System for producing augmented images

An aspect of the present invention relates to a system for generating augmented images, including at least one image-recording device; at least one analysis module connected to the at least one image-recording device at least one display device connected to the at least one analysis module; and an expansion module arranged in a transfer path between the at least one analysis module and the at least one display device, wherein the at least one image-recording device is configured to transmit images, including image data, to the at least one analysis module, wherein the at least one analysis module is configured to transmit control data to the at least one display device, the control data comprising the image data and instruction data for the at least one display of at least one augmentation in an image, wherein the at least one display device is configured to reproduce a recorded image and an associated augmentation based on the control data, wherein the at least one analysis module is configured to generate at least one piece of reliability information for each image, wherein the expansion module is configured to receive the control data and the reliability information from the at least one analysis module, generate control data modified based on the control data and the reliability information, and transmit the modified control data to at least one the display device.

Such systems are especially used in so-called augmented reality systems. These usually comprise a camera (image-recording device), a processing unit (analysis module) and a display (display device). The processing unit identifies information about the geometric and radiometric relationship between camera and environment, so that it can subsequently insert realistically looking objects into the scene. The geometric relationship, i.e. the position of the camera in space, can, for example, be determined by external infrared trackers, by visible markers in the scene, or by acceleration or step sensors. The radiometric relationship, i.e. the illumination difference between the recorded environment and an artificially generated image can, for example, be determined by intensity comparisons between a template and the current recording.

If, however, in such a known system, there are difficulties with a component, which detects or calculates the geometric or radiometric relationship between camera and environment, or if a realistic image cannot be generated for other reasons, an image is usually generated which does not appear realistic, or an image where no augmented reality is faded in. In both cases, an inadequate result will emerge, i.e. in the images displayed by the display device.

Object of the invention is to provide a system for the augmentation of images, which makes it possible to avoid the disadvantages above.

For the solution of this problem it is suggested that the system further comprises an expansion module, which is arranged in the transfer path between the analysis module and the display device, that the analysis module is further configured to generate at least one piece of reliability information for each image, and that the expansion module is configured to receive the control data and the reliability information from the analysis module and generate control data modified on the basis of the control data and of the reliability information and transmit same to the display device.

In this process, the expansion module allows, by means of the reliability information, to take into account measuring tolerances of sensors, for example, or determine in which state a sensor system is (malfunction/in operation or the like). Accordingly, the control data, which are usually passed on directly to the display device, can be adjusted if necessary by means of the expansion module and changed or modified in such a manner that modified control data are transmitted to the display device and can be displayed there, which represent an illustration with a good result, especially with regard to the augmentations in the images recorded by the image-recording device and reproduced by means of the display device.

The term "augmentation" used herein is meant to designate a kind of enhancement or change of the reproduction of reality. One, for example, considers a superimposition of an advertising message written in reality in the English language on a banner of a sports field with a same or another advertising in a different language. The German term “Anreicherung” used herein is also known as "Augmentierung" in the technical jargon, which is oriented on the English term “augment” which means improve, enhance, enrich.

The expansion module can have a state module and an animation module, wherein the state module is configured to receive the reliability information, select a piece of state information from a plurality of, in particular four, pieces of state information, and pass the state information selected on to the animation module. In this process, the animation module can be configured to receive the control data and generate the modified control data based on the state information.

The animation module can be further configured, depending on the state information,

to transmit the image data and instruction data for the augmentation as modified control data, which corresponds to a switch-on state for augmentations, or transmit only the image data as modified control data, which corresponds to a switch-off state for augmentations, or transmit a transition animation as part of the modified control data, wherein the transition animation is selected when switching between the switch-on state and the switch-off state.

Preferably, the transition animation is designed in such a manner that real data detected by the image-recording device and data of an augmentation to be displayed are processed in an integrated manner and displayed. Accordingly, a degree of realism can be achieved by integrating the reality into a transition animation, where it is not recognizable to a viewer of the display device if the system currently displays an augmentation or represents real images without augmentation.

The animation module can include a realization module, which is configured to create a transition animation, which has a specific number of images, and store it in an animation buffer. Furthermore, the animation module can include an animation memory, which is configured to store predetermined transition animations in the form of computer-readable instructions. Thus, prefabricated or readily programmed transition animations can be provided in the animation memory. These stored transition animations can be read from the animation memory by the realization module depending on the control data, in particular, the reliability information and the state information, and combined with the control data, so that the modified control data contain the selected transition animation to enable a switch between switch-on state and switch-off state.

The animation module can be further configured to remove, in the switch-off state, the instruction data for an augmentation from the control data provided by the analysis module, and only to transmit the image data as modified control data to the display device.

Furthermore, the animation module can be configured to modify the control signals of the analysis module according to the state information in such a manner that a transition animation is inserted smoothly when switching between the switch-on state and the switch-off state.

The transition animation can be executed as a virtual rolling banner or as a virtual window or the like.

It is pointed out that the above-described switch between switch-on state and switch-off state comprises a shift in both directions, i.e. from the switch-on state to the switch-off state and from the switch-off state to the switch-on state.

Another aspect of the present invention relates to a virtual advertising display system including the above system.

Another aspect of the present invention relates to a television broadcast system including the above system.

Another aspect of the present invention relates to an augmented reality system including the above system.

To use a system described herein within the scope of a television broadcast system, reference is made to the parallel application entitled "Television broadcast system for generating augmented images" of the same applicant filed on the same day. Reference is particularly made to the multiplication module described therein with reference to Figures 4 to 6 and to the control module, where a system according to the present application can be incorporated.

In the following text, the invention is exemplarily and non-restrictingly described with reference to the accompanying figures.

Fig. 1 shows a simplified and schematic representation of a system for the generation of augmented images.

Fig. 2 shows an expansion module of the system in a schematic and simplified manner.

Fig. 3 shows possible states and associated state transitions in a schematic and simplified manner.

Fig. 4 shows the functioning of an animation module of the expansion module in a schematic and simplified manner.

CLAIMS

1. A system for generating augmented images, comprising:

at least one image-recording device;

at least one analysis module connected to the at least one image-recording device;

at least one display device connected to the at least one analysis module; and

an expansion module arranged in a transfer path between the at least one analysis module and the at least one display device,

wherein the at least one image-recording device is configured to transmit images, including image data, to the at least one analysis module,

wherein the at least one analysis module is configured to transmit control data to the at least one display device, the control data comprising the image data and instruction data for the at least one display of at least one augmentation in an image,

wherein the at least one display device is configured to reproduce a recorded image and an associated augmentation based on the control data,

wherein the at least one analysis module is configured to generate at least one piece of reliability information for each image,

wherein the expansion module is configured to receive the control data and the reliability information from the at least one analysis module, generate control data modified based on the control data and the reliability information, and transmit the modified control data to at least one the display device.

2. The system of claim 1, wherein the expansion module includes a state module and an animation module, and wherein the state module is configured to receive the reliability information, select a piece of state information from a plurality of pieces of state information, and transfer the selected state information to the animation module.

3. The system of claim 2, wherein the animation module is configured to receive the control data and generate the modified control data based on the state information.

4. The system of claim 2, wherein the animation module is configured, depending on the state information, to transmit the image data and instruction data for the augmentation as modified control data, which corresponds to a switch-on state for augmentations, or transmit the image data only as modified control data, which corresponds to a switch-off state for augmentations, or transmit a transition animation as part of the modified control data, wherein the transition animation is selected when switching between the switch-on state and the switch-off state.

5. The system of claim 4, wherein the transition animation is configured in such a manner that real data detected by the at least one image-recording device and data of an augmentation to be displayed are processed in an integrated manner and displayed.

6. The system of claim 4, wherein the animation module includes a realization module configured to create a transition animation which has a specific number of images, and store the transition animation having the specific number of images in an animation buffer.

7. The system of claim 4, wherein the animation module includes an animation memory configured to store predetermined transition animations in the form of computer-readable instructions.

8. The system of claim 4, wherein the animation module is configured to remove the instruction data for an augmentation from the control data provided by the at least one analysis module in the switch-off state and transmit only the image data as modified control data to the at least one display device.

9. The system of claim 4, wherein the animation module is configured to modify the control signals of the at least one analysis module corresponding to the state information in such a manner that a transition animation is inserted smoothly when switching between the switch-on state and the switch-off state.

10. The system of claim 4, wherein the transition animation is a virtual rolling banner or a virtual window.

11. A television broadcast system comprising the system of claim 1.

12. A virtual advertising display system comprising the system of claim 1.

13. An augmented reality system comprising the system of claim 1.