilometre from the bus stop.

–   Alice saw the DS terminal device in the bus stop that showed information of the next buses that is expected to arrive.

–   She saw that the DS terminal device also provides information regarding local historical sites located near the bus stop. She searched and selected the name of the castle she was headed. The DS terminal device provided maps and pictures showing direction on how to get to the castle and other information related including a QR code that can connect to the mobile version of the castle's website. Alice downloads information needed to her mobile device and easily finds the castle to enjoy her visit.

(3)   Contents provided to users by interaction

–   Information synchronization with the DS terminal device in the bus with the mobile device.

–   Maps/pictures of direction with the DS terminal device in the bus stop.

(4)   Used functions and information flow

–   Local tourist information regarding each bus stop to the DS terminal device in the bus through IF-d.

–   Synchronization between DS terminal device in bus and mobile terminal device through IF-b.

–   Details of the local tourist information to the DS terminal device in the bus stop through IF-d.

–   User retrieved maps/picture of direction with DS terminal device in the bus stop through IF-b.

8.5   Interactive services based on wish lists

(1)   Overview

A user can have a wish list that contains wide variety of products including groceries, appliances, furniture, clothes, accessories, medicine, etc.; see Figure 8-5. Normally, a store sells part of the products in the wish list. A DS system can make use of the wish list and provide information on some of the products in the wish list that are offered by the corresponding store. The same wish list can be used by other stores that offer different variety of products. For example, a supermarket can provide sale information on groceries, and furniture store can provide sale information on furniture.

This use case provides DS service based on the user's wish list which is more accurate than the DS service based on a user's appearance. Users can have a wish list not only for themselves but also for family or friends. This way, the DS system can provide better information that fits their needs through the use of wish lists.

Customers prepare a wish list on their mobile phone. When they approach a DS system at the entrance of a shopping mall, the DS terminal device displays shopping information according to the wish list for items available in the shopping mall. The DS system can communicate with the customers' mobile terminal devices to get the customers' wish lists. Customers can download the personalized shopping information on the DS screen. Customers can watch the advertisement on commodities that are in the wish list.

Figure 8-5 – Interactive services based on wish list

(2)   Interaction scenario

–   Alice has a wish list containing milk for her child, shaving lotion for her husband and a toaster. She prepared a wish list in her mobile phone at home.

–   Alice enters a shopping mall that has a grocery store and pharmacy. At the entrance of shopping mall, she sees a DS terminal device, which supports interactive service based on the wish list of the mobile phone through NFC.

–   She touches the DS terminal device with her mobile phone to get the information on some of the products that are in the wish list. The DS displays a map including goods that she can buy in this shopping mall.

–   She can see pointers on the map to shops where to get milk and shaving lotion. Since the shopping mall does not sale toasters, it does not display sales information regarding toasters.

–   As Alice selects shaving lotion, the DS terminal device displays information of the shaving lotion along with special offers such as sales, promotion, event and coupons.

–   She checks the information and touches the DS terminal device to download the map and selected information to her mobile phone. Now she can see the map and special offer information in her mobile phone's screen. It provides guide to reach pharmacy that sells shaving lotion in the shopping mall.

–   After buying the shaving lotion, Alice goes in front of the DS terminal device at the grocery store, the DS terminal device starts to display the advertisement of new 'B-brand' milk, she picks up the milk because she thinks it is healthier for her child than the usual one she normally buys.

(3)   Contents provided to user by interaction

–   Shopping information (map and special offers) suits the customer's wish list

–   Advertisement of goods based on customer's wish list.

(4)   Used function and information flow

–   Wish list of customer is sent to other business functions through IF-b, IF-c and IF-d.

–   Personalised information on wish list is created by other business function and is displayed on the DS terminal device for customer through IF-d, IF-c and IF-a.

–   Customer selects the detail information by interaction with DS terminal device through IF-a

–   Selected information by customer are sent to the mobile terminal device through IF-b.

–   Advertisement of commodity based on wish list is displayed on the DS terminal device for customer through IF-d, IF-c and IF-a

8.6   Remote control by a smartphone

(1)   Overview

A smartphone can be used as a remote controller enabling audience to manipulate navigation functions of a DS terminal device from distance area instead of touching screens directly. See Figure 8-6.

(2)   Interaction scenario

–   Henrietta is looking for a restaurant through the DS terminal device in the shopping mall. A cursor on a screen of the DS terminal device can be moved based on a detection of her actions with her own smartphone.

–   She selects one food category "noodles", and relevant restaurant information automatically gathers around the cursor. She checks details of one candidate restaurant, and moves to the restaurant.

(3)   Contents provided to users by interaction

–   The detail information that a user wants to know through control of DS terminal device with user's mobile device.
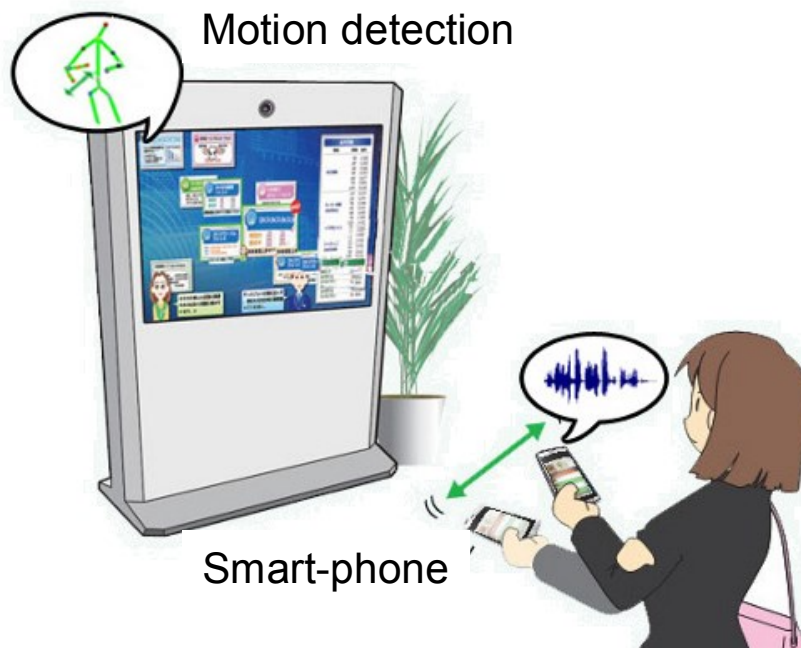

Figure 8-6 – Remote control scene

(4)   Used function and information flow

–   Information is displayed on the DS terminal device for users through IF-c and IF-a.

–   User's mobile device controls the DS terminal device through IF-b.

8.7   Flash sale service using mobile terminals

(1)   Overview

A sales manager can use the mobile device to control the DS terminal to immediately display a special event or promotion (flash sales). In addition, flash sale notification can be pushed to the other user's mobile terminals. This is illustrated in Figure 8-7.

Figure 8-7 – Flash sale service in real-time by mobile terminals

(2)   Interaction scenario

–   Steven, the sales manager, decides to initiate a flash sales on A-brand lipstick. He takes pictures of the A-brand lipstick and writes some texts informing flash sale service with his mobile phone. He selects the DS terminal devices which he wants to display. Then he presses a button in his mobile phone to post the special event to the DS terminal devices. The selected DS terminal devices display the request of flash sale service immediately.

–   Alice has registered for promotion notification service provided by the mall. She is window shopping in the mall and her phone rings. She is notified of Steven's flash sale event. She remembers her son wanted to buy an A-brand lip stick. Details of the event and a store map are displayed on her mobile phone. She immediately goes to Steven's shop and buys the A-brand lip stick for her son at the discounted price.

(3)   Contents provided to user by interaction

–   Notification of the promotion information (discount prices, flash sale event time, location and etc.)

(4)   Used function and information flow

–   Promotion information is sent, as a request of flash sale service, to the DS system through IF-b.

– The request of flash sale service is processed in application functions and the processing results are displayed on DS terminal devices through IF-c.

– Relevant flash sale notification is simultaneously pushed to customer's mobile terminal through IF-b

8.8 Zone-based personalized advertisement service

(1) Overview

Zone-based personalized advertisement can provide a personalized mobile advertisements page, which includes synchronized advertisement on a big wall screen. It also can provide some other mobile advertisements which are tightly related. Zone is an area in which a user can communicate DS terminal devices with user's mobile terminal. This is illustrated in Figure 8-8.
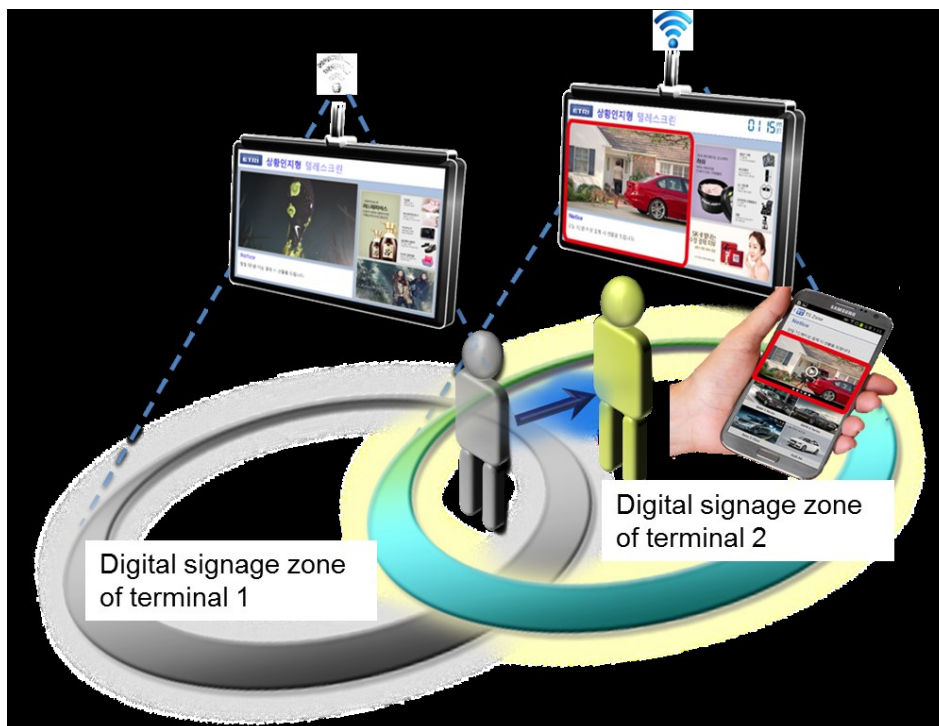

Figure 8-8 – Zone-based personalized advertisement service

(2) Interaction scenario

– John is shopping in a shopping mall. He can see a big wall screen that is displaying a car advertisement. John had plans to change his car and he wants to see the car advertisement in more detail. He approaches the big wall screen, gets an application from the DS system and executes it in his mobile phone. His mobile phone displays the thumbnail of a car advertisement.

– He can also watch some advertisements that are tightly related to the car advertisement.

– After that he moves to another zone of DS terminal devices. He can communicate the DS terminal with his mobile terminal.

(3) Contents provided to user by interaction

– Mobile advertisements or relevant information which are related to the advertisement of a DS terminal device.

(4) Used function and information flow

– A DS terminal device provides means to communication with user's mobile terminal.

– Location information of the user's mobile terminal is sent to the DS system through IF-b to associate with a DS terminal devices.

– Relevant information related to the advertisement shown in the DS terminal devices is sent to customer's mobile terminal through IF-b.

8.9 Game coupled advertisement service

(1) Overview

Game coupled advertisement service can provide sales promotion for multiple audiences simultaneously by using a big wall screen of a DS terminal device and user mobile terminals. Whereas a big wall screen usually provides one-way videos or images, this service attracts users' attention to join an interesting game. This is illustrated in Figure 8-9.
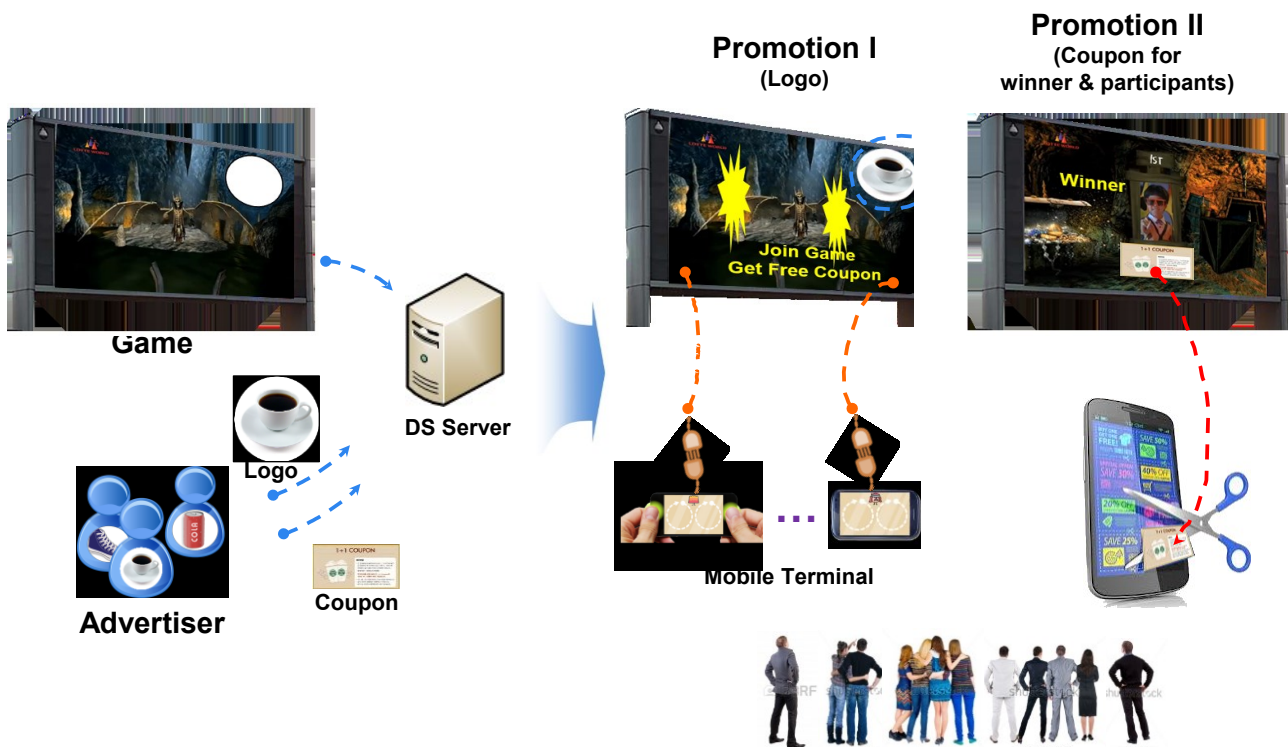

Figure 8-9 – Game coupled advertisement service

(2) Interaction scenario

– Peter and Alice are waiting for friends in front of a big wall screen of a DS terminal device. After a while, the DS terminal device announces the start of a game that provides coffee coupons to the winter. It attracts the people with the message "Join the game, get a free coupon."

– Peter and Alice join the game with their mobile terminal devices entering the announced URL. Peter and Alice play the game on the big wall screen using their mobile devices. While they are playing the game, a coffee shop logo is exposed to the people watching the game.

– Peter wins the game. After the game is over, the DS terminal device announces the winner of the game; a discount coupon is delivered to Peter's mobile terminal device.

(3) Contents provided to user by interaction

– User control of the game through a mobile terminal device.

– Advertisement contents (e.g., discount coupon, etc.) for sales promotion.

(4)   Used function and information flow

–   The user experience on the mobile terminal device through IF-b.

–   The game coupled advertisement service is processed in application functions and the processing results (e.g., winner or participants of the game) are displayed on DS terminal devices through IF-c.

–   Advertisement contents for sales promotion are sent to the mobile terminal devices of game winner or participants through IF-b'

8.10   Content adaptation service

(1)   Overview

Generally, content adaptation service for DS is needed when a mobile terminal device is required to support a DS terminal device. In apartment block, many residents are densely populated area, elevator display panel shows local news, many kinds of information delivering from a DS system. This terminal display supports audio, video contents as a DS terminal device. In this situation, residents are usually pre-registered with some private residence profile information, e.g. residence ID, cellular phone number, to an apartment management system. The DS system also can optionally support more interactive information to a mobile terminal's user after content adaptation processing with these residence profile information.

The scenario illustrated in Figure 8-10 is a general case of interaction procedure of content adaptation between a mobile terminal device and a DS system. It is assumed that the mobile device is already registered in a DS system, e.g. terminal device profile database. The system can be composed of device management functionality, profile database, content delivery server and application server. The device management functionality plays roles of detection of capability of the mobile terminal device. First, when the mobile terminal device is initially trying to connect the DS system and then a content server is ready to send DS information to the mobile terminal device. The DS system checks terminal device capabilities and/or service permissions before sending content to the mobile terminal device. If content adaptation is necessary, the content server sends information into the mobile terminal device after content adaptation.
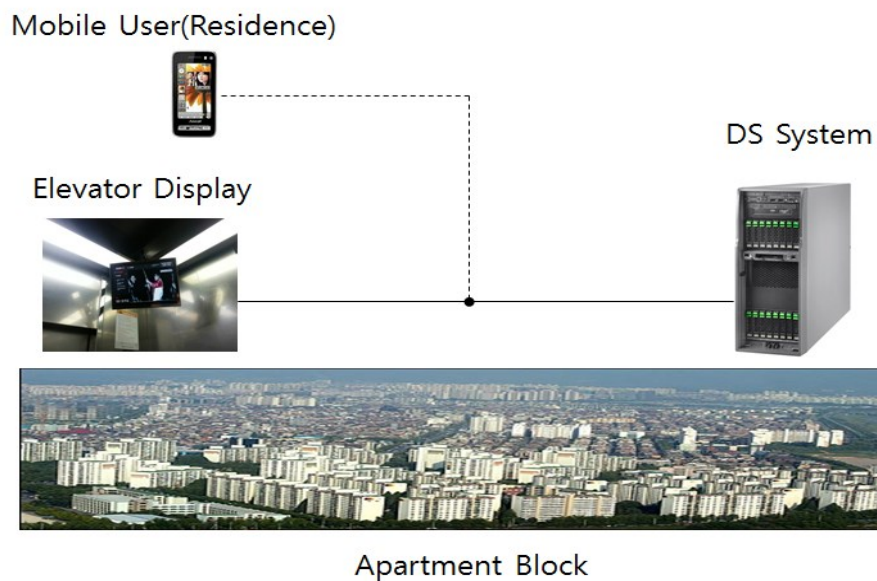

Figure 8-10 – Content adaptation service

(2)   Interaction scenario

–   Kim lives in an apartment, and he is getting on the apartment's elevator in every morning. In elevator, the display shows the brief district information, for example whether information, high-light news summary, etc. Some information is supporting with image format, and some with text format.

–   While he is on the elevator, he found interesting news, and starts reading the news, however in a short time later, elevator arrived at grand floor, therefore he stops reading from the display.

–   After getting off the elevator, he tries to connect the DS system of apartment with his mobile phone, and then receives mobile-adapted information from the DS system.

–   Further, he checks the survey message requests from the DS system, so he responds the request message to the DS system with his mobile terminal device.

(3)   Contents provided to user by interaction

–   Local district area information in a DS terminal device's screen, as well in mobile terminal devices

(4)   Used function and information flow

–   Content adaptation function provides information from the DS system to terminal devices through IF-c.

–   Local district information is displayed on the DS terminal devices, here the display panel, through IF-c and IF-a.

–   The resident mobile user, pre-registered personal profile information, can receive, send and retrieve information in DS server through IF-a and IF-b.

Appendix I

Requirement for interactive DS services

Requirements described in [ITU-T H.780] include the requirements for DS architecture relevant to interactive services. Particular requirements picked up from [ITU-T H.780] are listed in the following clause.

I.1 General Requirements

– The DS architecture can optionally provide specific user interfaces (e.g., touch-panels and mobile-phone linking) in order to enable two-way communications with audiences.

  NOTE 1 – cf. 7.1 in [ITU-T H.780]

– The DS architecture can optionally support audience measurement.

  NOTE 2 – cf. 7.1 in [ITU-T H.780]

Appendix II

Example of question answering architecture and natural language processing

This part provides information on question answering architecture and natural language processing (NLP) which is the core module of question answering system. Question answering (QA) is an advanced function to generate answers for the user's question in a natural language. Figure II-1 presents the example QA architecture. The QA system typically consists of question analysis module, answer generation module, natural language processing module and knowledge sources. The questions a user asks are analysed using natural language processing technology and the system finds what the user wants to know. With the target question, the knowledge sources are searched for the proper information. When the candidate answers to the user's question are ready, the best answer is selected using a confidence calculation. The next step is to prepare for the answer by answer generation module. The best answer is presented to the user using natural language generation technology.

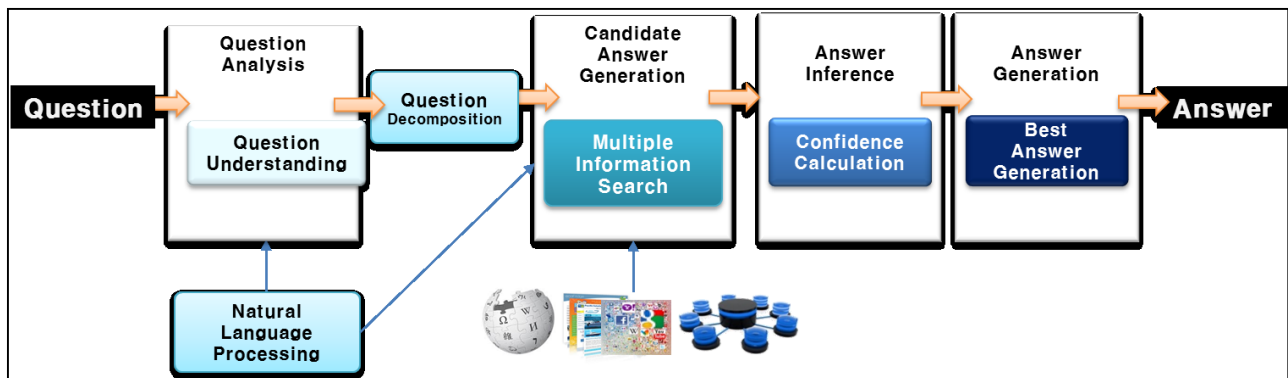The core module of QA system is NLP module is illustrated in Figure II-2.

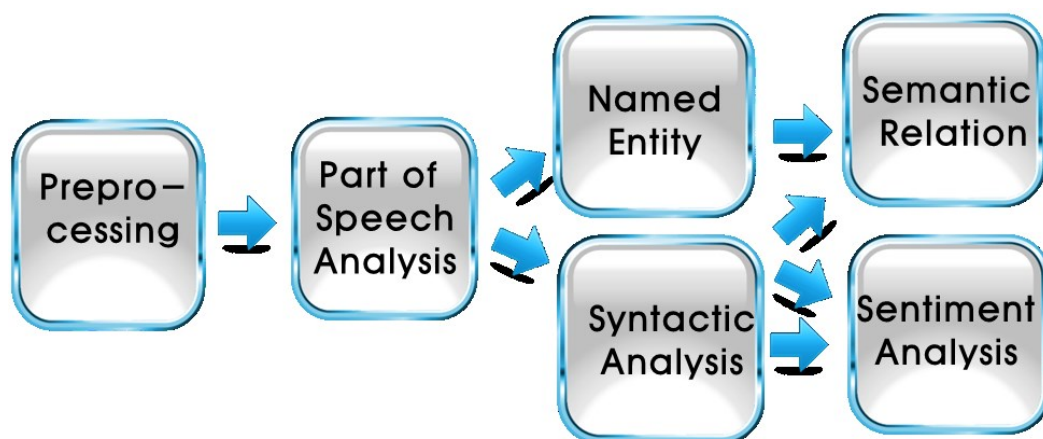**Figure II-1 – Example QA architecture**

Figure II-2 – Natural language processing

Figure II-3 shows an NLP example provided by social web. Social web is a candidate to provide NLP services over networks. Herein after, an example for social web is described in detail. Social web is the Internet space where users perform their social activities and exchange information with other users. Social web data include digital media (such as photos, pictures, videos, audio, and text) which is shared by people with social relations. In this figure, the process of social web data analysis is shown as an example of NLP. First, the social web contents are collected as shown in the box on the left. The data go through the pre-processing such as filtering redundant data, spam and false information. Next, the pre-processed text analysed for the part of speech, which is shown on the right box. Then the named entities are recognized using the part of speech tagged data. Syntactic analysis is performed as the next step for analysing the structure of the sentence. Final step of the NLP is recognition of emotion and semantic relations.
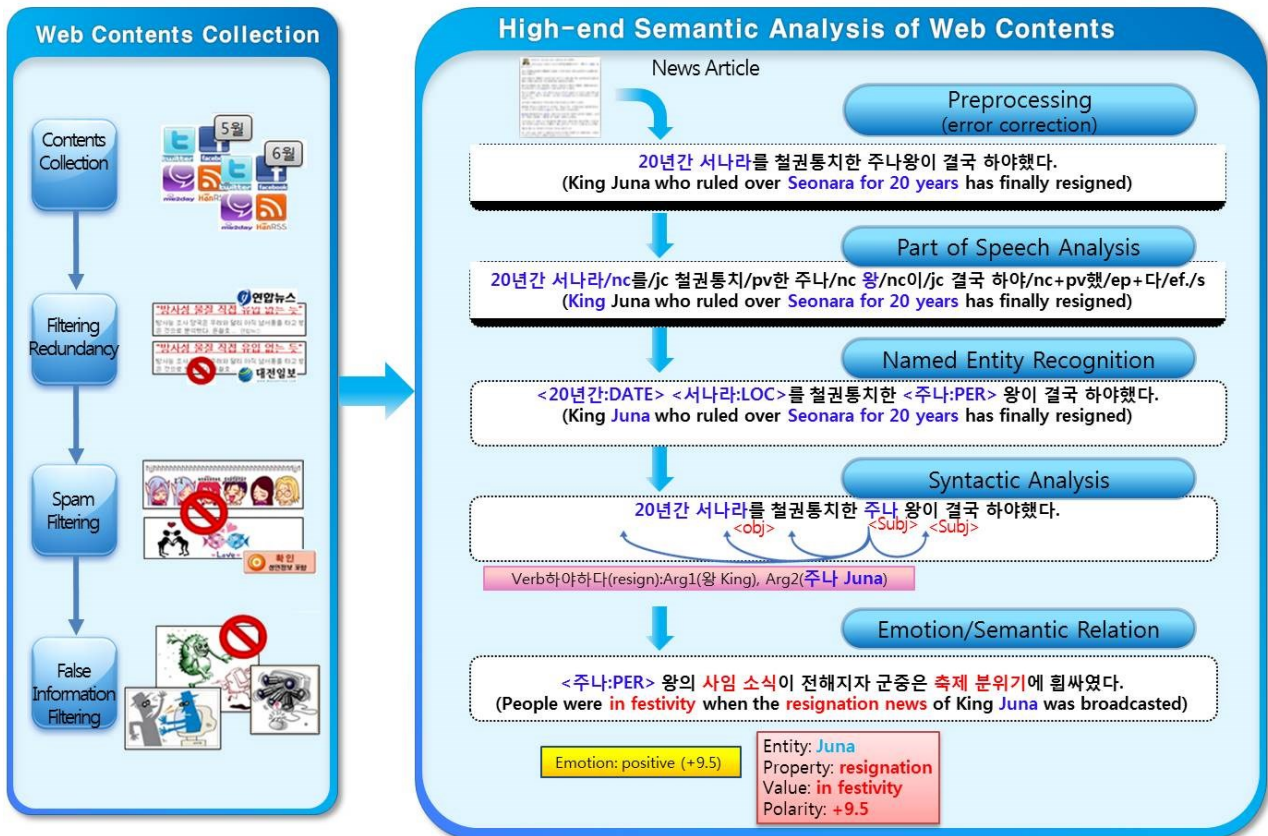

Figure II-3 – Natural language processing example for social web contents

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