DOWNLOAD PDF 4.2.2.6 ENDOSCOPIC IMAGING SYSTEMS

Chapter 1 : Endoscopy - Wikipedia

Crospon is an endoscopic diagnostics company that offers minimally-invasive diagnostic medical devices for gastroenterology professionals. Its Endoflip System and accessory catheters are used to evaluate patients with symptoms consistent with gastrointestinal motility disorders and to guide therapy during specialized esophageal surgery.

An endoscope can consist of: The light source is normally outside the body and the light is typically directed via an optical fiber system. Modern instruments may be videoscopes, with no eyepiece. A camera transmits image to a screen for image capture. Patients undergoing the procedure may be offered sedation , which includes its own risks. The first such lights were external although sufficiently capable of illumination to allow cystoscopy, hysteroscopy and sigmoidoscopy as well as examination of the nasal and later thoracic cavities as was being performed routinely in human patients by Sir Francis Cruise using his own commercially available endoscope by in the Mater Misericordiae Hospital in Dublin, Ireland. This proved useful both medically and industrially, and subsequent research led to further improvements in image quality. Further innovations included using additional fibres to channel light to the objective end from a powerful external source, thereby achieving the high level of full spectrum illumination that was needed for detailed viewing, and colour photography. This was the beginning of "key-hole surgery" as we know it today. A bundle of say 50, fibers gives effectively only a 50,pixel image, and continued flexing from use breaks fibers and so progressively loses pixels. Eventually so many are lost that the whole bundle must be replaced at considerable expense. Harold Hopkins realised that any further optical improvement would require a different approach. Previous rigid endoscopes suffered from low light transmittance and poor image quality. The tiny lenses of a conventional system required supporting rings that would obscure the bulk of the lens area; they were difficult to manufacture and assemble and optically nearly useless. This allowed the little lenses to be dispensed with altogether. The rod-lenses were much easier to handle and used the maximum possible diameter available. Once again it was Karl Storz who produced the first of these new endoscopes as part of a long and productive partnership between the two men. Harold Hopkins was recognized and honoured for his advancement of medical-optic by the medical community worldwide. It formed a major part of the citation when he was awarded the Rumford Medal by the Royal Society in By measuring absorption of light by the blood by passing the light through one fibre and collecting the light through another fibre a doctor can estimate the proportion of haemoglobin in the blood and diagnose ulceration in the stomach. Reprocessing endoscopes involves over individuals steps. In the UK, stringent guidelines exist regarding the decontamination and disinfection of flexible endoscopes, the most recent being CfPP 01â€”06, released in [25] Rigid endoscopes, such as an Arthroscope, can be sterilized in the same way as surgical instruments, whereas heat labile flexible endoscopes cannot. With the application of robotic systems, telesurgery was introduced as the surgeon could be at a site far removed from the patient. The first transatlantic surgery has been called the Lindbergh Operation. Recent developments [28] have allowed the manufacture of endoscopes inexpensive enough to be used on a single patient only. It is meeting a growing demand to lessen the risk of cross contamination and hospital acquired diseases. For instance, the position of an anatomical structure or tumor might be shown in the endoscopic video. Other emerging endoscope technologies are emerging that measure additional optical properties of light, such as optical polarization, [32] optical phase, [33] and hyperspectral endoscopy, which records images at many different wavelengths.

Chapter 2 : Endoscopic Ultrasound | PENTAX Medical (Global)

CLE endoscopic imaging system CellvizioÂ® AlveoFlexâ„¢ Endomicroscopy (pCLE) with the CellvizioÂ® system is intended to provide real-time dynamic microscopic imaging of the distal lungs that is currently unavailable using any other technique.

The laser scanning scope, adapted to the instrument channel of a commercially-available endoscopic sheath, allows for the real-time cross-sectional imaging of living biological tissue via direct endoscopic visual guidance. A conventional rod lens imaging system may be used for the visual guidance. The MEMS mirror is preferably actuated using either or both of a thermal-mechanical or electrostatic actuation system. OCT is based on optical coherence domain reflectometry OCDR - originally used to inspect fiber optic cables for defects , which utilizes broadband light and interferometry to detect the pathlength distribution of echoes of light from reflective interfaces. Two- dimensional and three-dimensional images can be obtained by combining OCDR measurements i. Ultrasound produces images from backscattered sound echoes, and OCT uses infrared light waves that reflect off the internal microstructure within the biological tissues. These light reflections are then used to image the specimen. The frequencies and bandwidths of infrared light are orders of magnitude higher than medical ultrasound signals which results in greatly increased image resolution when compared to any existing modality. The imaging guidewire contains a complete lens assembly to perform a variety of imaging functions. Because of its size, OCT imaging can be performed over approximately the same area as a biopsy at high resolution and in real-time. Thus, the most attractive applications for OCT are those in which conventional biopsies cannot be performed or are ineffective, or where non-invasive or minimally invasive procedures are preferred. However, because of the extremely high velocity of light, interferometric techniques are required to extract the reflected optical signals from the infrared light used in OCT. The output, measured by an interferometer, is computer-processed to produce high resolution, real-time, cross-sectional or 3-dimensional 3D images of the specimen tissue. This technology provides in situ images of tissues at near histological resolution without the need for excision or processing of the specimen. OCT has also been used to image a wide variety of biological tissues such as skin, tooth, gastrointestinal tracts, genitourinary tracts, and malformations thereof. Further, experiments have demonstrated that the internal morphological and cellular structures in biological tissues can be displayed by the spatially resolved map of the reflected light in an OCT image with high spatial resolution e. The rotary fiber joint method is side view only not front view OCT and includes no imaging guidance. The swinging method is fragile, slow, and makes it difficult to maintain high quality light scanning. Because of limitations and complications in these previous attempts, development of high performance, reliable and low-cost OCT catheters and endoscopes suitable for future clinical applications still remains desirable. MEMS preferably facilitates endoscopic beam steering because of its small size, low cost, and excellent micro-beam manipulating capacity. For example, an existing cystoscope provides a 5 mm instrument channel which allows for a large lateral OCT scan. However, the invention may also be used with smaller scopes, such as a mm scope. In the thermal-mechanical case, the MEMS mirror is disposed on the end of a cantilever made of at least two materials bi-material. The coefficient of expansion of each of the materials is different, and heat is applied to the cantilever via current flowing through an embedded resistor. This heat causes the two materials to expand or contract at different rates thereby causing the cantilever and, hence, the mirror to bend and straighten under the control of the applied current. Two "finger" electrodes are placed as part of the optical system. A first electrode is fixed below or above the mirror, and a second electrode is disposed on the side of the mirror assembly. The finger electrodes are preferably interdigitated to provide a vehicle for applying a voltage therebetween. When the voltage is thus applied, the two electrodes are attracted in such a way as to rotate the mirror into and out of plane against the torsional beam. Again, the mirror can be controlled in a bi-directional manner under precise control. For example, the mirror may be moved along the plane of the cantilever and may also be rotated 90 degrees to that plane. By providing for more than one axis of control, two- and three-dimensional 2D and 3D OCT and other scans may be facilitated. More than one MEMS mirror may also be used to facilitate such multiple degree scans. For example, if the scanning light beam is reflected off a regular mirror, up to the MEMS mirror, and out the front of the endoscope tube, a front scanning OCT scope is enabled. Alternatively, if only a single MEMS mirror is used without the regular mirror , the scanning light beam may be oriented perpendicular to the opening of the endoscope tube and a lateral scan is enabled. Variations on this general scheme are contemplated within the knowledge of one skilled in these arts. Other and further objects and advantages of the present invention will be made clear through the following description of the invention, the attached drawings and the claims. However, because such elements are well known in the art, and because they do not facilitate a better understanding of the present invention, a discussion of such elements is not provided herein. The detailed description will be provided hereinbelow with reference to the attached drawings. Although many applications of OCT are known, the ability to control the scanning of the light source in an extremely narrow instrument channel is not easily facilitated using conventional technologies. As such, novel ways to control such scanning are provided by the present invention. Although the figures show general system diagrams of several alternative embodiments of the present invention, many other and further embodiments will be understood to those skilled in the art e. This scanning operation is facilitated by using one or more rotatable or translatable mirrors that can be manipulated to move the light beam. When designing such a mirror, there are at least three major mirror attributes that must be balanced in order to ensure proper OCT operation. Those mirror requirements include: The general problem with these systems is designing lateral scanning ability into a very confined space: A specialized MEMS mirror is capable of satisfying these requirements by allowing for a large beam size in a confined space. Without a substantial beam size, an acceptable focal spot, which determines the lateral resolution of the microscope design, can not be achieved for a practical focal distance in endoscopic settings. The present invention incorporates a larger mirror than conventional applications to create an adequate beam size which can be used for OCT or other laser scanning technologies such as Confocal Endoscopy or Multi-Photon Excitation Endoscopy. For example, in fiber optic switching applications as briefly described above, MEMS mirrors are generally on the order of about microns or less. For the present application, the mirror may be 1mm x 1mm, or even larger. For a large scanning angle and a quick response time, there are at least two types of control systems for the MEMS mirror: The thermal-mechanical design gives a very large scan angle up to 18 degrees or more , but the speed may be limited by thermal relaxation. The electrostatic design generally provides faster speed and lower power consumption compared to the thermal- mechanical design; however, the scan angle in the electrostatic design may not be as large as in the thermal -mechanical application. Hence, although both systems are improvements over the conventional designs, one or the other may be better suited to a particular application depending on the desired characteristics. Physicians and other operators will therefore get a more complete view of the specimen tissue combining both physiological and micro- morphological features through the use of the present invention. However, the present invention may be used with a wide variety of endoscopes or other instruments, such as a bronchial scope for the esophagus, an osteoscope for orthopedics and various other scopes for cervical or colon cancer and the kidneys. For all of these various designs, the general design is the same. As briefly described above, OCT is based on microscopic interferometry -- light interferometry illuminated with broadband light. The present invention combines OCDR - a technology originally used to inspect fiber optic cable to look for defects -- with a lateral scanning mirror design. With the addition of the lateral scanning mirror, a two-dimensional scan, with two mirrors, a three-dimensional scan is achieved. A broadband low coherence light source is guided equally into two single mode fibers through a The light in the sample arm lower arm is collimated by a fiber optic aspherical lens CM, and deflected by a conventional mirror and the beam steering MEMS micromirror. The beam is then focused through a lens e. The light in the reference arm upper arm is linearly scanned in the axial direction by an optical delay line. A photo detector represents the system for analyzing the reflected scan beam to product an image of the specimen. Because broadband light has short temporal coherence, this orientation permits detection of backscattering from different depths within the sample. A broadband light source BBS is initially provided with defined light spectral characteristics and is coupled into a fiber optic Michelson interferometer. The source BBS is preferably a standard commercial broadband light source, and the spectral specifications are typically defined by the commercial entity that provides the light source. In practice, the beam splitter may be a fiber coupler, or more specifically, it may be a single mode fiber optic coupler serving as a beam splitter. These two light source beams are used for scanning the specimen lower arm and for providing a reference signal upper arm with which the scanning signal can be compared for imaging. The FPC has three disks that may be manipulated to adjust the polarization of light passing therethrough. Therefore, a polarized beam of light exits from the fiber in the reference arm. However, a large mirror cannot typically be used in this type of device orientation because the large mirror "wobbles". This wobbling causes a deflection of the light beam and will disrupt the scanning coming off of the mirror The desired Doppler shift is separately created by passing the reference light beam through an electro-optical phase shifter E-O, also called an electro-optical phase modulator. The phase modulator E-0 can create the Doppler phase shift, and the reference mirror itself will give the axial delay line. In short, the delay line gives the optical delay and the phase modulator or phase shifter E-0 gives the Doppler effect or Doppler delay or, alternatively, a differential acoustic modulator could be used for the same purpose. In this way, the optical delay is separated from the Doppler shift. Alternatively, optical heterodyne detection can also be located in the phase modulator in order to manage the Doppler shift or Doppler effect. The principle of a grating lens-based optical delay line as described above is known in the art. The temporal profile of a broadband light is linearly distributed at the Fourier focal plane of a grating lens pair; thus, placing a mirror at the focal plane and tilting it rapidly with a galvanometer allows fast group delay. Furthermore, this method permits phase and group delays to be independently managed. By selecting each component e. Moreover, the dispersion induced by unbalanced fiber lengths and optical components between the two arms of the Michelson interferometer can be minimized by slightly moving the grating along the optical axis, which can greatly enhance the axial resolution as has been observed during the alignment. The first is to use a Differential Acoustic Optical Modulator. For this component, the frequency of a laser is modulated to achieve a 2MHz round trip Doppler shift e. The second improvement method uses a broadband Electro-Optical Modulator. This broadband version is driven by a triangle wave, and a single Doppler frequency results. In the first alternative, multiple Doppler frequencies may be achieved because of all the base functions, but certain embodiments also allow for a single resulting Doppler frequency. When a single Doppler frequency ensues from either alternative, a higher quality result with better signal-to-noise ratio is typically achieved. Because the ferrule is only 2. Because the lateral scanning range is determined by the size of the OCT tube, a large scale scope is preferred in order to achieve a larger OCT imaging range per scan. The ferrule is inserted from the front side rather than the back side, and the ferrule is then glued or screwed into the instrument channel. In conventional endoscope applications, the scope is first inserted into the patient, and thereafter the instrument is inserted from the back of the tube outside the patient. Various alternatives of this preferred embodiment are also envisioned. In this way the operator can view both the surface of the specimen via the rod lens system as well as the interior region of the specimen via the OCT. The preferred rod lens system operates in realtime and returns about 30 frames per second. Preferably the rod lens system is incorporated into a small size endoscope - for example a 2.

Chapter 3 : EVIS EXERA III Endoscopy System - Gastroenterology - Olympus Medical Systems

The KARL STORZ NIR/ICG Imaging System, the only FDA-approved 4 mm NIR/ICG fluorescence imaging system for endoscopic neurosurgery. Neurosurgeons can benefit from the enhanced visualization of patient anatomy provided using NIR imaging to detect ICG distribution in tissue.

It will be appreciated from FIG. In this instance, the camera body 94 is coupled to an extension portion 96 at a pivot point which includes a pin The camera body 94 includes a plurality of recesses 99 which receive a detent or pawl to lock the body 94 and extension portion 96 in position. The endoscope coupler 40 is shown adjacent to the focus ring 44 which is adjacent to the zoom ring The zoom ring 84 is adjacent to the image ring The elbow joint 90 is shown connected to the body The distal end of the body 94 of the camera unit contains the optical lens mechanism which accommodates the focus and zoom functions, in order to direct the image onto the CCD or CMOS chip The chip is connected to the input of an analog-to-digital converter via the ribbon wire The user input controls 82 are coupled to the processor , or alternatively to a controller such as shown in FIG. The proximal end of the body 94 also includes a battery and a connector for external DC. The body 94 also includes on board flash memory Finally, a wireless radio transceiver is shown for wireless downloading of data and wireless control of the camera unit. A power on peg is shown. The power on peg includes a switch see FIG. The memory includes a code for a sleep mode and power up routine, or similar battery saving features. The unit is normally in a sleep mode as one skilled in the art will appreciate. Upon the coupler 40 engaging an endoscope, the power on peg is engaged and the power up routine is initiated. As is shown, ribbon wire or other conductors extend within the elbow joint 90 from the distal coupler end to proximal body. The image acquisition device may be an CCD chip , for example. The high speed data transfer port is shown coupled to the on board screen 64 and the port for connection to an external device. An analog output , such as audio S, is provided for coupling to an external device. Conductors are coupled to the device and extend within the endoscope. The coupler 40 includes an electrical and mechanical connector for coupling to an electrical and mechanical connector having the ribbon connector wire The electrical and mechanical connector is also adapted for coupling to the endoscope and the conductors For example, the connector may include a portion connected to the endoscope and a portion connected to the coupler The system of FIG. Both camera housing and display housing are preferably constructed from high impact plastic, although other sturdy materials may alternatively be used. Camera housing includes an elongated main body region , a bulbous gripping region , and two elongated, indented forefinger or index finger accepting regions on opposing left and right sides of main body region , proximate bulbous gripping region A power-on switch not shown is disposed on the left side of main body region A plurality of screw holes and associated screws permit camera housing to be constructed from a plurality of housing portions. As best seen in FIGS. In particular, the top surface of camera housing includes direction button , mode button , and menu button Direction button is preferably a digital joystick, normally spring biased to remain in a central, vertical orientation, which may be momentarily rocked into forward, reverse, left and right orientations, relative to its central orientation. One of the functions of direction button is to select a digital zoom level for image viewing and capture. Movement of direction button to the forward or reverse orientation causes an associated positive or negative change in the digital zoom level of the image to be viewed and the still or motion video image to be captured. Mode button and menu button are preferably pushbutton, momentary switches. Direction button performs several additional functions, in conjunction with mode button , menu button , and an on-screen menu presented to the physician using video display 64, under control of the microprocessor, or digital signal processor, contained within the housing of the present endoscopic camera. In addition to direction button , mode button , and menu button , as best seen in FIGS. In particular, either video record button or a may be depressed to record a video clip, and either still photograph shutter button or a may be depressed to capture a still photograph. As shown in FIG. The provision of redundant video record and still photograph shutter buttons serve to facilitate ease of operation by the physician in recording video clips and still images using the present endoscopic camera. In particular, depending upon the type of endoscope attached to the present endoscopic camera, as well as the type of endoscopic inspection being performed, it may be convenient for the physician to hold the present endoscopic camera in a variety of different manners. Several different ways in which the present endoscopic camera and an attached endoscope may be held by the physician are shown in FIGS. This bulbous gripping region may be substantially bulbous or bulb-like, substantially spherical, substantially spheroidal, substantially oblate spheroidal, or substantially ellipsoid in shape. When held in this manner, it will be more convenient for the physician to record video clips and still images using video record button and still photograph shutter button , respectively, by using the middle or ring finger to depress the desired button in a trigger-like manner. Accordingly, as best seen in FIG. Moreover, inasmuch as two, substantially identical forefinger accepting regions are symmetrically disposed on opposing sides of camera housing , and inasmuch as buttons and are disposed proximate a front, central region of bulbous gripping region , the present endoscopic camera may be held and operated in a pistol grip manner using either the left hand or the right hand. Another manner of gripping the present endoscopic camera, in conjunction with an attached flexible endoscope 52, is shown in FIG. As shown, the physician 20 is holding the flexible endoscope in a top, distal tip control manner. When so held, the physician has relatively easy access to either buttons and , or buttons a and a, and can use whichever is considered by the physician to be most convenient. Yet another manner of gripping the present endoscopic camera, in conjunction with the use of a flexible endoscope, is shown in FIG. As shown, the physician 20 is holding the flexible endoscope in a bottom, distal tip control manner. Again, the he physician has relatively easy access to either buttons and , or buttons a and a, and can use whichever is considered to be most convenient. Display swivel post comprises stem portion , swivel head portion , central bore , and a longitudinal axis extending through central bore Swivel head portion is retained within an interior region of display housing by swivel hinge pins which, in turn, are maintained in position by respective associated retention nuts Stem portion of display swivel post extends from bottom aperture of display housing and into camera body at display rotating slot as shown, for example, in FIG. Electrical conductors, such as a ribbon cable, are passed through central bore to electrically connect video display 64 to a printed circuit board carried within camera housing As shown in FIGS. Display post connector secures stem portion of display swivel post to display rotational connector , with a distal end of stem portion extending through swivel post stem aperture Upon attachment of display post connector and, in turn, display swivel post to display rotational connector , locking members are disposed within aperture , and respective mounting apertures and are aligned and secured together with suitable fasteners. Upon attachment of display post connector and display swivel post to display rotational connector , stem portion of the display swivel post extends outwardly from camera housing , through display rotating slot As the display rotational connector is rotated back and forth, stem portion travels back and forth through slot , through a range of motion limited by contact of stem portion with slot endpoints a and b, disposed on the right and left hand sides of main body region , respectively, as shown in FIGS. Moreover, and as shown in FIGS. This permits the display housing to be secured for overall storage of the present endoscopic camera by first rotating the display counter-clockwise fully to the left as viewed from the rear of camera housing , until stem portion contacts endpoint b, and then rotating the display housing back towards battery door , until the display rests substantially flat against the left hand side of elongated main body region This, in turn, permits display housing and display 64 not only to be rotated about the longitudinal axis of display swivel post as the two swivel hinge posts rotate about display swivel post proximate the juncture of stem portion and swivel head portion but further permits display housing and display 64 to be simultaneously pivoted towards and away from camera body , as stem portion enters and exits the arcuate portion of bottom aperture , respectively. In a preferred embodiment, the range of pivotal movement of display housing , relative to camera body , extends from a first position, wherein display housing is substantially perpendicular to a longitudinal axis of camera housing extending through the camera housing main body region , the center of zoom ring 84, and the center of focus ring 44 , to a second position, where display housing rests substantially flat against camera housing main body region As best seen in FIG. A plurality of webs, or bosses , integrally formed with and extending inwardly from the inner surface of camera housing , cooperate with first flanged end and second flanged end of display rotational connector , permitting annular ring to to rotate about the longitudinal axis of the camera housing while retaining connector in position within the housing. Spring biased pin cooperates with the plurality of detent apertures of display rotational connector , permitting display rotational connector and, in turn, display housing , to be maintained in any of several click-stop orientations, all perpendicular to the longitudinal axis of the camera, as display rotational connector and, in turn, display housing , is rotated about the longitudinal axis. In particular, spring biased pin , when in its extended position, will releasably lock display rotational connector in a particular degree of rotation, upon engagement with an associated detent aperture While the spring biasing pressure placed upon pin and is sufficient to maintain rotational connector in a particular detent orientation, the spring pressure is not so strong so as to preclude the application of manual rotational force on display rotational connector from causing spring biased pin to retract sufficiently to permit further rotation of the connector, towards rotating the overall video display to another detent orientation. First, display housing may be rotated, transverse to the longitudinal axis of display swivel post , about a point P1 FIG. Second, display housing may be pivoted about point P1, from a first position wherein display housing is substantially aligned with stem portion and is substantially perpendicular to main body region , towards the camera body to a second position where at least a portion of the display housing contacts main body region Third, by rotating display rotational connector , point P1 and display housing may be rotated along an arc defining a portion of a circle concentric to the longitudinal axis of camera housing , passing through main body region , focus ring 44 and zoom ring For convenient viewing of display 64, display housing is rotated about point P1 FIG. Additional internal components of the present endoscopic camera are shown in FIGS. Battery is preferably a conventional lithium-ion type battery, which may be removed for recharging in a separate charging unit by first removing battery door from camera housing Alternatively, or in addition, a battery recharging jack may be disposed on the surface of housing , and a suitable recharging cradle or stand supplied, to permit the battery to be recharged in situ. Memory card is releasably retained within an associated card slot, and may be removed from within the camera housing upon removal of the battery door. Primary printed circuit board includes much of the circuitry depicted in FIG. Secondary printed circuit board carries direction button , mode button , and menu button Secondary printed circuit board carries redundant video record button a and redundant still photograph shutter button a. Secondary printed circuit board carries redundant video record button and redundant still photograph shutter button Camera body may further contain a miniature microphone not shown , also coupled to primary printed circuit board Although preferred embodiments of the invention have been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications, and substitutions of parts and elements without departing from the spirit of the invention. For example, it is also anticipated that the viewing screen on the camera may be a commercially available twin LCD display having a backlight and a system LSI large-scale integrated circuit chip between two LCD screens, allowing both sides of the display to work at the same time. Further, the system may include an audio input for accommodating stroboscopic analysis. A digital endoscopic camera adapted for interchangeable use with a variety of endoscopes having a first end and a second end, the first end having an eyepiece and the second end having a viewing end, the digital endoscopic camera comprising: The invention according to claim 1 , wherein the viewing screen is further rotatable about a point spaced from the main body portion of the digital endoscopic camera, and wherein the viewing screen remaining distally spaced from the main body portion during such rotation. The invention according to claim 1 , wherein the viewing screen is further pivotable towards and away from the main body portion of the digital endoscopic camera about a point spaced from the main body portion. The invention according to claim 1 , wherein the viewing screen is further rotatable about a point spaced from the main body portion of the digital endoscopic camera, wherein the viewing screen remaining distally spaced from the main body portion during such rotation, and wherein the viewing screen is further pivotable towards and away from the main body portion of the digital endoscopic camera about the same point spaced from the main body portion of the digital endoscopic camera. The invention according to claim 1 , wherein the viewing screen is coupled to a rotating connector, at least a portion of the rotating connector being carried inside of the housing of the digital endoscopic camera. The invention according to claim 6 , wherein the rotating connector rotates about the longitudinal axis of the housing. The invention according to claim 6 , wherein the viewing screen is coupled to the rotating connector via a post interposed between the viewing screen and the rotating connector, and wherein the viewing screen is both capable of both rotatable and pivotal movement proximate a point of attachment of the viewing screen to the post. A method of performing an endoscopic inspection, comprising the steps of: The method according to claim 9 , further comprising the step of rotating the viewing screen about a point spaced from the main body portion of the digital endoscopic camera while maintaining the viewing screen in a distally spaced orientation, relative to the main body portion, during such rotation. The method according to claim 9 , further comprising the step of pivoting the viewing screen about a point spaced from the main body portion of the digital endoscopic camera. The method according to claim 9 , further comprising the steps of: The invention according to claim 13 , wherein the at least one indented forefinger accepting region comprises two intended forefinger accepting region disposed on opposing sides of the main body portion of the housing.

Chapter 4 : EU-ME2 | Imaging Systems | All Products | Products | Olympus Medical Hong Kong

The only FDA-cleared ICG technology for endoscopic neurosurgery in a 4 mm format, the KARL STORZ NIR/ICG Imaging System assists surgeons in making critical decisions that may reduce the occurrence.

What is claimed is: An endoscopic imaging system comprising: The endoscopic imaging system of claim 1, wherein the image sensor is a complementary metal-oxide semi-conductor sensor. The endoscopic imaging system of claim 1, wherein the communication link is an electrical cable. The endoscopic imaging system of claim 1, wherein the communication link is a wireless link. The endoscopic imaging system of claim 1, wherein the image display has a diagonal dimension of less than 2. The endoscopic imaging system of claim 1, further comprising a moire fringe erasing filter coupled to the display housing. The endoscopic imaging system of claim 1, wherein the endoscope comprises a rigid endoscope, a flexible endoscope, or an articulating endoscope, and wherein the image sensor is housed in, coupled to, or carried in the endoscope. The endoscopic imaging system of claim 1, wherein a surface of the image display is in complementary alignment with a surface of the camera-sensor. The endoscopic imaging system of claim 10, wherein the image display is rotatable within the display housing such that the image display is rotatable relative to the camera-sensor. The endoscopic imaging system of claim 10, wherein the display housing comprises a wireless component for receiving signals from a transmitting component coupled to the image sensor. The endoscopic imaging system of claim 10, wherein the display housing is detachably coupled to the camera housing with a C-mount. An endoscopic imaging method comprising: The endoscope of claim 15, wherein the image display has a diagonal dimension of less than 1. The endoscope of claim 15, wherein the proximal-facing recess is configured such that the spacing from a proximal surface of the image display to a proximal face of the proximal housing is at least 0. The endoscope of claim 18, wherein the spacing is at least 0. The endoscope of claim 15, further comprising a de-focusing lens proximate the image display. The endoscope of claim 15, further comprising a de-focusing lens disposed in the proximal housing proximal to the image display. The endoscope of claim 15, further comprising an adjustable de-focusing lens assembly disposed in the proximal housing proximal to the image display. The endoscope of claim 15, wherein the elongated member comprises a rigid assembly. The endoscope of claim 15, wherein the elongated member comprises a flexible assembly. The endoscope of claim 15, wherein the elongated member comprises an assembly that can be articulated by an actuation mechanism. The endoscope of claim 15, wherein the housing has a diagonal dimension of less than 2. An endoscope system comprising: More specifically, the invention relates to an imaging and display system and coupler that provides a universal image communication link to allow a disposable endoscope to be used with any legacy video endoscopy system. For example, endoscopes can be used to diagnose and treat diseases in the urethra, bladder, ureter, kidney, uterus, nasal passageways, sinuses, esophagus, stomach, colon, lungs, bronchi and other body passageways, cavities and spaces. Such an endoscope can have an imaging sensor and optics at its distal tip to produce an image that is routed to a display, or the endoscope can have an objective lens and fiber optic light guide that communicates with a camera detachably coupled to an endoscope handle. A typical flexible endoscope has a distal articulating portion, with articulation forces created in the handle which are transmitted to the articulation portion by control cables also referred to as pull-wires. The pull-wires allow the physician to steer the working end of the endoscope to direct and navigate the working end to visualize the targeted site. Endoscopes can further include working channels for introducing treatment tools into a working space. In commercial re-useable endoscopes, there are a number of problems. Flexible endoscopes are expensive devices and a paramount problem is sterilization of the endoscope following a procedure if reused. Such sterilization requires tedious cleaning of the working channel with a brush followed by steam sterilization or another form of sterilization. Further, re-usable endoscopes are fragile and frequently damaged during use and particularly during the sterilization process. While disposable endoscopes can be economical and advantageous over the reusable endoscopes, one problem disposable endoscopes have is that they are not adaptable for use with the legacy video endoscopic systems that are in use in hospital operating rooms and surgery centers. What is needed is a disposable endoscope and imaging system that allows for coupling to multiple different legacy video endoscopic systems found in hospital operating rooms. The imaging systems can have an endoscope having an image sensor, a display housing having an image display, a communication link configured to couple the image sensor to the image display, and a camera housing having a camera-sensor. The display housing can be configured to be detachably coupled to the camera housing. The camera-sensor can be configured to receive signals from the image display. The methods can include transmitting signals from a first sensor to a first display, transmitting signals from the first display to a second sensor, and transmitting the signals received by the second sensor from the first display to a second display for observation. The second sensor can be detachably coupled to the first display. The endoscope can have an elongated member having a proximal housing and a distal end, an image sensor disposed in the distal end, and an image display disposed in a proximal-facing recess of the proximal housing. The endoscope imaging system can have an endoscope comprising an elongated member having a proximal housing and a distal end, an image sensor disposed in the distal end, and a video endoscopy camera-sensor body configured to be mated to the proximal housing. The mated proximal housing and video endoscopy camera-sensor body can be configured to provide a light-tight chamber between the image sensor and a camera-sensor. The medical endoscope systems can have a digital display component and coupler that provide for a universal image communication link to video endoscopy systems found in hospital operating rooms, ambulatory surgery centers and the like. The display system can include a display housing that is configured for detachable coupling to an existing or legacy endoscopic video system i. The endoscope can be a disposable endoscope or a re-useable endoscope. For example, the endoscope can be sterilizable and thus re-usable for a number of uses. The endoscope can have a digital image sensor , such as a complementary metal-oxide semi-conductor sensor CMOS chip at a distal end of the endoscope The endoscope body can have a diameter from about 1 mm to about 4 mm. Other diameters, more or less, as well as other ranges, narrower or wider, are also appreciated. For example, in a variation useful for urology among other applications , the endoscope can have a diameter of about 2. The endoscope body can carry, enclose, or otherwise house light fibers for illuminating a working space. Referring again to FIG. For example, the base unit can house a light source that carries light through a light cable to a connector that detachably couples to the light fitting on the handle portion of the endoscope The light source can comprise one or more LEDs that are coupled to light fibers in the light cable A fiber optic light collimator can be used to reduce the LED emitter surfaces to a 0. The base unit can have a video microprocessor for processing the image data stream from the image sensor of the endoscope For example, the base unit can carry, enclose, or otherwise house the microprocessor Similarly, the endoscope can carry, enclose, or otherwise house the image sensor e. A data transmission cable can extend from the base unit to a connector that connects to the handle portion of the endoscope Still referring to FIG. For example, the base unit can carry or house the battery module The battery unit can be re-charged as is known in the art, for example, by inductive coupling or by a cable to an electrical source. The battery module can provide for an operating time of 2 hours or more with normal usage e. Other times for any type of usage, more or less, are also appreciated e. Power usage can be optimized, for example, through software-controlled standby modes, display dimming and LED dimming. For example, the cable can extend from the base unit to the display As can be seen in FIG. The display housing can carry or house the digital display In a variation, the display can have a diagonal dimension of less than 2 inches, less than 1. Other diagonal dimensions and pixel resolutions, more or less, as well as other ranges, larger or smaller, are also appreciated. For example, in a variation, the display can have at least twice as many pixels as the camera-sensor of the cooperating video endoscopy system to minimize the Moire effect and to thus not limit resolution on the optical output side. The video processor can be configured to process the sensor input image data and display it on a display e. The display can be carried or housed in the display housing in a configuration that provides complementary alignment with the camera-sensor of the endoscopic video system By the term alignment, it is meant that a centerline of the display can be aligned with a centerline of the camera-sensor , and that a surface of display can be parallel with a surface of the camera-sensor Other alignments are also appreciated. In a variation, the display housing can carry or house the display in a manually rotatable collar that can be manually rotated to angularly align the display with the camera-sensor It can be seen that the display is positionable in alignment with the camera-sensor when the two housings and are coupled together. Optical lenses can be integrated into the display housing It can be understood from FIGS. Concurrently, the camera-sensor of the legacy video endoscopy system images the display and transmits its image data to a video processor of the video endoscopy system and then displays the images on a video display see, e. A sterile cover can be provided to cover the cables , , The sterile cover can be disposable. As shown in FIG. Similarly, the video processor can include a transmitter for sending Bluetooth or Wi-Fi data signals to a receiver carried or housed by the display housing The endoscope can be functionally similar or identical to endoscope and can have any of the features described above. For example, the endoscope can be a rigid, flexible, articulating, disposable, re-useable, or a combination thereof. The sensor can be connected by a cable to a video processor as described above. Other degree changes, more or less, as well as other ranges, narrower or wider, are also appreciated e. As can be understood from FIG. The video processor can include one or more algorithms to select image data from the sensor in first and second positions in which the sensor is furthest laterally or angularly spaced apart. The video processor can display the selected data as two video images in a stereoscopic manner in two displays, or a single display , to provide the viewer with a 3D or stereoscopic view of the target site. It should be appreciated that the endoscope and imaging display system can be used together with an electrosurgical probe introduced through the working channel of the endoscope When such electrosurgical devices are used in close proximity to an imaging sensor as described above, there is a potential for electrical interference with the imaging chip. Electronic shielding is known in the art and can be a thin polymer layer layers containing conductive metallic powders, wire mesh components or the like. Such shielding systems can he designed or provided by one of the following companies: Now turning to FIGS. The image sensor can be carried or disposed inward e.

Chapter 5 : Endoscopic imaging system - All medical device manufacturers - Videos

Concurrently, the camera-sensor of the legacy video endoscopy system images the display and transmits its image data to a video processor of the video endoscopy system and then displays the images on a video display (see, e.g., FIGS. 1 and 4).

Chapter 6 : 3D Imaging System | Olympus America | Medical

The PINPOINT Endoscopic Fluorescence Imaging System combines - into a single laparoscopy platform - the latest in high definition white-light video with SPY Fluorescence imaging, resulting in bright, clear images.

Chapter 7 : PINPOINT Endoscopic Fluorescence Imaging System

Healthcare imaging specialist Barco announced the availability of its 4K end-to-end solution for the operating room, comprising a 4K inch and inch surgical display and its OR-over-IP management platform for streaming of 4K video and data.

Chapter 8 : WOA1 - Endoscopic imaging system - Google Patents

The KARL STORZ NIR/ICG Imaging System enables surgeons to perform minimally invasive surgery using standard endoscopic visible light as well as an enhanced visual assessment of vessels, blood flow and related tissue perfusion, using near-infrared (NIR) imaging.

Chapter 9 : USA1 - Endoscopic imaging system - Google Patents

The Image 1 S3 Endoscopic Imaging System is the first completely digital camera system by Karl Storz. Digital source sampling technology facilitates the fully digital transfer of information with no loss in quality using an A/D converter, as *well as loss-free data storage on all known digital media.*