the likelihood of introducing any blurring from scanning well below the refresh rate of the display device. By scanning slower than standard video rates, the optical system can deliver higher power levels for optical therapies and allow longer times for signal integration from weak-signal fluorescence diagnoses. Thus, the dynamic range of the scanning optical system can be optimized according to the system components and application requirements.

[0102] Illumination may only occur in one or a few pixels per frame. For example, real-time optical biopsies can be carried out with the present invention at single points in an ROI, enabling very bright flashes of light excitation to be used and providing time for spectroscopic acquisition and spectral mapping over the normal image.

[0103] **FIG. 6C** illustrates a portion of a concentric optical fiber assembly **280** that includes a relatively small central optical fiber **284** surrounded by cladding **286**. A larger diameter optical fiber surrounds the smaller optical fiber. Illumination of an ROI is provided through small diameter optical fiber **284**, and light emitted thereby passes through lenses **288***a*, **288***b*, and **288***c* to illuminate the ROI. Light reflected or otherwise received from the ROI is focused by these lenses back into an optical fiber assembly **289**, which conveys the light that is received to instrumentation disposed outside the patient's body. It should be noted that a single optical fiber can both illuminate the ROI and convey light from the ROI to the external instrumentation in this so-called concentric confocal imaging. The concentric optical fiber geometry is a single mechanical unit either fused together, or alternatively, the concentric regions of refractive index differences can be manufactured by doping the glass fiber radially. A tubular piezoelectric actuator **282** causes the concentric optical fibers to move together and thus to scan the ROI in one of the modes described above. The light collected in the surrounding optical fiber can be used with signals from detectors or optical fibers at radially increasing distances from the reflected confocal point to enhance image analysis and refine the depth of light penetration for diagnosis, imaging, and therapy. In extremely high-gain or discrimination detection configurations, the backscattered light may be collected in the same part of the waveguide (e.g., the core of the optical fiber). Such applications will use the optical coherence property to amplify the small signal level, producing diagnostic maps based upon optical coherence reflectometry (OCR) or optical coherence tomography (OCT), or laser-induced feedback.

[0104] **FIGS. 6D and 6E** illustrate an embodiment that includes detectors for RGB, UV, and IR spectral components. An optical fiber assembly **295** includes an internal actuator **291** mounted on a support **293**. An optical fiber **300** enclosed within the housing having an opening **298** extends distally of actuator **291** and is moved by the internal actuator, which is preferably a tubular piezoelectric type, in one of the modes described above. RGB detectors **292** and **294** are disposed above and below optical fiber **300**, while RGB detectors **306** and **308** are disposed to the left and right of the optical fiber, as illustrated in **FIG. 6E**. In addition, RGB detectors **290** and **296** are disposed on the outer surface of the assembly on the top and bottom thereof, as indicated in these Figures. In a similar manner, RGB detectors **302** and **304** are mounted on the left and right sides of the detector as illustrated in **FIG. 6E**. UV detectors **310** and **312** are mounted on one of the diagonals between the RGB detectors, while IR detectors **314** and **316** are mounted on the other diagonal. Accordingly, a pseudo-stereo image can be produced in regard to the RGB, UV, or IR spectral components received by the various detectors included on this assembly.

[0105] **FIGS. 6F and 6G** illustrate an optical fiber assembly **295**' in which parallel and perpendicular polarized light detectors are included. Optical fiber **300** conveys light that is polarized in a parallel direction as indicated by reference numeral **328**. On opposite sides of optical fiber **300** are disposed parallel polarized light detectors **334** and **336**, while above and below optical fiber **300** are disposed perpendicular polarized light detectors **324** and **326**, as shown in **FIG. 6G**. In addition, perpendicular polarized light detectors **320** and **322** are disposed above and below perpendicular polarized detectors **324** and **326**, while parallel polarized light detectors **329** and **330** are disposed left and right of parallel polarized light detectors **334** and **336**. Optical fiber assembly **295**' is thus able to detect polarized light in both orientations that is reflected or otherwise received from an ROI for analysis by instrumentation disposed external to the patient's body. The signal produced by the various polarized light detectors can also be used for producing an image corresponding to that specific type of polarization.

[0106] A schematic diagram illustrating a light source system **340** for producing light of different spectral composition that is coupled into an optical fiber **360** is illustrated in **FIG. 7A**. In this embodiment, a red light source **342**, a green light source **344**, a blue light source **346**, and an UV light source **348** are each selectively coupled into optical fiber **360**. Attenuators **350** are provided for each of the light sources so that the intensity of the light they produce can be selectively controlled. Three dichroic mirrors **352**, **354**, and **356** that include coatings specific to the color of light emitted by each of the corresponding green, blue, and UV light sources are positioned within the light path to reflect green, blue, and UV light, respectively, into the proximal end of optical fiber **360**. Light that is outside the reflectance waveband for each of these dichroic mirrors is passed through the dichroic mirror and is focused by a lens **358** into the proximal end of optical fiber **360**.

[0107] An alternative light source system **362** is illustrated in **FIG. 7B**. In this embodiment, red, green, and blue light sources **342**, **344**, and **346**, respectively, are coupled through optional attenuators **350** to a series or sequence of optical couplers **366** through lenses **364**. Lenses **364** focus the light from each of the different colored light sources into optical fibers **365**, which convey the light to optical couplers **366**. In addition, an IR source **368** transmits light through an optional attenuator **350** and a lens **364** into optical fiber **365**, which conveys the IR light to the last optical coupler in the sequence. Optical detectors **370** are provided for monitoring the light intensity levels or power levels for each of the different sources of light, enabling the intensity of the various light sources to be controlled. From the last optical coupler, an optical fiber **367** conveys light to an input to optical detectors **370**, while the output from the last optical coupler is input to the proximal end of optical fiber **360** for input to a patient's body. To produce the smallest affective source size, the optical fiber that would be chosen in **FIG. 7C** would be single mode for wavelengths at or above that of blue light.