

## AUTONOMOUS DATA QUALITY EVALUATION

### TECHNICAL FIELD

**[0001]** The disclosure relates generally to asset management, and more particularly, to autonomous evaluation of data quality for sensor data acquired on an asset that is deployed to a physical location for operation.

### BACKGROUND ART

**[0002]** Platforms that include various sensors for monitoring various aspects of a physical area are utilized in a variety of industries and applications. The sensors can include various combinations of one or more types of sensors having diverse technologies to measure physical, chemical, biological, radiological, and/or the like, characteristics of the surrounding environment. Such platforms can be located in water, in the air (e.g., using a balloon or aircraft), located in space, or located on land. Sensors and platforms can be stationary or moving. Illustrative industries and applications for water-based platforms include, but are not limited to: oceanography (e.g., research), port operations, river management, offshore oil and gas exploration and production, environmental monitoring and protection, ocean energy devices (wave and tidal), offshore wind farm monitoring, weather stations, aquaculture, marine biology, water quality, navigational aids, monitoring buoys, research platforms, flood control, mineral extraction (e.g., ocean mining), drilling platforms, etc. Platforms for land-based applications include, but are not limited to, roadway and traffic monitoring systems, internal and external building monitoring, distributed energy monitoring systems (generation, transmission, distribution, etc.), pipeline monitoring, structural monitoring (bridges, dikes, levees, and/or the like), security systems (video and/or acoustic monitoring), and/or the like.

**[0003]** These platforms are commonly left unattended, perform their desired operations autonomously or semi-autonomously, and report data to remote locations. Furthermore, a platform can be self-powered, e.g., using batteries that can be charged by various ambient energy sources, such as photovoltaic solar panels, wind-driven generators, energy harvesting devices (e.g., piezoelectric, thermal energy, etc.), water (e.g., current or flow) driven generators, and/or the like. In a typical deployment, multiple sensors can be connected to a small scale local or embedded computer system, which handles data sampling, collection, storage, and transmission of the sensor data.

**[0004]** A sensor on a platform can provide invalid or erroneous data (e.g., due to physical circumstances, sensor failure, associated component failures, and/or the like). In this case, the computer system will typically transmit the invalid sensor data for use in a larger monitoring/management system. In some instances, the monitoring/management system will process the data as valid sensor data, and initiate one or more actions that are not required. Furthermore, the data can be propagated to other systems, thereby requiring extensive time and effort to detect and correct the resulting data problem in the various systems.

### SUMMARY OF THE INVENTION

**[0005]** Aspects of the invention provide a solution for managing an asset. A set of sensing devices associated with the asset are operated independent of a user to acquire sensor

data. At least some of the sensor data is evaluated using a computer system associated with the asset to determine whether any sensor data in at least a portion of the sensor data is suspect. In response to a determination that at least a portion of the evaluated sensor data is suspect, an action is initiated by the computer system associated with the asset. The action can include adjusting additional processing of the sensor data, adjusting interaction between the computer system and at least one other system remote from the asset, and/or adjusting management operations of the asset.

**[0006]** A first aspect of the invention provides a method of managing an asset, the method comprising: operating a set of sensing devices associated with the asset using a computer system associated with the asset to acquire sensor data, wherein the computer system operates the set of sensing devices independent of a user; evaluating at least a portion of the sensor data using the computer system, the evaluating including determining whether any sensor data in the at least a portion of the sensor data is suspect; and initiating an action using the computer system in response to determining at least a portion of the evaluated sensor data is suspect, wherein the action includes at least one of: adjusting additional processing of the sensor data, adjusting interaction between the computer system and at least one other system remote from the asset, or adjusting management operations of the asset.

**[0007]** A second aspect of the invention provides a system comprising: an asset deployed to a desired physical area; a set of input/output (I/O) devices associated with the asset, the set of I/O devices including a set of sensing devices for acquiring sensor data; a power system associated with the asset, wherein the power system is configured to provide all power for operating devices associated with the asset; and a computer system including at least one computing device associated with the asset, wherein the computer system is configured to manage the asset by performing a method including: operating the set of sensing devices independent of a user to acquire sensor data; evaluating at least a portion of the sensor data, the evaluating including determining whether any sensor data in the at least a portion of the sensor data is suspect; and initiating an action in response to determining at least a portion of the evaluated sensor data is suspect, wherein the action includes at least one of: adjusting additional processing of the sensor data, adjusting interaction between the computer system and at least one other system external to the asset, or adjusting management operations of the asset.

**[0008]** A third aspect of the invention provides a computer-readable storage medium comprising program code embodied therein, which when executed, causes a computer system to implement a method of managing an asset, the method comprising: operating a set of sensing devices associated with the asset to acquire sensor data independent of a user; evaluating at least a portion of the sensor data, the evaluating including determining whether any sensor data in the at least a portion of the sensor data is suspect; and initiating an action in response to determining at least a portion of the evaluated sensor data is suspect, wherein the action includes at least one of: adjusting additional processing of the sensor data, adjusting interaction between the computer system and at least one other system remote from the asset, or adjusting management operations of the asset.

**[0009]** A fourth aspect of the invention provides a method of deploying an asset, the method comprising: providing a computer system associated with the asset, wherein the computer system is configured to manage the asset by performing