optically interacted light, the optically interacted light having an amplitude proportional to a dot product of an input light beam into the integrated computational element and a regression vector associated with a characteristic of the fluid, an electromagnetic radiation source configured to emit electromagnetic radiation that optically interacts with the fluid, ~~and at least one~~ a first detector arranged to receive the optically

interacted light and generate an output signal corresponding to ~~a~~ the characteristic of the fluid and a second detector arranged to detect the electromagnetic radiation from the electromagnetic radiation source and thereby ~~to~~ generate a compensating signal indicative of electromagnetic radiating deviations stemming from ~~an~~ the electromagnetic radiation source ~~forming the input light beam, wherein the compensating signal is based on a portion of the input light beam that has not interacted with the integrated computational element~~. The system may further include a signal processor communicably coupled to the ~~at least one~~ first and second detector of each optical computing device for receiving the output and compensating signal of each optical computing device, the signal processor being configured to determine the characteristic of the fluid as detected by each optical computing device and provide a resulting output signal.

[0008] In another aspect, a method of monitoring a fluid within a pipeline may be disclosed. The method may include introducing a movable inline inspection device into the pipeline, the movable inline inspection device having a first end and a second end and one or more optical computing devices arranged on at least one of the first or second ends, wherein each optical computing device has at least one integrated computational element arranged therein, emitting electromagnetic radiation from an electromagnetic radiation source arranged in each optical computing device; optically interacting the electromagnetic radiation with the fluid; generating optically interacted radiation to be detected by ~~at least one~~a first detector in each optical computing device, the optically interacted radiation having an amplitude proportional to a dot product of an input light beam into the integrated computational element and a regression vector associated with a characteristic of the sample; generating an output signal corresponding to a characteristic of the fluid with the ~~at least one~~first detector arranged within each optical computing device, receiving the output signal from each optical computing device with a signal processor communicably coupled to the ~~at least one~~ first detector of each optical computing device, receiving and detecting with a second detector arranged in each optical computing device at least a portion of the electromagnetic radiation, generating with each second detector a compensating signal indicative of radiating deviations of the corresponding electromagnetic radiation source, computationally combining the output signal and the compensating signal of

each optical computing device with the signal processor communicably coupled to the first and second detectors of each optical computing device, normalizing the output signal of each optical computing device, and determining with the signal processor the characteristic of the fluid detected by each optical computing device. ~~The method further comprises the at least one detector generating a compensating signal indicative of electromagnetic radiating deviations stemming from the electromagnetic radiation source forming the input light beam, and wherein the compensating signal is based on a portion of the input light beam that has not interacted with the integrated computational element.~~

[0009] The features and advantages of the present invention will be readily apparent to those skilled in the art upon a reading of the description of the preferred embodiments that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The following figures are included to illustrate certain aspects of the present invention, and should not be viewed as exclusive embodiments. The subject matter disclosed is capable of considerable modifications, alterations, combinations, and equivalents in form and function, as will occur to those skilled in the art and having the benefit of this disclosure.

[0011] FIG. 1 illustrates an exemplary integrated computation element, according to one or more embodiments.

[0012] FIG. 2 illustrates a block diagram non-mechanistically illustrating how an optical computing device distinguishes electromagnetic radiation related to a characteristic of interest from other electromagnetic radiation, according to one or more embodiments.

CLAIMS

1. A system for monitoring a pipeline, comprising:

a movable inline inspection device arranged within the pipeline and having a first end and a second end;

one or more optical computing devices arranged on at least one of the first and second ends for monitoring a fluid within the pipeline, the one or more optical computing devices each comprising:

an electromagnetic radiation source configured to emit electromagnetic radiation that optically interacts with the fluid;

at least one integrated computational element configured to optically interact with the fluid and thereby generate optically interacted light, the optically interacted light having an amplitude proportional to a dot product of an input light beam into the integrated computational element and a regression vector associated with a characteristic of the fluid;

~~at least one~~ a first detector arranged to receive the optically interacted light and generate an output signal corresponding to ~~a~~ the characteristic of the fluid; and

a second detector arranged to detect the electromagnetic radiation from the electromagnetic radiation source and thereby ~~to~~ generate a compensating signal indicative of electromagnetic radiating deviations stemming from ~~an~~ the corresponding electromagnetic radiation source ~~forming the input light beam, wherein the compensating signal is based on a portion of the input light beam that has not interacted with the integrated computational element~~; and,

a signal processor communicably coupled to the ~~at least one~~first and second detectors of each optical computing device for receiving the output and the compensating signal of each optical computing device, the signal processor being configured to determine the characteristic of the fluid as detected by each optical computing device and provide a resulting output signal.

2. The system of claim 1, wherein the compensating signal is based on a portion of the input light beam that has not interacted with the integrated computational element.

23. The system of claim 1, wherein the resulting output signal is indicative of the characteristic of the fluid.

34. The system of claim 1, wherein the fluid is a multiphase fluid.

45. The system of claim 1, wherein the characteristic of the fluid is a concentration of one or more reagents in the fluid.

56. The system of claim 1, wherein the characteristic of the fluid is a concentration of a product resulting from a chemical reaction occurring in the fluid.

67. The system of claim 1, wherein the one or more optical computing devices are arranged at both the first and second ends, the one or more optical computing devices arranged at the first end being configured to monitor the fluid preceding the movable inline inspection device, and the one or more optical computing devices arranged at the second end being configured to monitor the fluid following the movable inline inspection device.

78. The system of claim 1, wherein the one or more optical computing devices are arranged within a housing configured to protect the one or more optical computing devices from external contamination and/or damage.

~~8. The system of claim 1, wherein each optical computing device further comprises an electromagnetic radiation source configured to emit electromagnetic radiation that optically interacts with the fluid.~~

~~9. The system of claim 8, wherein the at least one detector is a first detector and the one or more optical computing devices further comprises a second detector arranged to detect the electromagnetic radiating deviations.~~

~~10~~9. The system of claim ~~9~~1, wherein the signal processor is ~~communicably coupled to the first and second detectors and~~ configured to receive and computationally combine the output and compensating signals in order to normalize the output signal.

~~11~~10. A method of monitoring a fluid within a pipeline, comprising:

introducing a movable inline inspection device into the pipeline, the movable inline inspection device having a first end and a second end and one or more optical computing devices arranged on at least one of the first or second ends, wherein each optical computing device has at least one integrated computational element arranged therein;

emitting electromagnetic radiation from an electromagnetic radiation source arranged in each optical computing device;

optically interacting the electromagnetic radiation with the fluid;

generating optically interacted radiation to be detected by ~~at least one~~ a first detector in each optical computing device, the optically interacted radiation having an amplitude proportional to a dot product of an input light beam into the integrated computational element and a regression vector associated with a characteristic of the sample;

generating an output signal corresponding to a characteristic of the fluid with the ~~at least one~~first detector arranged within each optical computing device;

receiving the output signal from each optical computing device with a signal processor communicably coupled to the ~~at least one~~first detector of each optical computing device;

receiving and detecting with a second detector arranged in each optical computing device at least a portion of the electromagnetic radiation;

generating with each second detector a compensating signal indicative of radiating deviations of the corresponding electromagnetic radiation sources;

computationally combining the output signal and the compensating signal of each optical computing device with the signal processor communicably coupled to the first and second detectors of each optical computing device;

normalizing the output signal of each optical computing device; and

determining with the signal processor the characteristic of the fluid detected by each optical computing device.~~,~~

~~wherein the method further comprises the at least one detector generating a compensating signal indicative of electromagnetic radiating deviations stemming from the electromagnetic radiation source forming the input light beam, and wherein the compensating signal is based on a portion of the input light beam that has not interacted with the integrated computational element.~~

~~12. The method of claim 11, wherein the at least one detector in each optical computing device is a first detector, the method further comprising:~~

~~receiving and detecting with a second detector arranged in each optical computing device at least a portion of the electromagnetic radiation;~~

~~generating with each second detector the compensating signal indicative of radiating deviations of the corresponding electromagnetic radiation source;~~

~~computationally combining the output signal and the compensating signal of each optical computing device with the signal processor communicably coupled to the first and second detectors of each optical computing device; and~~

~~normalizing the output signal of each optical computing device.~~

11. The method of claim 10, wherein the compensating signal is based on a portion of the input light beam that has not interacted with the integrated computational element.

~~13~~12. The method of claim ~~11~~10, further comprising providing with the signal processor a resulting output signal indicative of the characteristic of the fluid.

~~14~~13. The method of claim ~~11~~10, wherein generating the output signal corresponding to the characteristic of the fluid further comprises determining a concentration of a substance in the fluid.

~~15~~14. The method of claim ~~11~~10, wherein generating the output signal corresponding to the characteristic of the fluid further comprises determining a concentration of one or more reagents in the fluid.

~~16~~15. The method of claim ~~11~~10, wherein generating the output signal corresponding to the characteristic of the fluid further comprises determining a concentration of a product resulting from a chemical reaction occurring in the fluid.

~~17~~16. The method of claim ~~11~~10, wherein the one or more optical computing devices are arranged at both the first and second ends, the method further comprising:

monitoring the fluid preceding the movable inline inspection device with one or more optical computing devices arranged at the first end; and

monitoring the fluid following the movable inline inspection device with one or more optical computing devices arranged at the second end.