

TITLE OF THE INVENTION:

**VARIABLE THREE-DIMENSIONAL CAMERA ASSEMBLY FOR STILL
PHOTOGRAPHY**

PREAMBLE OF THE DESCRIPTION:

THE FOLLOWING SPECIFICATION PARTICULARLY DESCRIBES THE INVENTION
AND THE MANNER IN WHICH IT IS TO BE PERFORMED

BACKGROUND

Technical field

[0001] The embodiments herein generally relate to a field of photography and particularly relates to a 3-D camera system. The embodiments herein more particularly relates to a variable 3-D camera assembly with a dual camera arrangement for a still photography.

Description of the Related Art

[0002] 3-D imaging or stereoscopy is a technique capable of recording three-dimensional visual information or creating the illusion of depth in an image. Human vision uses several cues to determine relative depths in a perceived scene. Some of these cues are as follows: stereopsis, accommodation of the eyeball, occlusion of one object by another, subtended visual angle of an object of known size, linear perspective, vertical position, haze, de-saturation, a shift to bluishness and change in size of textured pattern detail. All of the cues, except the first two, are present in traditional two-dimensional images such as paintings, photographs and television. Stereoscopy is the enhancement of the illusion of depth in a photograph, movie or other two-dimensional image by presenting a slightly different image to each eye.

[0003] The differences between the Right and Left pictures are the most important visual information which our brain uses to perceive a depth of an image. The greater the difference, the deeper is the depth perception.

[0004] Traditional stereoscopic photography consists of creating a 3-D illusion starting from a pair of 2-D images. The easiest way to enhance depth perception in the brain is to provide the eyes of the viewer with two different images, representing two perspectives of the same object, with a certain deviation approximately equal to the perspectives that both eyes naturally receive in binocular vision.

[0005] The beginning of the 21st century marked the coming of the age of digital photography. Stereo lenses were introduced which could turn an ordinary film camera into a stereo camera by using a special double lens to take two images and direct them through a

single lens to capture them side-by-side on the film. By mounting two cameras on a bracket, spaced apart a bit, with a mechanism wherein pictures can be taken at the same time. The precise methods for camera control have also allowed the development of multi-rig stereoscopic cameras where different slices of scene depth are captured using different inter-axial settings. The images of the slices are then composed together to form the final stereoscopic image pair. This allows important regions of a scene to be given better stereoscopic representation while less important regions are assigned less of the depth budget.

[0006] There have been cameras having dual camera system which work on a parallax phenomenon. The detector heads of such cameras remain parallel and never converge. There is a lateral separation of the two cameras and their visual input sources. Hence, the target goes out of the field of vision of one of the cameras. In other cameras, the axes of the two cameras are diverging and generally they deal with creating a 3-D virtual reality environment and models, not a 3-D vision or view.

[0007] Moreover in some dual camera systems, the two cameras are so fixed and so held together that the inter-camera distance remains fixed. So the whole camera system has to be adjusted for taking images from different angles. Also, these camera systems have single eyepiece, which affects their functionality.

[0008] Hence there is a need for a camera assembly with a dual camera arrangement in which the cameras are adjustable and moved independently of each other to provide a 3-D view of the objects.

[0009] The above mentioned shortcomings, disadvantages and problems are addressed herein, which will be understood by reading the following specification.

OBJECTS OF THE EMBODIMENTS

[0010] A primary objective of the embodiments herein is to develop a 3-D camera

assembly having two image capturing devices in which the cameras incoming light-paths are moved independently to provide an enhanced 3D view of the objects.

[0011] Another objective of the embodiments herein is to develop a 3-D camera assembly in which the two image capturing devices work separately independently from each other.

[0012] Yet another objective of the embodiments herein is to develop a 3-D camera assembly to provide 3-D view of the objects directly, without using any computer program to process the visual data.

[0013] Yet another objective of the embodiments herein is to develop a 3-D camera assembly to facilitate a convergence of the light rays to ensure a simultaneous locking of the views at different angles on the target.

[0014] Yet another objective of the embodiments herein is to develop a 3-D camera assembly with non-parallel optic axes.

[0015] Yet another objective of the embodiments herein is to develop a 3-D camera assembly in which the difference caused by differing angles of the right and left cameras on the target is used for 3-D effect.

[0016] Yet another objective of the embodiments herein is to develop a 3-D camera assembly in which the inter objective effective distance is variable.

[0017] These and other objects and advantages of the embodiments herein will become readily apparent from the following detailed description taken in conjunction with the accompanying drawings.

SUMMARY

[0018] The embodiments herein provide a three-dimensional camera assembly. According to one embodiment herein, a variable 3-D camera assembly comprises a housing. A first camera unit is assembled inside the housing for viewing a target object through a left eye. A second camera unit is assembled inside the housing for viewing of the target object through a right eye. A common, shared, control unit is provided for adjusting the first camera and the second camera. A horizon parallel indicator is installed to hold the first and second camera unit at the horizontal level. An image processing unit is provided for a simultaneous three dimensional viewing of the target object.

[0019] The common, shared control unit regulates an operation of the first and second camera units to capture an image of the target object at a plurality of angles to provide a three dimensional viewing of angle and to increase a degree of a depth of a perception of a three dimensional image of the target object.

[0020] The first camera unit comprises a left eye piece and a left arm connected to the housing through a plurality of telescopically extendable first set of barrels. A first motorized control system for the left arm is provided. One or more left elbows are provided in the left arm for a forward rotation of the left arm. A left lens/ mirror / prism complex is assembled at one end of the left arm. A left side display screen is provided to display an image of the target object captured by the first camera unit. One or more left side mirrors is provided for conducting the light rays to the left eye piece. The first motorized control system regulates the operation of the first camera unit to adjust a movement of the left objective to converge light rays on the target object, by adjusting a bending angle of the left arm, for displaying an image of the target object on the left eye piece and the left side display screen simultaneously.

[0021] The second camera unit comprises a right eye piece and a right arm connected to the housing through a plurality of telescopically extended second set of barrels. A second motorized control system for the right arm is provided. One or more right elbows are provided in the right arm for a forward rotation of the right arm. A right mirror/prism/ lens

complex is assembled at one end of the right arm. A right side display screen is provided for displaying an image of the target object captured by the second camera unit. One or more right side mirrors are provided for conducting light rays from the target object to the right side display screen through the right objective and the right eye piece.

[0022] The second motorized control system regulates the operation of the second camera unit to adjust a movement of the right objective to converge light rays on the target object, by adjusting a bending angle of the right arm, for displaying an image of the target object on the right eye piece and the right side display screen simultaneously.

[0023] A common motorized control for both the Left and the Right arms are also deployed .

[0024] The image processing unit includes mirrors, prisms, lenses and an image recording device.

[0025] The first camera unit and the second camera unit share a single optical axis for focusing the image on a photographic film or for displaying the image on the left side display screen and the right side display screen or for recording and storing the image on a storage device. An optic axis of the first camera unit and an optic axis the second camera unit are adjusted to converge on to the target object.

[0026] The left arm and the right arm are attached to the housing and coupled respectively with the first camera unit and the second camera unit. The left arm and the right arm moves synchronously, independently, manually or automatically, symmetrically as well as non-symmetrically for focusing the target object.

[0027] A length of an optical path in the first camera unit and a length of an optical path in the second camera unit is varied based on a distance of the target object from the first camera unit and the second camera unit for enhancing the 3-D effect. The left objective and right objective includes at least one of glasses and lenses arranged as a graticule. The left

objective and right objective are optically coupled to the left eye piece and the right eye piece respectively.

[0028] The assembly further comprises a Plane Polarised light filter oriented vertically/horizontally in a light pathway of the first camera unit and the second camera unit respectively.

[0029] The first motorized control system in the first camera unit and the second motorized control system in the second camera unit are operated based on an output of the image processing unit to control a movement of the left arm, a movement of the right arm, a bending angle of the left arm and a bending angle of the right arm.

[0030] The assembly further comprises a mobile adjustable multi position primary lens, prisms, lenses and mirrors complex unit (LMPC4) for the first camera unit and the second camera unit.

[0031] The right arm and the left arm have a plurality of joints to move the left arm and the right outwardly and inwardly to focus on the target object. The right arm and the left arm are made of at least one of metal and fiber optic. An electro-mechanical power unit controls a movement of the LMPC4, the left arm and the right arm.

[0032] The assembly further comprises a master - slave camera system for an outdoor 3-D still photography. A master camera in the master -slave control system controls a slave camera in the master -slave control system through a wired network, wireless network, an internet, an intranet, Wide Area Network (WAN) and Local Area Network (LAN). The master camera includes a control panel for adjusting orientation of the slave camera in line with the target object.

[0033] According to one embodiment herein, the assembly comprises a single camera with a plain polarized filter or a single charge coupled device (CCD) or an image sensor for the 3-D still photography.

[0034] The left and the right Arms are adjusted to focus on the target object while keeping the left arm and the right arm in stationary condition.

[0035] The left side display screen and the right side display screen or selected from a group comprising a liquid crystal display (LCD) screen, a light emitting diode (LED) display screen and a plasma display screen (PDP).

[0036] The assembly includes a housing to accommodate two cameras for left eye viewing and right eye viewing of a target object, a common control for adjusting the first camera and the second camera, a horizon parallel indicator to hold the first camera and the second camera at the horizontal level with respect to the target object and a variable image processing unit for simultaneous three dimensional viewing of the target object.

[0037] The first camera includes a left eye piece, a left arm connected to the housing through telescopically extended barrels, a motorized control system for the left arm, one or more left elbows for forward rotation of the left arm, a left objective assembled at the end of telescopically projecting left arm, a left LCD screen and one or more left mirrors for conducting light rays. The left objective is adjusted to converge the light rays from the target object by adjusting bending angles of the left arm through the motorized control system for displaying the target object on the left eye piece and the left LCD screen simultaneously. Similarly, the second camera includes a right eye piece, a right arm connected to the housing through telescopically extended barrels, a motorized control system for the right arm, one or more right elbows for forward rotation of the right arm, a right objective assembled at the end of telescopically projecting right arm, a right LCD screen and one or more right mirrors for conducting light rays. The right objective is adjusted to converge light rays from the target object by adjusting bending angles of the right arm through the motorized control system for displaying the target object on the right eye piece and the right LCD screen simultaneously.

[0038] The eyepieces of the first camera and the second camera are arranged for viewing a picture are movable so that the inter eyepiece distance can be adjusted to the inter

eye distance of the camera operator, based on the images being fed from the right and the left objectives. A plane polarized light filter is provided in both the input light pathway of the left and right cameras. The plane polarized light filter is vertically/ horizontally oriented. An image processing unit is provided for each camera. The motorized control of the cameras are regulated based on the output of the image processing units to control the movement and the bending angles of the arms to ensure that both the objectives are converged on a single desired target simultaneously to view the images acquired through the two cameras.

[0039] A common control is adopted for adjusting the two cameras. The common control performs auto focusing operation and adjusting the aperture and shutter speed, etc. A horizontal /horizon parallel indicator is provided to hold the cameras at the horizontal level to avoid any parallax errors. The assembly has a unique light image picture processing system provided with mirrors, prisms, lenses and an image recording device.

[0040] The image recording device is a digital recording device or the images are recorded on a photographic film. The image capturing device may a charge coupled device or an image sensor device.

[0041] The arms of the first camera and the second camera are telescopically projected out of the housing. The arms have multiple joints and elbows which move independent of each other. The arms move synchronously, independently, manually or automatically, symmetrically as well as non-symmetrically, for focusing the target. So the length of the arms can be varied based on the distance of the target from the camera, as well as the need for enhancement of 3D effect. The motorized control controls the movements of the arms to adjust the length and the angle of convergence and the horizontal or horizon indicator system holds the cameras at a horizontal level. There is a plane polarized light filter, vertically or horizontally oriented, in the right and left light input pathway.

[0042] A multi position primary lens /prism / mirrors complex unit (LMPC4) is arranged inside the housing on a common optical axis of both the cameras. The LMPC4 is mobile adjustable. The LMPC4 is a picture or image transferring set present on each arm.

The LMPC4 is fixed in the camera housing which focuses the image on a film or LCD or any storage device. The location of the LPMC4 can be altered. When the right and the left arms move synchronously symmetrically or non-symmetrically, the location of the LPMC4 is altered from X1Y1 (closest to camera) to X2Y2 (farthest from camera). The arms have multiple joints allowing them to move outwards (away from the camera) as well as inwards to focus on target. The arms are made of metal or fiber optic or other material combinations. The length of the right and left arms are varied based on the distance of target from camera, as well as on the need for enhancement of 3D effect. The electro-mechanical power unit is used to move the primary LMPC4 and the arms. The prior LMPC4 is mounted on a platform which can rotate around a vertical axis enabling a fine adjustment for accurate convergence of the right and the left optical medium. As the degree of convergence increases, the 3 D effect also increases. The LMPC4 is mounted to enable a sharing between the right and left optical media. The LPMC4 can be mounted on each arm also.

[0043] A single common control system is provided for controlling the right and the left image processing units, capturing and string devices of the two (right and left) optical systems. The various other functions which are controlled by the single control system are auto focusing, aperture adjusting, shutter speed adjusting, etc.

[0044] The variable image processing unit (IPU) is adopted for simultaneous three dimensional viewing of the target. The IPU is a unique light image picture processing system made of mirrors, prisms, lenses along with image recording device. The image recording device can be digital or it can be photographic film as according to various embodiment of the present invention.

[0045] According to one embodiment herein, a convergence tracking target cross with a circle in the right and left image processing units (IPU) is provided. Other tracking systems that are also used includes laser, light, etc

[0046] According to one embodiment herein, the various components of the 3-D camera are as follows: a digital sensor chip/ film, a lens, a view finder/LCD screen, a shutter,

a flash, a memory card, an autofocus mechanism, an image stabilization mechanism, a control, a battery storage zone, an OEM, a lens rings, a controls for memory, a lights , an ambient light sensors, a speaker, a power switch, a flash one/two, a PC/AV terminal, a tripod socket, a buttons or controls for power, a zoom, a shutter release, a menu including an enter, an ok, a displace and a mean navigator.

[0047] Thus the various embodiments of the 3-D camera assembly enable to adjust the degree of convergence of the objectives to a desired level and to vary the inter-optical distance of the left and right incident light beams easily, efficiently and accurately to enhance the 3-D effect.

[0048] According to one embodiment herein, a master - slave camera system is provided for outdoor 3-D photography. The camera system consists of a master camera. The master camera controls the slave camera placed at a long distance (in meters) from the master camera remotely through wired, wireless and internet/intranet, WAN, LAN networks. The master camera controls the slave camera through wire or wireless networks remotely. The master camera has a control panel for adjusting the orientation of the slave camera in space to orient it towards the target. The slave camera can be moved in all directions. All camera settings are synchronizable with master camera. The distance between the two cameras is variable. The two cameras can also be used as single still individual camera. All other configurations of the master and the slave camera are similar to the variable 3-D camera used for still photography.

[0049] According to one embodiment herein, the images can be viewed directly or projected on a flat screen. The images projected on a flat screen is viewed through a 3-D goggles or plane polarized spectacles. The images can be projected on LCD monitor and viewed through a 3-D goggles or plane polarized spectacles.

[0050] According to one embodiment herein, the movement or the adjustment of the left arm and the right arm to focus on the target object is done manually by an operator or electronically by the left motor and the right motor respectively.

[0051] According to one embodiment herein, the outstretching of the left arm and the right arm away from the camera to the maximum increase the angle that is subtended by the left and the right paths at the object.

[0052] According to one embodiment herein, the retracting of the left arm and the right arm towards the camera reduces the distance between the left optics and the right optics and reduces the angle between the left visual path and the right visual path of the object resulting in a diminished depth perception of the target object.

[0053] According to one embodiment herein, the left arm and the right arm are retracted and protruded to focus on the target object. One or more elbows adopted in the left arm and the right arm helps in forward rotation of the left arm and the right arm to focus on the target object.

[0054] According to one embodiment herein, the left objective/ LPMC and the right objective/LMPC of the first and the second camera are moved or adjusted keeping the left arm and the right arm at the fixed position to focus on the target object.

[0055] According to one embodiment herein, a single camera with a plain polarized filter and a single CCD or an image sensor can be used to take 2-D still photography.

[0056] These and other aspects of the embodiments herein will be better appreciated and understood when considered in conjunction with the following description and the accompanying drawings. It should be understood, however, that the following descriptions, while indicating preferred embodiments and numerous specific details thereof, are given by way of illustration and not of limitation. Many changes and modifications may be made within the scope of the embodiments herein without departing from the spirit thereof, and the embodiments herein include all such modifications.

BRIEF DESCRIPTION OF THE DRAWINGS

[0057] The other objects, features and advantages will occur to those skilled in the art from the following description of the preferred embodiments herein and the accompanying drawings in which:

[0058] FIG. 1A-B illustrates a side view of the 3-D camera showing various features, according to one embodiment herein.

[0059] FIG. 2 illustrates a side view of the 3-D camera with multiple telescoping joints and elbows of the left and right arms, according to one embodiment herein.

[0060] FIG. 3 illustrates a master slave camera system with large inter distance for outdoor 3-D still photography, according to one embodiment herein.

[0061] Although the specific features of the embodiments herein are shown in some drawings and not in others. This is done for convenience only as each feature may be combined with any or all of the other features in accordance with the embodiments herein.

DETAILED DESCRIPTION OF THE EMBODIMENTS HEREIN

[0062] In the following detailed description, a reference is made to the accompanying drawings that form a part hereof, and in which the specific embodiments that may be practiced is shown by way of illustration. These embodiments are described in sufficient detail to enable those skilled in the art to practice the embodiments and it is to be understood that the logical, mechanical and other changes may be made without departing from the scope of the embodiments. The following detailed description is therefore not to be taken in a limiting sense.

[0063] The various embodiments herein provide a three-dimensional camera assembly. The assembly includes a housing to accommodate two cameras for left eye viewing and right eye viewing of a target object, a common control for adjusting the first

camera and the second camera, a horizon parallel indicator to hold the first camera and the second camera at the horizontal level with respect to the target object and a variable image processing unit for simultaneous three dimensional viewing of the target object. The first camera includes a left eye piece, a left arm connected to the housing through telescopically extended barrels, a motorized control system for the left arm, one or more left elbows for forward rotation of the left arm, a left objective assembled at the end of telescopically projecting left arm, a left LCD screen and one or more left mirrors for conducting light rays. The left objective is adjusted to converge light rays on the target object by adjusting bending angles of the left arm through the motorized control system for displaying the target object on the left eye piece and the left LCD screen simultaneously. Similarly, the second camera includes a right eye piece, a right arm connected to the housing through telescopically extended barrels, a motorized control system for the right arm, one or more right elbows for forward rotation of the right arm, a right objective assembled at the end of telescopically projecting right arm, a right LCD screen and one or more right mirrors for conducting light rays. The right objective is adjusted to converge light rays on the target object by adjusting bending angles of the right arm through the motorized control system for displaying the target object on the right eye piece and the right LCD screen simultaneously.

[0064] The eyepieces of the first camera and the second camera are arranged for viewing a picture are movable so that the inter eyepiece distance can be adjusted to the inter eye distance of the camera operator, based on the images being fed from the right and the left objectives. A plane polarized light filter is provided in both the input light pathway of the left and right cameras. The plane polarized light filter is vertically/ horizontally oriented. An image processing unit is provided for each camera. The motorized control of the cameras are regulated based on the output of the image processing units to control the movement and the bending angles of the arms to ensure that both the objectives are converged on a single desired target simultaneously to view the images acquired through the two cameras.

[0065] A common control is adopted for adjusting the two cameras. The common control performs auto focusing operation and adjusting the aperture and shutter speed, etc. A horizontal /horizon parallel indicator is provided to hold the cameras at the horizontal level to

avoid any parallax errors. The assembly has a unique light image picture processing system provided with mirrors, prisms, lenses and an image recording device.

[0066] The image recording device is a digital recording device or the images are recorded on a photographic film. The image capturing device may a charge coupled device or an image sensor device.

[0067] The arms of the first camera and the second camera are telescopically projected out of the housing. The arms have multiple joints and elbows which move independent of each other. The arms move synchronously, independently, manually or automatically, symmetrically as well as non-symmetrically, for focusing the target. So the length of the arms can be varied based on the distance of the target from the camera, as well as the need for enhancement of 3D effect. The motorized control controls the movements of the arms to adjust the length and the angle of convergence and the horizontal or horizon indicator system holds the cameras at a horizontal level. There is a plane polarized light filter, vertically or horizontally oriented, in the right and left light input pathway.

[0068] A multi position primary lens /prism / mirrors complex unit (LMPC4) is arranged inside the housing on a common optical axis of both the cameras. The LMPC4 is mobile adjustable. The LMPC4 is a picture or image transferring set present on each arm. The LMPC4 is fixed in the camera housing which focuses the image on a film or LCD or any storage device. The location of the LPMC4 can be altered. When the right and the left arms move synchronously symmetrically or non-symmetrically, the location of the LPMC4 is altered from closest to camera farthest from the camera. The arms have multiple joints allowing them to move outwardly as well as inwardly to focus on target. The arms are made of metal or fiber optic or other material combinations. The length of the right and left arms are varied based on the distance of target from camera, as well as on the need for enhancement of 3D effect. The electro-mechanical power unit is used to move the primary LMPC4 and the arms. The prior LMPC4 is mounted on a platform which can rotate around a vertical axis enabling a fine adjustment for accurate convergence of the right and the left optical medium. As the degree of convergence increases, the 3 D effect also increases. The

LMPC4 is mounted to enable a sharing between the right and left optical media. The LPMC4 can be mounted on each arm also.

[0069] A single common control system is provided for controlling the right and the left image processing units, capturing and string devices of the two (right and left) optical systems. The various other functions which are controlled by the single control system are auto focusing, aperture adjusting, shutter speed adjusting, etc.

[0070] The variable image processing unit (IPU) is adopted for simultaneous three dimensional viewing of the target. The IPU is a unique light image picture processing system made of mirrors, prisms, lenses along with image recording device. The image recording device can be digital or it can be photographic film as according to various embodiment of the present invention.

[0071] According to one embodiment herein, a convergence tracking target cross with a circle in the right and left image processing units (IPU) is provided. Other tracking systems can also be used are laser, light, etc.

[0072] According to one embodiment herein, a master - slave camera system is provided for outdoor 3-D photography. The camera system consists of a master camera. The master camera controls the slave camera placed at a long distance (in meters) from the master camera remotely through wired, wireless and internet/intranet, WAN, LAN networks. The master camera controls the slave camera through wire or wireless networks remotely. The master camera has a control panel for adjusting the orientation of the slave camera in space to orient it towards the target. The slave camera can be moved in all directions. All camera settings are synchronizable with master camera. The distance between the two cameras is variable. The two cameras can also be used as single still individual camera. All other configurations of the master and the slave camera are similar to the variable 3-D camera used for still photography.

[0073] According to one embodiment herein, the movement or the adjustment of the left arm and the right arm to focus on the target object is done manually by an operator or electronically by the left motor and the right motor respectively.

[0074] According to one embodiment herein, the images can be viewed directly or projected on a flat screen. The images projected on a flat screen is viewed through a 3-D goggles or plane polarized spectacles. The images can be projected on LCD monitor and viewed through a 3-D goggles or plane polarized spectacles.

[0075] According to one embodiment of the present invention, the outstretching of the left arm and the right arm away from the camera to the maximum increase the left and the right paths suspended at the object.

[0076] According to one embodiment herein, the retracting of the left arm and the right arm towards the camera reduces the distance between the left optics and the right optics and reduces the angle between the left visual path and the right visual path of the object resulting in a diminished depth perception of the target object.

[0077] According to one embodiment herein, the left arm and the right arm are retracted and protruded to focus on the target object. One or more elbows adopted in the left arm and the right arm helps in forward rotation of the left arm and the right arm to focus on the target object.

[0078] According to one embodiment herein, the left objective and the right objective of the first and the second camera are moved or adjusted keeping the left arm and the right arm at the fixed position to focus on the target object.

[0079] According to one embodiment herein, a single camera with a plain polarized filter and a single CCD or an image sensor can be used to take 3-D still photography.

[0080] FIG. 1A-B illustrates a top view of the 3-D camera showing various features, according to one embodiment herein. As shown in FIG. 1A-B the housing has two cameras, the left camera 1 and the right camera 2. The left camera 1 has left eyepiece 11 and the right camera 2 has right eyepiece 21. The left arm 12 and the right arm 22 are connected to the housing 5 through telescoping joints and elbows 14 and 24. The objectives 15 and 25 are provided for both the left arm 12 and the right arm 22 at the further end of the left arm 12 and right arm 22 to focus on the target object 4. The objectives 15 and 25 are made of assemblies of gratitudes and grids of lenses or glasses. The objectives 15 and 25 are optically coupled with the two cameras 1 and 2 through two arms 12 and 22. The movement of the left arm 12 and the right arms 22 is controlled by a left motor 13 and right motor 23 separately, respectively. The light rays are conducted with the help of mirrors 16a and 16b to the objective 15 in the left camera 1. Similarly, in the right camera 2 the light rays are conducted with the help of mirrors 26a and 26b to the objective 25. The two cameras 1 and 2 are independently movable to capture different views of the target object 4 from different angles. A system of common control 6 for controlling the left camera 1 and the right camera 2 is adopted. A variable image processing unit 3 is adopted to simultaneously view the 3-D images of the target object 4. Horizon indicator 7 is adopted for keeping the left camera 1 horizontal with respect to the right camera 2. The 3-D camera assembly also includes a left and right synchronizer for synchronizing the left camera 1 and the right camera 2. The variable 3-D camera assembly also includes a left LCD 17 and right LCD 27 on the housing 5 to display the target object 4.

[0081] The variable image processing unit 3 also includes a multi position primary lens or prisms or mirrors complex unit (LMPC4) for both the left camera 1 and the right camera 2. The LMPC4 is a mobile adjustable. The LMPC4 is fixed in the camera housing 5 which focuses the image on a film or LCD or any storage device. The location of the LPMC4 can be altered. When the left arm 12 and the right arm 22 moves synchronously symmetrically or non-symmetrically, the location of the prior LPMC4 is altered from X1Y1 (closest to camera) to X2Y2 (farthest from camera) as shown in FIG. 1B. The arms 12 and 22 have multiple joints allowing them to move outwards (away from the camera) as well as inwards (nearer to the camera) to focus on the target object 4. The length of the left arm 12

and the right arm 22 vary based on the distance of target object 4 from the camera, as well as on the need for enhancement of the 3-D effect. An electro-mechanical power unit is adopted to move the primary LMPC4 and the arms 12 and 22. The LMPC4 is mounted on a platform which can rotate around a vertical axis giving it fine adjustment capacity for accurate convergence on sharing between the left camera 1 and the right camera 2. As the degree of convergence increases, the 3-D effect also increases.

[0082] According to one embodiment herein, the set of LMPC4's can be placed on left arm 12 and the right arm 22 respectively to work independently for left camera 1 and the right camera 2.

[0083] FIG. 2 illustrates a side view of the 3-D camera with multiple telescoping joints and elbows of the left and right arms, according to one embodiment herein. As shown in FIG. 2 the housing has two cameras, the left camera 1 and the right camera 2. The left camera 1 has left eyepiece 11 and the right camera 2 has right eyepiece 21. The left arm 12 and the right arm 22 are connected to the housing 5 through a multiple telescoping joints and elbows 14 and 24. The objectives 15 and 25 are provided for both the left arm 12 and the right arm 22 at the further end of the left arm 12 and right arm 22 to focus on the target object 4. The objectives 15 and 25 are made of assemblies of graticules and grids of lenses or glasses. The objectives 15 and 25 are optically coupled with the two cameras 1 and 2 through two arms 12 and 22. The movement of the left arm 12 and the right arms 22 is controlled by a left motor 13 and right motor 23 separately, respectively. The light rays are conducted with the help of mirrors 16a and 16b to the objective 15 in the left camera 1. Similarly, in the right camera 2 the light rays are conducted with the help of mirrors 26a and 26b to the objective 25. The two cameras 1 and 2 are independently movable to capture different views of the target object 4 from different angles. A system of common control 6 for controlling the left camera 1 and the right camera 2 is adopted. A variable image processing unit 3 is adopted to simultaneously view the 3-D images of the target object 4. Horizon indicator 7 is adopted for keeping the left camera 1 horizontal with respect to the right camera 2. The 3-D camera assembly also includes a left and right synchronizer for synchronizing the left camera 1 and

the right camera 2. The variable 3-D camera assembly also includes a left LCD 17 and right LCD 27 on the housing 5 to display the target object 4.

[0084] According to one embodiment herein, the telescoping joints and one or more elbows adopted on the left arm and right arm helps in forward rotation of the left arm and the right arm to focus on the target object. The telescoping left arm and right arm retracts and protrudes to focus on the target object, whereas one or more elbows on the left arm and the right arm helps in forward rotation of the left arm and the right arm to focus on the target object.

[0085] FIG. 3 illustrates the master slave camera with large inter distance for outdoor 3-D still photography, as one embodiment herein. The master slave camera for outdoor 3-D photography consists of a master camera 31 mounted on a stand 32 and similarly, a slave camera 41 mounted on a stand 42. The slave camera 41 is positioned away from the master camera 31. The slave camera 41 is placed at a distance of x meters from the master camera 31 as shown in FIG. 3. The cameras 31 and 41 provide 3-D view of distantly placed target object 4. The master camera 31 is provided with a control panel 33 for controlling the different actions of the slave camera 41. The master camera 31 can control the orientation of the slave camera 41 for focusing the distant target object 4. The distance between the two cameras 31 and 41 is variable. All camera settings of the slave camera 42 are synchronized to the master camera 31. The two cameras 31 and 41 are also used as a single still individual camera. All other configurations of the master camera 31 and the slave camera 41 are similar to the 3-D camera for still photography.

[0086] According to one embodiment herein, the images of the target object 4 can be viewed directly or projected on a flat screen or on LCD. The images projected on a flat screen is viewed through a 3-D goggles or plane polarized spectacles. The images can also be projected on LCD monitor and viewed through a 3-D goggles or plane polarized spectacles.

[0087] Thus the various embodiments of the 3-D camera assembly enable to adjust the degree of convergence of the objectives to a desired level and to vary the inter-optical

distance of the left and right incident light beams easily, efficiently and accurately to enhance the 3-D effect.

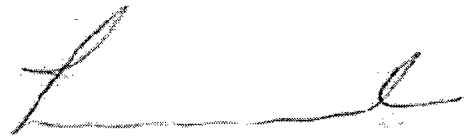
[0088] The 3-D camera of the embodiments herein allows to view the three dimensional image of a target object directly, as no computer system is present to process the visual data. The two image capturing devices of the 3-D camera work separately and independently from each other providing ease of operation. The 3-D camera of the present invention includes digital projection 3-D spectacles, which can simultaneously project right and left images. The 3-D camera has a design which incorporates convergence to ensure simultaneous locking of the different views of the target. The 3-D camera of the present invention also allows an easy and efficient capturing of 3-D images of different objects.

[0089] The images of the target object from the 3-D camera of the present invention can be viewed directly or projected on a flat screen. The images projected on a flat screen is viewed through a 3-D goggles or plane polarized spectacles. The images can also be projected on LCD monitor and viewed through a 3-D goggles or plane polarized spectacles. The camera of the embodiments herein does not use a software program to project the 3-D images.

[0090] The foregoing description of the specific embodiments will so fully reveal the general nature of the embodiments herein that others can, by applying current knowledge, readily modify and/or adapt for various applications such specific embodiments without departing from the generic concept, and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalents of the disclosed embodiments. It is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation. Therefore, while the embodiments herein have been described in terms of preferred embodiments, those skilled in the art will recognize that the embodiments herein can be practiced with modification within the spirit and scope of the appended claims.

[0091] Although the embodiments herein are described with various specific embodiments, it will be obvious for a person skilled in the art to practice the embodiments herein with modifications. However, all such modifications are deemed to be within the scope of the claims.

[0092] It is also to be understood that the following claims are intended to cover all of the generic and specific features of the embodiments described herein and all the statements of the scope of the embodiments which as a matter of language might be said to fall there between.



Date: March 04, 2011

Place: Bangalore.

RAKESH PRABHU

Patent Agent

CLAIMS

What is claimed is:

1. A variable 3-D camera assembly, the assembly comprising;
 - a housing;
 - a first camera unit assembled inside the housing for viewing a target object through a left eye;
 - a second camera unit assembled inside the housing for viewing of the target object through a right eye;
 - a control unit for adjusting the first camera and the second camera;
 - a horizon parallel indicator to hold the first camera unit at the horizontal level with respect to the second camera unit;
 - an image processing unit for a simultaneous three dimensional viewing of the target object;
 - wherein the control unit regulates an operation of the first camera unit and the second camera unit to view and capture an image of the target object at a plurality of angles to provide a three dimensional viewing of angle and to increase a degree of a depth of a perception of a three dimensional image of the target object.
2. The assembly according to claim 1, wherein the first camera unit comprises;
 - a left eye piece;
 - a left arm connected to the housing through a plurality of telescopically extended first set of barrels;
 - a first motorized control system for the left arm;
 - one or more left elbows for a forward rotation of the left arm;
 - a left objective arranged at one end of the left arm;
 - a left side display screen; and
 - one or more left side mirrors for conducting light rays to the left eye piece ;
 - wherein the first motorized control system regulates the operation of the first camera unit to adjust a movement of the left objective to converge light rays on the target object, by adjusting a bending angle of the left arm, for displaying an image of the target object on the left eye piece and the left side display screen simultaneously.
3. The assembly according to claim 1, wherein the second camera unit comprises;

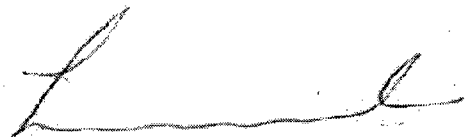
a right eye piece;
a right arm connected to the housing through a plurality of telescopically extended second set of barrels;
a second motorized control system for the right arm;
one or more right elbows for a forward rotation of the right arm;
a right objective arranged at one end of the right arm;
a right side display screen; and
one or more right side mirrors for conducting light rays;
wherein the second motorized control system regulates the operation of the second camera unit to adjust a movement of the right objective to converge light rays on the target object, by adjusting a bending angle of the right arm, for displaying an image of the target object on the right eye piece and the right side display screen simultaneously.

4. The assembly according to claim 1, wherein the image processing unit includes mirrors, prisms, lenses and an image recording device.
5. The assembly according to claim 1, wherein the first camera unit and the second camera unit do not share a single optical axis for focusing the image on a photographic film or for displaying the image on the left side display screen and the right side display screen or for recording and storing the image on a storage device.
6. The assembly according to claim 1, wherein an optic axis of the first camera unit and an optic axis of the second camera unit are adjusted to converge on to the target object.
7. The assembly according to claim 1, wherein the left arm and the right arm are attached to the housing and coupled respectively with the first camera unit and the second camera unit.
8. The assembly according to claim 1, wherein the left arm and the right arm moves synchronously, independently, manually or automatically, symmetrically as well as non-symmetrically for focusing the target object.
9. The assembly according to claim 1, wherein a length of an optical path in the first camera unit and a length of an optical path in the second camera unit is varied based on a distance of the target object from the first camera unit and the second camera unit for enhancing the 3-D effect.

10. The assembly according to claim 1, wherein the left LPMC and right LPMC includes at least one of glasses and lenses arranged as a graticule.
11. The assembly according to claim 1, wherein the left objective and right objective includes at least one of glasses and lenses arranged as a graticule.
12. The assembly according to claim 1, wherein the left objective and right objective are optically coupled to the left eye piece and the right eye piece respectively.
13. The assembly according to claim 1, further comprising a Plane Polarised light filter oriented vertically/horizontally in a light pathway of the first camera unit and the second camera unit
14. The assembly according to claim 1, wherein the first motorized control system in the first camera unit and the second motorized control system in the second camera unit are operated based on an output of the image processing unit to control a movement of the left arm, a movement of the right arm, a bending angle of the left arm and a bending angle of the right arm.
15. The assembly according to claim 1, further comprising a mobile adjustable multi position primary lens, prisms, lenses and mirrors complex unit (LPMC4) for the first camera unit and the second camera unit.
16. The assembly according to claim 1, wherein the right arm and the left arm have a plurality of joints to move the left arm and the right outwardly and inwardly to focus on the target object.
17. The assembly according to claim 1, wherein the right arm and the left arm is made of at least one of metal and fiber optic.
18. The assembly according to claim 1, wherein an electro-mechanical power unit controls a movement of the LMPC4, the left arm and the right arm.
19. The assembly according to claim 1, further comprising a master - slave camera system for an outdoor 3-D still photography.
20. The assembly according to claim 1, wherein a master camera in the master -slave control system controls a slave camera in the master -slave control system through a wired network, wireless network, an internet, an intranet, Wide Area Network(WAN) and Local Area Network(LAN).

21. The assembly according to claim 1, wherein the master camera includes a control panel for adjusting orientation of the slave camera in line with the target object.
22. The assembly according to claim 1, comprising a single camera with a plain polarized filter or a single charge coupled device (CCD) or an image sensor for the 2-D still photography.
23. The assembly according to claim 1, wherein the left objective and the right objective alone are adjusted to focus on the target object while keeping the left arm and the right arm in stationary condition.
24. The assembly according to claim 1, wherein the left side display screen and the right side display screen or selected from a group comprising a liquid crystal display (LCD) screen, a light emitting diode (LED) display screen and a plasma display screen (PDP).

Dated this the 4th day of March, 2011



Rakesh Prabhu,
Patent Agent,
ALMT Legal,
No.2, Lavelle Road,
Bangalore-560 001,
INDIA