**Title**: IMAGE DISPLAY DEVICE WITH AUTOMATIC SETUP FUNCTION ACCORDING TO BROADCAST INPUT SIGNALS

**Abstract**: The present invention relates to a signal processing device such as an image display device having facilitated setup function performing automatic setup steps according to broadcast input signals. More particularly, the present invention relates to signal processing device receiving a plurality of broadcasting services and comprising a digital TV processor, at least one tuner in association with a demodulator and a plurality of broadcast signal inputs said signal processing device further being in communication with a display unit.
Description

IMAGE DISPLAY DEVICE WITH AUTOMATIC SETUP FUNCTION ACCORDING TO BROADCAST INPUT SIGNALS

[0001] The present invention relates to a signal processing device such as an image display device having facilitated setup function performing automatic setup steps according to broadcast input signals.

[0002] Digital and interactive TV systems provide a comprehensive amount of TV channels and programs leading to the general outcome that conventional methods for configuring the operation of the image display device from among a plurality of setting parameters may become inefficient to the extent that it is unperformable in a time-saving manner.

[0003] Considering the fact that a large number of television and multimedia services are being made available to consumers today, methods for enabling the host, i.e. an image display device such as a TV set with a digital receiver-decoder to satisfactorily process the received services are required. An image display device may receive programs via cable or satellite broadcasting in the form of separate subscription formats.

[0004] Assuming that a TV service may have hundreds of channels, configuring channel information for a significant number of channels on a manual basis might take some serious time. It is to be noted that an image display device can be factory-configured such that channel information is preloaded for a plurality of channels, in which case, the image display device will be ready for the first use. Alternatively, users can initiate auto-scan function to automatically retrieve channel-specific information, generally based on a preloaded frequency range or transponder information.

[0005] The auto-scan function is generally performed such that both the preloaded frequency ranges are scanned, transponder list is checked or alternatively an additional blind scan is performed.

[0006] On the other hand, configuration of channel information can be better managed and users can be offered a less troublesome viewing experience without having to manually set scanning parameters.

[0007] Among others, one of the prior art disclosures in the technical field of the
present invention can be referred to as GB2480133, which discloses an apparatus comprising a circuit with an intermittent supply to a connector to detect if a High Definition Multimedia Interface device is connected. A first pin on a HDMI connector provides a pulsed hot pin detect (HPD) signal to the device when connected to an appliance, and a second pin receives the signal back from the device when connected and causes the intermittent HPD signal to be replaced by a DC supply when connected. The intermittent supply may be a voltage pulse with a controllable duty cycle of <20%, set by a programmable register, and a 5V DC supply when latched on. An over-current circuit may monitor current flowing from the DC supply and disconnect from the HDMI device, such as an HD display monitor, when excessive current is detected. The detection circuit may comprise a comparator to compare a voltage at the second pin against a threshold voltage.

[0008] The present invention provides a system and method by which an image display device is operable so as to automatically detect available broadcast input signals and configure channel settings in a facilitated and non-intrusive manner without requiring additional actions on the part of the user, as provided by the characterizing features defined in Claim 1.

[0009] Primary object of the present invention is to provide a system and method by which management of channel information in an image display device is automatically carried out.

[0010] The present invention proposes a signal processing device in the form of a receiver or image display device. The signal processing device receives a plurality of broadcasting services while at least one tuner supplies transport streams to a digital TV processor.

[0011] The digital TV processor performs a channel information retrieving operation by scanning of frequency bands and updating of transponders in association with a satellite. The signal processing device may process preloaded transponder lists in this respect.

[0012] The signal processing device comprises satellite broadcast and terrestrial/cable broadcast inputs in electrical connection with respective input circuits. The input circuits communicates with the digital TV
processor of the signal processing device so that presence of broadcast input connectors in the respective inputs associated with the satellite broadcast input and the terrestrial/cable broadcast input can be detected.

[0013] Accompanying drawings are given solely for the purpose of exemplifying a system and method by which an image display device is operable, whose advantages over prior art were outlined above and will be explained in brief hereinafter.

[0014] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in said claims without recourse to the technical disclosure in the description of the present invention.

[0015] Fig. 1 demonstrates a general flow diagram according to which the signal processing device of the invention executes the method according to the present invention.

[0016] The present invention proposes a signal processing device in the form of an image display device or a set-top box receiving programs via cable, terrestrial antenna or satellite broadcasting in the form of separate subscription formats. A set-top box typically contains a plurality of tuner inputs, operating in connection with an image display device. Alternatively, the image display device itself can receive programs using cable, satellite or over-the-air (terrestrial) built-in tuners.

[0017] Digital and interactive TV systems provide a comprehensive amount of TV channels and programs. A conventional structure receiving program contents receives a transport stream via a tuner. In order for viewing a first program content and processing a second program content, the receiver-decoder should have at least two tuners, which also enables various types of services including interactive functions such as picture-in-picture.

[0018] The signal processing device in the form of an image display device in accordance with the invention can be connected to a set-top box, the latter having at least one tuner. The image display device itself or the receiver (set-top box) can therefore have multiple tuners as well as demodulators suitable for receiving broadcast multimedia content. In this regard,
receivers capable of receiving and tuning to signals of different generations (e.g. DVB-T and DVB-T2, DVB-S and DVB-S2, DVB-C and DVB-C2) can be in use.

[0019] Frequency bands allocated to terrestrial or cable broadcasting services using radio signals are scanned by the image display device or the receiver/set-top box such that all television broadcasting signals are searched. Typically, an initial scanning frequency and a search interval are determined and sequential or incremental search is performed so that signals within the entire band are scanned. Frequencies in all television broadcasting channels within a bandwidth are thereby recorded.

[0020] On the other hand, satellite broadcasting involves a frequency band of 10.7 – 12.75 GHz while a Low Noise Block (LNB) converts the signal into a 950 – 2200 MHz frequency band as supported by the receiver. The tuners are typically connected to dish antennas collecting satellite signals to be focused by the parabolic curvature thereof. Conventionally, signal received from a satellite dish is amplified by the low noise amplifier (LNA) and converted to IF signal (Intermediate frequency) in the form of a block of frequencies by a block converter (the LNB, low noise block downconverter), which can then be processed by the demodulators. The demodulators then typically output transport streams to a digital TV processor having an audio/video processing unit, which accordingly processes said transport streams and retrieves service data for all the channels. The intermediate frequency is created by mixing the carrier signal with a local oscillator signal by heterodyning, which allows the signals in microwave frequencies to be sent over a length of cable. The output of the mixer is an IF signal of a specific bandwidth that can be amplified.

[0021] By way of scanning terrestrial and cable frequencies and processing the signal received from a satellite dish, specific information of each channel is retrievable. A transponder typically receives a television signal from the satellite uplink stations on the ground, encoding, amplifying and rebroadcasting the same. Transponder parameters typically involve satellite name, transponder frequency in MHz, polarization, symbol rate in
Ksym/s etc.

[0022] The signal processing device can be factory-configured such that channel frequency information, i.e. frequency ranges for each channel, is preloaded for a plurality of channels. Likewise, the image display device can be factory-configured to have a satellite’s transponder list. However, as the actual transponder list of a satellite can expand in time so as to accommodate new entries along with old ones, a channel whose transponder information is not updated will typically be viewed as a blank screen during channel surfing.

[0023] The present invention proposes a system and a method for operating an image display device, having a facilitated channel information retrieving operation as delineated below. The automatic channel information retrieving operation of the invention can be automatically called on a periodical basis by setting a time interval such that frequency ranges and transponder information in association with a plurality of channels are processed and channels that exhibit signal error are automatically cleared.

[0024] To this end, the signal processing device of the present invention executes the method of retrieving channel information to be implemented in the following manner: The signal processing device initiates the automatic channel information retrieving operation based on frequency ranges for terrestrial and cable frequencies and the preloaded transponder list. Television broadcasting signals are searched and parameters such as frequency, symbol rate and polarization of a transponder are fed to the demodulators to verify whether signal lock is achievable.

[0025] According to the present invention, the type of the available broadcast signal is automatically detected by the signal processing device as will be delineated hereinafter. The signal processing device typically comprises a plurality of broadcast signal inputs and presence of available input signals is notified to the user prior to initiating the automatic channel information retrieving operation. This is particularly advantageous in that the user can either review the information as to the available signal sources and recheck cable connections if needed or just verify the accuracy of the notified information.
[0026] To this end, the signal processing device receiving a plurality of broadcast services can initiate the automatic channel information retrieving operation without requiring user intervention. The scanning operation will not be initiated if no signal source is connected and if initiated, only the frequency ranges for terrestrial and cable frequencies or the preloaded transponder list will be processed. If both the satellite broadcast and the terrestrial/cable broadcast input connectors are connected, available sources will be notified to the user and the auto-scan or blind scan operation will be carried out for the respective sources.

[0027] Conventionally, switch contacts can be provided with one normally closed (NC) contact, which is connected to the tip connection when no broadcast input connector is in the socket, and disconnected when a broadcast input connector is plugged. In other words, the respective broadcast input connector can conventionally break the contact of a normally closed contact. Therefore the digital TV processor of the signal processing device in electrical communication with two respective input circuits associated with the satellite broadcast input and the terrestrial/cable broadcast input continuously monitors presence of respective broadcast input connectors in the respective inputs.

[0028] In summary, the present invention proposes a signal processing device receiving a plurality of broadcasting services and comprising a digital TV processor, at least one tuner in association with a demodulator and a plurality of broadcast signal inputs, the signal processing device further being in communication with a display unit.

[0029] According to one embodiment of the present invention, said digital TV processor is configured to effect initiation of a channel information retrieving operation by means of at least one tuner in the manner that presence and type of broadcast signal is automatically detected by the digital TV processor of the signal processing device prior to the channel information retrieving operation and the channel information retrieving operation is automatically effectuated only for the type of broadcast signals whose presence is thereby detected.

[0030] According to a further embodiment of the present invention, the type and
presence of the broadcast signals in the form of terrestrial/cable and/or satellite broadcast signal is detected.

[0031] According to a further embodiment of the present invention, presence and type of available input signals is notified prior to initiating the automatic channel information retrieving operation.

[0032] According to a further embodiment of the present invention, the signal processing device comprises satellite broadcast and terrestrial/cable broadcast inputs in electrical connection with respective input circuits in the manner that the digital TV processor of the signal processing device in electrical communication with two respective input circuits associated with the satellite broadcast input and the terrestrial/cable broadcast input continuously monitors presence of broadcast input connectors in the respective inputs.

[0033] According to a further embodiment of the present invention, an auto-scan or blind scan operation is automatically initiated when a broadcast input connector is connected to a respective satellite broadcast and/or terrestrial/cable broadcast input.

[0034] According to a further embodiment of the present invention, type and connection status of a broadcast input connector is notified when a satellite broadcast and/or terrestrial/cable broadcast input connector is disconnected from a broadcast input.

[0035] According to a further embodiment of the present invention, a broadcast input connector breaks the contact of a normally closed contact of switch contacts when connected to a respective broadcast input.

[0036] According to a further embodiment of the present invention, the signal processing device is an image display device or a set-top box.

[0037] Therefore, the present invention facilitates the channel information retrieving operation. In this regard, the present invention ensures that configuration of channel information settings can be better managed in a less intrusive and substantially shorter manner such that users are offered a less troublesome viewing experience without having to individually select broadcast sources. The present invention therefore substantially facilitates maintenance of the channel information without requiring user intervention.
Claims

1. A signal processing device receiving a plurality of broadcasting services and comprising a digital TV processor, at least one tuner in association with a demodulator and a plurality of broadcast signal inputs, the signal processing device further being in communication with a display unit, characterized in that the digital TV processor is configured to effect initiation of a channel information retrieving operation by means of at least one tuner in the manner that presence and type of broadcast signal is automatically detected by the digital TV processor of the signal processing device prior to the channel information retrieving operation and the channel information retrieving operation is automatically effectuated only for the type of broadcast signals whose presence is thereby detected.

2. A signal processing device as in Claim 1, characterized in that the type and presence of the broadcast signals in the form of terrestrial/cable and/or satellite broadcast signal is detected.

3. A signal processing device as in Claim 1, characterized in that presence and type of available input signals is notified prior to initiating the automatic channel information retrieving operation.

4. A signal processing device as in Claim 1 or 2, characterized in that the signal processing device comprises satellite broadcast and terrestrial/cable broadcast inputs in electrical connection with respective input circuits in the manner that the digital TV processor of the signal processing device in electrical communication with two respective input circuits associated with the satellite broadcast input and the terrestrial/cable broadcast input continuously monitors presence of broadcast input connectors in the respective inputs.

5. A signal processing device as in Claim 4, characterized in that an auto-scan or blind scan operation is automatically initiated when a broadcast input connector is connected to a respective satellite broadcast and/or terrestrial/cable broadcast input.

6. A signal processing device as in Claim 4 or 5, characterized in that type and connection status of a broadcast input connector is notified when a satellite broadcast and/or terrestrial/cable broadcast input connector is disconnected from a broadcast input.
7. A signal processing device as in Claim 4, 5 or 6, characterized in that a broadcast input connector breaks the contact of a normally closed contact of switch contacts when connected to a respective broadcast input.

8. A signal processing device as in any preceding Claims, characterized in that the signal processing device is an image display device or a set-top box.
Fig. 1

Image processing device activated

Cable broadcast input active?

Yes

Cable broadcast channel scanning

No

Satellite broadcast input active?

Yes

Satellite broadcast channel scanning

No

At least one of the inputs active?

No

Error notification

Yes

Scanning operation initiated
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04N21/426 H04N5/50 H04N5/765 H04N21/438 H04N21/61
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C. | See patent family annex.

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Date of the actual completion of the international search

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Date of mailing of the international search report

10/11/2015

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Hindelang, Thomas
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