Claims

1. An acoustic method of providing spatial and temporal classification of a range of different types of sound producing targets in a geographical area, the method including the steps of:

repeatedly transmitting, at multiple instants, interrogating optical signals into one or more of a plurality optical fibres distributed across the geographical area and forming at least part of an installed fibre-optic communications network, wherein the installed fibre-optic communications network including the plurality of optical fibres and wherein segments of one or more of the plurality of the optical fibres create a plurality of virtual dedicated sensing networks;

receiving, during an observation period following each of the multiple instants, returning optical signals scattered in a distributed manner over distance along the one or more of the plurality of optical fibres, the scattering influenced by acoustic disturbances caused by the multiple targets within the observation period;

demodulating acoustic data from the optical signals;

processing the acoustic data and classifying the processed acoustic data in accordance with target classes or types to generate a plurality of datasets including classification, temporal and location-related data;

storing the datasets in parallel with raw acoustic data which is time and location stamped so that it can be retrieved for further processing and matched with the corresponding datasets to provide both real time and historic data; and

monitoring a plurality of different footprints in the geographic area, each footprint comprising at least one virtual dedicated sensing network.

2. A method according to claim 1 in which the acoustic data is classified by correlating it with acoustic signatures associated with each of the target classes or types, wherein the method includes generating the acoustic signatures of a number of sound producing targets.

3. A method according to claim 2 which includes the step of classifying the sound producing targets as symbols representative of the sound producing targets and storing the symbols as part of the datasets in a digital symbol index.

4. A method according to claim 1 which includes receiving a search request directed towards one or more of the classification, temporal or location-related data, and using the data in conjunction with a GIS overlay, including representing target classes or types as symbols.

5. A method according to claim 2 which includes generating a higher order symbol index database including dynamic symbol data associated with velocity and direction, and with alert criteria.

6. A method according to claim 1 wherein the one or more optical fibres include one or more unlit optical fibres or unused spectral channels in the installed urban or metropolitan fibre-optic communications network, and the fibre-optic communications network is a high density public telecommunications network.

7. A method according to claim 1 further including processing or representing the datasets together with surveillance data obtained from at least one non-acoustic sensing system.

8. A method according to claim 1 which includes storing raw optical data in parallel for subsequent retrieval and processing.

9. A method according to claim 8 in which beam forming techniques are used on at least one of the retrieved and processed raw optical data and/or on the demodulated acoustic data.

10. A method according to claim 1 which includes obtaining at least location related

data associated with each footprint and processing this data with that of the generated datasets to provide dedicated datasets associated with each footprint, the location related data corresponding to the virtual dedicated sensing network.

11. A method according to claim 10 in which the entity or subscriber has at least one premises in the geographic area and the virtual dedicated sensing network coincides with critical infrastructure around the premises requiring monitoring and protection including at least one of power lines, water mains, telecommunications lines and gas mains.

12. A method according to claim 2 which includes generating alert criteria associated with the respective acoustic signatures, and triggering an alarm or warning in the event of the alert criteria being triggered, wherein the alert criteria are generated using a semantics engine to assess a threat or alert level associated with a target, and the alarm is triggered in the event of the threat or alert level exceeding a threshold.

13. An acoustic method of providing spatial and temporal classification of a range of different types of sound producing targets in a geographical area, the method including the steps of:

repeatedly transmitting, at multiple instants, interrogating optical signals into one or more of a plurality of optical fibres distributed across the geographical area and forming at least part of an installed fibre-optic communications network, wherein the installed fibre-optic communications network is made up of the plurality of optical fibres and wherein segments of one or more of the plurality of optical fibres are stitched together to create a number of virtual dedicated sensing networks;

receiving, during an observation period following each of the multiple instants, returning optical signals scattered in a distributed manner over distance along the one or more of the plurality of optical fibres, the scattering influenced by acoustic disturbances caused by the multiple targets within the observation period;

converting the optical signals to optical data, and storing the optical data, the optical data including temporal and location related data;

receiving a search request including temporal and location related filters or parameters, and retrieving the optical data based on said parameters;

processing the optical data into acoustic data; and

monitoring a plurality of different footprints in the geographic area, each footprint comprising at least one virtual dedicated sensing network.

14. An acoustic method according to claim 13 which includes: processing the acoustic data and classifying it in accordance with the target classes or types to generate a plurality of datasets including classification, temporal and location-related data, and storing the datasets.

15. An acoustic method according to claim 13 in which the optical data is processed into acoustic data at a resolution based on the temporal and location based parameters, the processing including retrieving the acoustic data at a desired resolution for beam forming at a desired location.

16. An acoustic system for providing spatial and temporal classification of a range of different types of sound producing targets in a geographical area, the system including:

an optical signal transmitter arrangement for repeatedly transmitting, at multiple instants, interrogating optical signals into one or more of a plurality of optical fibres distributed across the geographical area and forming at least part of an installed fibre-optic communications network, wherein the installed fibre-optic communications network is made up of the plurality of optical fibres and wherein segments of one or more of the plurality of optical fibres are stitched together to create a plurality of virtual dedicated sensing networks;

an optical signal detector arrangement for receiving, during an observation period following each of the multiple instants, returning optical signals scattered in a

distributed manner over distance along the one or more of the plurality of optical fibres, the scattering influenced by acoustic disturbances caused by the multiple targets within the observation period;

a processing unit for demodulating acoustic data from the optical signals, processing the acoustic data and classifying it in accordance with the target classes or types to generate a plurality of datasets including classification, temporal and location-related data;

a storage unit for storing the datasets in parallel with raw acoustic data which is time and location stamped so that it can be retrieved for further processing and matched with the corresponding datasets to provide both real time and historic data; and

wherein the processing unit is configured to monitor a plurality of different footprints in the geographic area, each footprint comprising at least one virtual dedicated sensing network.

17. A system according to claim 16 in which the processing unit is configured to obtain at least location related data associated with each footprint and process this data with that of the generated datasets to provide dedicated datasets associated with each footprint, the location related data corresponding to the virtual dedicated sensing network.

18. An acoustic system for providing spatial and temporal classification of a range of different types of sound producing targets in a geographical area, the system including:

an optical signal transmitter arrangement for repeatedly transmitting, at multiple instants, interrogating optical signals into one or more of a plurality of optical fibres distributed across the geographical area and forming at least part of an installed fibre-optic communications network, wherein the installed fibre-optic communications network is made up of a plurality of optical fibres and wherein

segments of one or more of the plurality of optical fibres are stitched together to create a plurality of virtual dedicated sensing networks;

an optical signal detector arrangement for receiving, during an observation period following each of the multiple instants, returning optical signals scattered in a distributed manner over distance along the one or more of the plurality optical fibres, the scattering influenced by acoustic disturbances caused by the multiple targets within the observation period;

an A/D converter for converting the optical signals to optical data;

a storage unit for storing the optical data, the optical data including temporal and location related data;

a communications interface and processor for receiving a search request including temporal and location related filters or parameters, and retrieving the optical data based on said parameters for processing it into acoustic data;

a processing unit configured to demodulate acoustic data from the optical signals, process the acoustic data and classify it in accordance with the target classes or types to generate a plurality of datasets including classification, temporal and location-related data, and store the datasets in the storage unit, wherein the processing unit is configured to process the optical data into acoustic data at a resolution based on the temporal and location based parameters, the processing unit being arranged to retrieving the acoustic data at a desired resolution for beam forming at a desired location;

wherein the processing unit is configured to monitor a plurality of different footprints in the geographic area, each footprint comprising at least one virtual dedicated sensing network.