

Tree Climbing Observation System

Technical Field

5 [001] The invention relates to a remotely controlled mobile observations device. More particularly, the present invention relates to remotely controlled mobile observation device mounted onto a moveable platform. Yet more particularly, the invention relates to a remotely operated observation camera mounted onto a remotely operable mobile platform for use as observation
10 camera from treetops.

Background of the Invention

15 [002] In a typical infantry operation in a forested area, observation posts are set up during troop harboring or reconnaissance missions. Either soldiers or unattended ground sensors (UGS) are used to monitor and to observe activities around the jungle environment. However, the use of soldiers or UGS is either resource intensive or inefficient. For instance, the conventional manual
20 technique requires the soldiers to operate in invoking shifts in manning and monitoring a specific sector. This operation is physically demanding to an individual soldier. Further the view obtained by the soldier is activities happening at ground / eye level and limited elevated level. In tropical forests

due to heavy vegetative undergrowth, the line and scope of vision by a soldier is very limited even if armed with binoculars or telescopes.

[003] Unattended ground sensors (UGS) are constrained by their limited
5 field of view at ground level. They also need to be properly camouflaged to avoid discovery by hostile enemy forces. The UGS can also be made inefficient if the ground is flooded under heavy rainfall.

[004] Thus, there is a need for an apparatus for an effective observation
10 system that can capture a wider field of vision and preferably from a top down view rather than a bottom-up view. The observation system should be light weight easily carried by soldiers on foot and should be easily camouflaged.

[005] Any discussion of documents, devices, acts or knowledge in this
15 specification is included to explain the context of the invention. It should not be taken as an admission that any of the material forms a part of the prior art base or the common general knowledge in the relevant art in Singapore or elsewhere on or before the priority date of the disclosure and claims herein. All statements as to the date or representation as to the contents of these
20 documents is based on the information available to the applicant and does not constitute any admission as to the correctness of the dates or contents of these documents.

Summary of the Invention

[006] The invention discloses a remote controlled video camera system for capturing visual images from a tree top. The system comprises at least one remote controlled video camera mounted on a pan-tilt system, a platform with moveable means to move the platform along a linear direction, at least one harpoon anchoring system, at least one winch system with a flexible cord secured to the harpoon anchoring system, at least one energy source to operate energy dependant components and at least one anchoring claw mounted on rear section of the platform.

[007] The harpoon anchoring system and winch system are used to move the platform from a lower level to a higher level of a tree, and visual images from the video camera are capable of being transmitted by wireless means to a video display monitor distantly placed from the video camera. The moveable means to move the platform includes a plurality of traction wheels mounted onto the platform and at least one climbing claw.

[008] The pan-tilt system is controlled and operated by means of a joystick mounted on a ground control system. The movement of the platform is controlled and operated by means of a joystick mounted on a ground control system.

[009] The invention further discloses a method of capturing visual images from a top portion of a tree using a video camera comprising the steps of launching a harpoon to an upper level of the tree, the said harpoon being mounted onto a platform carrying the video camera mounted onto a pan-tilt
5 system, anchoring the harpoon onto a trunk or branch of the tree, winching the platform from a lower level to a higher level, by means of a winch means mounted onto the platform and sending images from the video camera wirelessly to a video display monitor in a ground control station. The platform is further anchored to a trunk or branch of a tree by securing a anchoring claw
10 provided on the rear section of the platform to the branch or trunk of the tree.

[0010] Other aspects and preferred aspects are disclosed in the specification and / or defined in the appended claims, forming a part of the description of the invention.

15

[0011] Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only,
20 since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

List of Accompanying Drawings

[0012] The present invention will be better understood with the following detailed description with reference to the accompanying drawings which describe specific embodiments as non-limiting examples or illustration, in
5 which:

[0013] Fig. 1 shows a system overview of mobile platform mounted camera and a portable ground control/ view station;

10 [0014] Fig. 2(a) illustrates the launch and anchoring of the mini harpoon;

[0015] Fig. 2(b) illustrates the climbing of the mobile platform along a tree trunk;

15 [0016] Fig. 2(c) illustrates a momentary perching of the mobile platform along a tree trunk while conducting observations operations;

[0017] Fig. 3(a) – 3(c) illustrates sequential diagrams of a device shown in Fig 1 and 2 descending a tree; and

20

[0018] Fig. 4(a) – 4(b) illustrates diagrammatically a servo–motor to operate the anchoring claw.

[0019] It is to be appreciated that the invention is not limited in its application to the details of the particular arrangement of the embodiment described hereafter, since the invention is capable of other embodiments. The terminology used herein is for the purpose of the description and not of
5 limitation.

Detailed Description of the Invention

10 [0020] Fig. 1 illustrates a system overview of observation system comprising of a man-portable ground control station (100) and a wireless video camera system mounted onto a remote controlled mobile platform (collectively referred to as (200)). The man-portable ground control station (100) includes a video display screen (102) capable of receiving mobile usages from a wireless
15 video camera system (202), a joystick control (104) to control the mobility of the mobile platform (200) and another joystick (106) to control pan-tilt system (206) in the mobile platform (200).

[0021] The mobile platform (200) includes a platform (204) onto which are
20 mounted two pairs of traction wheels (210) and a pair of anchoring claws (212) at the rear of the platform (see Fig 2a). At front portion of the mobile platform (200) are mounted two sets of harpoon anchoring systems (214) with winch (216). The wireless video camera (202) is mounted onto the pan-tilt system (206), which is mounted on the platform (204). To provide energy to operate

the video-camera, the pan-tilt system harpoon and the winch, adequate and appropriate energy source such as battery packs (not shown) are included in the mobile platform.

5 [0022] The whole mobile platform (200) is about the size of a toy remote control car and can be packed into a soldier's field backpack. Lithium polymer battery pack is preferably used to provide power onboard the mobile platform (200).

10 [0023] The wireless video camera (202) is a 2 mega-pixel, 1/3.2-Inch CMOS Camera System-on-a-Chip (SOC) integrated with another SOC radio chip consisting of 2.4GHz wireless radio utilising 802.15.4 MAC layer and 8051 Micro-controller engine. Video data from the CMOS camera is streamed to the SOC radio chip via a 2-wire serial interface and transmitted to the ground
15 control station at a bit rate of 250Kbps using Direct-sequence Spread Spectrum modulation.

[0024] The wireless video camera (202) is mounted on a two-axis orientation servo pan-tilt system that allows viewing of surveillance video feed
20 on the man-portable ground control station. The motorised pan and tilt capabilities allow a greater coverage from the camera. The camera offers both optical and digital zoom allowing zero-in on possible target effectively. Such a system is often used in security applications. The pan-tilt system (206) is also

responsible for target alignment before firing the harpoon during climbing or locking to a designated landing site while descending from the tree.

[0025] The harpoon (214) consists of front latching mechanism and a
5 reeling device. The latching mechanism includes a spearhead (218) with
several hooks/ paws (220). The hooks/ paws (220) are positioned
symmetrically and deployed by means of expansion springs. During upward
launch, any obstruction will push the hooks/paws (220) inwards in to the
harpoon. Simultaneously, a rope (222) is spooled at the rear of the harpoon to
10 relieve tension to the platform. When the harpoon (214) reaches peak of the
trajectory without the spearhead (218) anchored to the trunk of the tree, the
backwards movement allows the hooks/paws (220) to latch on any branches.

[0026] If all else fails, the winching system on the platform (204) is used to
15 wound the rope uniformly onto a driven reel as well as positioning the harpoon
in a launcher (224) for re-launch. Upon completion of the operation, the rope
(222) is subsequently wound back to the reeling device of the harpoon. The
winching system is also used to pull the platform to the observation/
surveillance position by winding the rope or lower the platform (204) to ground
20 level by gradually releasing the rope (222).

[0027] To move the mobile platform (200) to tree canopy or treetop, the
following method is adopted. The mobile platform (200) is positioned at the
foot of a tree. One of the harpoon systems is used and the harpoon (214) is

launched projecting upwards (See Fig. 2a). The harpoon is launched using mini-pyrotechnic charges pre-loaded within the harpoon barrel. Launcher (224) is electrically activated using the triggering circuit in the platform. Upon activation, the harpoon (214) will propel itself up the tree. If the harpoon (214) fails to anchor on the tree branch, the winch (216) will be activated to retract ropes (222) of the harpoon for a repeat attempt. The electric motor on the winch (216) will reel back the ropes. Basically, on each harpoon system, there are two spools of ropes; one on the harpoon end, the other on the platform end. Upon the harpoon launch, the rope will be released on the harpoon end, the winch (216) on the platform end will reel in the released ropes when the system starts climbing up the tree. After successfully anchoring the harpoon (214) on the treetop, the winch (216) will be activated so as to rewind the ropes of the harpoon (214). The mobile platform will move upwards along the tree trunk (see Fig. 2b). To prevent sliding back of the mobile platform (200) upon the mobile platform (200) reaching the intended position along the tree trunk, the anchoring claw (212) is activated.

[0028] The anchoring mechanism is for securing the platform (204) onto the tree trunk, which includes an anchoring claw (which is an elongated arm with a curvilinear extend and a tapered distal end). The anchoring claw is coupled to a servo-motor (226) that supplies the force to secure platform to the tree trunk. The servo-motor (226) is activated by remote-control means. The servo-motor (226) on the platform end rotates counterclockwise to shove the pointed end of the claw into the tree. During the process of lowering the platform to the

ground, the servo motor (226) is rotated the reverse direction allowing the anchoring claw to withdraw the tapered distal end from the tree trunk. There are preferably two sets of anchoring mechanisms one on each side at the rear of the platform (204).

5

[0029] If it is desired to move the mobile platform (200) further higher up the tree, it is ascertained the mobile platform is securely anchored along the tree trunk by the existence of the anchor claw (212) as shown in Fig 4(a) and (b).

10 [0030] Thereafter the second set of harpoon (214) is employed using the same method as the first. The system will release the first set of harpoon (214). The second harpoon (214) is launched upwards again to it at a higher level by remote control means. If the harpoon (214) fails to securely anchor, the harpoon (214) is retracted and re-launched. The process is repeated until the
15 harpoon is securely anchored onto a tree trunk or branch.

[0031] Upon the mobile platform (200) being securely anchored with the harpoon (214) and rope at the front and the anchoring claw at the rear, the video camera system is activated. The pan – tilt mechanism (206) is activated
20 to provide guidance in a desired vision.

[0032] Upon attaining a designated or deserved surveillance area the video camera (202) will continue to capture images for transmission by wireless means to the ground control system (100). An operator at ground level will

select one surveillance point for engagement. When the system is fixated at a surveillance point, the video camera will provide a panoramic view (i.e. video stitching) of the target area. It will be appreciated that the video camera (202) and the pan-tilt system (206) can be activated at any time to provide visuals for
5 initial navigation and searching for direction of vision to launch the harpoon (214).

[0033] Suitable controls are provided in the ground control station to operate the pan-tilt system (206), the zooming / focusing of the video camera
10 (202), the harpoon (214) and the winch (216). Instead traction wheels (210), climbing down can be provided on each side of the platform.

[0034] Before climbing downwards to ground level, the platform (204) will release its rear anchoring claws and unwind the rope at the winch end slowly.
15 Upon reaching the ground, it will release the rope (222) and harpoon (214). See the descend process illustrations in Fig 3(a) – 3(c). All these operations can be activated and controlled by remote controlled means, which technology is well known.

20 [0035] The embodiment described above incorporates only one video camera and one monitor. However it will be appreciated that it is possible to mount a plurality of video cameras each individually remotely controlled and operated, to provide a broader scope of vision. Similarly, it is also possible to

have more than one harpoon and winch system to provide greater flexibility in the operation of the system.

[0036] While this invention has been described in connection with specific embodiments thereof, it will be understood that it is capable of further
5 modification(s). This application is intended to cover any variations uses or adaptations of the invention following in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice within the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth.

10

[0037] As the present invention may be embodied in several forms without departing from the spirit of the essential characteristics of the invention, it should be understood that the above described embodiments are not to limit
15 the present invention unless otherwise specified, but rather should be construed broadly within the spirit and scope of the invention as defined in the appended claims. Various modifications and equivalent arrangements are intended to be included within the spirit and scope of the invention and appended claims. Therefore, the specific embodiments are to be understood to be illustrative of the many ways in which the principles of the present invention
20 may be practiced. In the following claims, means-plus-function clauses are intended to cover structures as performing the defined function and not only structural equivalents, but also equivalent structures. For example, although a nail and a screw may not be structural equivalents in that a nail employs a cylindrical surface to secure wooden parts together, whereas a screw employs

a helical surface to secure wooden parts together, in the environment of fastening wooden parts, a nail and a screw are equivalent structures.

[0038] “Comprises/comprising” when used in this specification is taken to
5 specify the presence of stated features, integers, steps or components but
does not preclude the presence or addition of one or more other features,
integers, steps, components or groups thereof.”

Claims

1. A remote controlled video camera system for capturing visual images from a tree top comprising:
 - 5 i) at least one remote controlled video camera mounted on a pan-tilt system,
 - ii) a platform with moveable means to move the platform along a linear direction,
 - iii) at least one harpoon anchoring system,
 - 10 iv) at least one winch system with a flexible cord secured to the harpoon anchoring system,
 - v) at least one energy source to operate energy dependant components,
 - vi) at least one anchoring claw mounted on rear section of the platform,wherein, the harpoon anchoring system and winch system are used to move
15 the platform from a lower level to a higher level of a tree, and visual images from the video camera are capable of being transmitted by wireless means to a video display monitor distantly placed from the video camera.
2. A remote controlled video corner system as claimed in Claim 1 wherein
20 the moveable means to move the platform includes a plurality of traction wheels mounted onto the platform.

3. A remote controlled video camera system as claimed in claim 1 wherein the moveable means to move the platform includes at least one anchoring claw.
- 5 4. A remote controlled video camera system as claimed in claim 1 wherein the pan-tilt system is controlled and operated by means of a joystick mounted on a ground control system.
5. A remote controlled video camera system as claimed in claim 1 wherein
10 the movement of the platform is controlled and operated by means of a joystick mounted on a ground control system.
6. A method of capturing visual images from a top portion of a tree using a video camera comprising the steps of:
- 15 i) launching a harpoon to an upper level of the tree, the said harpoon being mounted onto a platform carrying the video camera mounted onto a pan-tilt system.
- ii) anchoring the harpoon onto a trunk or branch of the tree
- iii) winching the platform from a lower level to a higher level, by means of a
20 winch means mounted onto the platform.
- iv) sending images from the video camera wirelessly to a video display monitor in a ground control station.

7. A method of capturing visual images as claimed in claim 6 wherein the platform is further anchored to a trunk or branch of a tree by securing a anchoring claw provided on the rear section of the platform to the branch or trunk of the tree.