452 sensed by the optical sensing portion of sensing element 460 may be referred to as the "outer" portion of optical signal 452.

As shown, sensing element 460 transmits sensed signal 464 to a controller 480. Controller 480 uses sensed signal 464 to control optical energy source 450 via control signal 482. As an example, controller 480 uses sensed signal 464 to produce control signal 482, which may serve to control the power level of optical energy source 450.

Without the feedback control provided by the described systems, such as systems 400 and 440, the intensity of the optical energy sources may vary due to factors such as the age and ambient temperature of the optical energy source. Such variance can reduce the SNR created within systems 400 and 440. Controlled feedback allows for subsequent common-mode subtraction of the correlated noise to increase the effective SNR of the optical system.

FIG. 5 shows a flowchart illustrating an embodiment of a method 500 in accordance with the System and Method for Increasing Signal-to-Noise Ratio in Optical Based Sensor Systems. Method 500 may be used within systems 100, 300, 400, and 440 as discussed herein. For illustration purposes, method 500 will be discussed with reference to systems 300 and 400.

Method 500 may begin at step 510, wherein a portion 334 of an optical signal 332 having a power level is passed through an aperture of a sensor 320 having a sensing element. The portion 334 of the optical signal 332 that passes through the aperture is the inner portion of optical signal 332 and the portion 336 of optical signal 332 that does not pass through the aperture is the outer portion of optical signal 332.

Method 500 may proceed to step 520, which involves producing a sensed signal by sensing the outer portion 336 of optical signal 332 with the sensing element of sensor 320, which may be the anode of sensor 320. As an example, step 520 may involve sensing and integrating the outer portion 336 of optical signal 332 about at least a first angle of the sensing element. In some embodiments, the first angle exceeds π radians. In other embodiments, the first angle is less than or equal to it radians. Step 520 may involve sampling optical signal 332 about an n-degree range at or near the perimeter of the sensing element. In some embodiments, step 520 involves sensing and integrating the outer portion of the optical signal over symmetrical segments of the sensing element.

Step 530 involves controlling the source of the optical signal using the sensed signal (see FIG. 4A). As an example, step 530 may involve providing feedback 424 to a source 410 of the optical signal 412 to control the power level of the source of optical signal 412. Step 540 involves passing the inner portion 334 of the optical signal 332 through an optical isolation device 350 (see FIG. 3). Step 550 involves detecting the inner portion 334 of the optical signal 332 with a detection element 370 (see FIG. 3).

It should be recognized that step 520 may occur prior to steps 540 and 550, simultaneously as steps 540 and 550, or subsequent to steps 540 and 550. Further, step 530 may occur prior to steps 540 and 550, simultaneously as steps 540 and 550, or subsequent to steps 540 and 550.

Method 500 may be implemented using a programmable device, such as a computer-based system. Method 500 may be implemented using various programming languages, such as "C", "C++", "FORTRAN", "Pascal", and "VHDL".

Various computer-readable storage mediums, such as magnetic computer disks, optical disks, electronic memories and the like, may be prepared that may contain instructions that direct a device, such as a computer-based system, to implement the steps of method 500. Once an appropriate device has access to the instructions and contained on the computer-readable storage medium, the storage medium may provide the information and programs to the device, enabling the device to perform method 500.

As an example, if a computer disk containing appropriate materials, such as a source file, an object file, an executable file or the like, were provided to a computer, the computer could receive the information, appropriately configure itself and perform the steps of method 500. The computer could receive various portions of information from the disk relating to different steps of method 500, implement the individual steps, and coordinate the functions of the individual steps.

Many modifications and variations of the System and Method for Increasing Signal-to-Noise Ratio in Optical Based Sensor Systems are possible in light of the above description. Therefore, within the scope of the appended claims, the System and Method for Increasing Signal-to-Noise Ratio in Optical Based Sensor Systems may be practiced otherwise than as specifically described. Further, the scope of the claims is not limited to the implementations and embodiments disclosed herein, but extends to other implementations and embodiments as may be contemplated by those having ordinary skill in the art.

We claim:

1. A method comprising the steps of:

passing a portion of an optical signal through an aperture of a sensor having a sensing element, wherein the portion of the optical signal that passes through the aperture is an inner portion of the optical signal and the portion of the optical signal that does not pass through the aperture is an outer portion of the optical signal;

producing a sensed signal by sensing the outer portion of the optical signal with the sensing element;

controlling the source of the optical signal using the sensed signal;

passing the inner portion of the optical signal through an optical isolation device, wherein the optical isolation device is a linear polarizer having a quarter-wave plate coupled thereto; and

detecting the inner portion of the optical signal with a detection element.

2. The method of claim 1, wherein the sensing element is ring-shaped, wherein the step of producing a sensed signal comprises sensing and integrating the outer portion of the optical signal about at least a first angle of the sensing element, wherein the first angle exceeds π radians.

3. The method of claim 1, wherein the step of producing a sensed signal comprises sensing and integrating the outer portion of the optical signal over symmetrical segments of the sensing element.

4. The method of claim 1, wherein the step of controlling the source of the optical signal using the sensed signal comprises controlling the power level of the source of the optical signal.

5. The method of claim 1, wherein the sensor is a photodiode.

6. The method of claim 1, wherein the inner portion of the optical signal has a total noise source that correlates to a total noise source of the outer portion of the optical signal.

7. The method of claim 1, wherein the optical isolation device is coupled to the sensor.

8. The method of claim 1, wherein at least one side of the optical isolation device has an anti-reflective coating.

9. A system comprising:

an optical energy source configured to produce an optical signal having a power level;