CLAIMS

1. A method for configuring a plurality of mobile field devices to perform non-identical operations in a coordinated manner according to a control program, comprising:

arranging, in an operational environment, a plurality of field devices to occupy respective starting positions in an application-dependent formation, in which the field devices are programmed with the same control program and are arranged without regard to which particular field device occupies which starting position in the formation, and in which the control program on each field device is configured to coordinate non-identical operation by a respective field device and coordinate application-dependent, formation-based operations by the plurality of field devices;

configuring each of the plurality of field devices, each field device including a non-transitory computer readable memory storing the control program, a wireless transceiver and a processor that is configured by executing the control program, in which, for each of the plurality of field devices, configuring comprises:

positioning a human-machine interface (HMI) and a particular field device in proximity, in which the HMI is a portable computing device including a computer-readable storage medium having executable instructions stored therein, one or more position sensors, a wireless transceiver and a processor that is configured by executing the instructions,

establishing, by the HMI using the transceiver, wireless communication between the HMI and the particular field device,

determining, by the HMI, the respective starting position occupied by the particular field device in the formation, in which the respective starting position is a relative position within the formation,

automatically defining, by the HMI, configuration settings for the particular field device including assigning at least a respective device identifier (ID) as a function of the respective starting position of the particular field device within the formation, and

transferring, by the HMI using the wireless transceiver, the configuration settings to the particular field device to configure the particular field device; and

initiating coordinated operation of the plurality of field devices according to the control program and the respective configuration settings including at least the respective device ID.

2. A method according to Claim 1, in which the configuration settings also includes information concerning the formation including one or more of: a number of field devices in the formation, relative positions of the plurality of field devices, a layout of the formation, a layout of the environment.

3. A method according to Claim 1, in which the respective device ID is assigned on an incremental basis and as a function of the respective starting position of the particular field device within the formation, and in which the respective device ID is defined irrespective of any pre-existing unique identifier assigned to the particular field device.

4. A method according to Claim 1, in which the control program is identical for each of the plurality of field devices and in which the respective device ID is assigned on an incremental basis and as a function of the respective starting position of the particular field device within the formation and is unique such that, during operation based on the control program, the respective device ID enables unique operation of the respective field devices and coordinated operation of the respective field device relative to the operation of one or more other field devices as a function of the respective starting position in the formation.

5. A method according to Claim 1, further comprising:

in which the respective device ID is assigned on an incremental basis and as a function of the respective starting position of the particular field device within the formation and in which the HMI is configured to configure the plurality of field devices in a sequence defined by a prescribed formation-dependent order beginning with a first starting position in the formation; and

in which the HMI determines the respective starting position occupied by the particular field device as a function of the prescribed formation-dependent order and a record of any previous configurations of one or more field devices among the plurality of field devices, and in which the device ID is incremented by the HMI as each field device is configured.

6. A method according to Claim 1, in which the one or more position sensors are selected from the group consisting of: a GPS receiver, an accelerometer, and a gravity magnetometer, and in which determining the respective starting position further comprises:

detecting, with the HMI using the position sensor, a current position of the HMI;

comparing, with the processor, the current position to a reference layout of one or more of the formation and the operational environment; and

identifying, by the HMI, the respective starting position based on the comparison.

7. A method according to Claim 6, in which the respective device ID is assigned on an incremental basis and as a function of the respective starting position of the particular field device within the formation, the method further comprising: updating the reference layout in the memory of the HMI according to the detected current position and the assigned device ID.

8. A method according to Claim 6, in which defining configuration settings further comprises:

determining, by the HMI using the one or more position sensors, position data for the HMI; and

translating the position data into localization data for the particular field device for transmission to the field device, in which the localization data includes one or more of an orientation, an absolute location, a direction, and a position relative to one or more other devices or landmarks in the reference layout.

9. A method according to Claim 8, further comprising:

determining, at the HMI, application-dependent parameters relating to the particular position of the particular field device in the formation including one or more of: a layout of at least a portion of the operational environment and control settings that serve to enable communication between the particular field device and other devices within the operational environment; and

transmitting, by the HMI using the wireless transceiver, the application-dependent parameters to the particular field device.

10. A method according to Claim 9, in which the other devices include one or more stand-alone control computers configured to assist the operation of the plurality of field devices according to the control program, and further comprising:

establishing, with the HMI using the wireless transceiver, communication with the one or more stand-alone control computers;

receiving, with the HMI from the one or more stand-alone control computers, the control settings.

11. A method according to Claim 1, further comprising:

receiving, with the processor from the respective field device, data identifying a type of the field device; and

launching, with the HMI processor, a configuration application specific to the identified field device type, and in which the configuration settings are defined according to the configuration application and as a function of any preceding configurations of one or more other field devices.

12. A method according to Claim 1, in which the field devices are identical mobile robotic devices.

13. A method according to Claim 1, in which the field devices are multiple groups of different types of field devices and in which each group of field devices is comprised of multiple robots of identical type, and further comprising:

performing the configuring step for each of the multiple groups of field devices, and in which the control program coordinates application-dependent, formation-based operations by the plurality of groups of field devices based on the assigned device IDs and a respective type of field device.

14. A method according to Claim 1, in which the control program coordinates non-identical operation by a respective field device and coordinates application-dependent, formation-based operations by the group of field devices as a function of one or more of: deployment-specific configuration data, sensor data, data detected from a sensor on board the respective field device, and commands received by the respective field device from another device during operation.

15. A method according to Claim 1, further comprising:

replacing, a particular field device among the plurality of field devices with a replacement field device;

determining, with the HMI, a particular respective device ID assigned to the particular field device being replaced; and

repeating the steps of:

positioning the HMI and a replacement field device in proximity,

establishing, by the HMI using the transceiver, wireless communication between the HMI and the replacement field device,

automatically defining, by the HMI, configuration settings for the replacement field device including at least the particular respective device ID, and

transferring, by the HMI using the wireless transceiver, the configuration settings to the replacement field device to configure the replacement field device.

16. A system for configuring a plurality of mobile field devices to perform non-identical operations in a coordinated manner according to a control program, comprising:

a plurality of field devices, each field device including a non-transitory computer readable memory storing a control program, a wireless transceiver and a processor that is configured by executing the control program,

in which the plurality of field devices, in which the field devices are programmed with the same control program and thereby are configured to be arranged, in an operational environment, to occupy respective starting positions in an application-dependent formation without regard to which particular field device occupies which starting position in the formation, and

in which the control program on each field device is configured to coordinate non-identical operation by a respective field device and coordinate application-dependent, formation-based operations by the plurality of field devices;

a human-machine interface (HMI), in which the HMI is a portable computing device including a computer-readable storage medium having executable instructions stored therein, one or more position sensors, the display, a wireless transceiver and a processor

that is configured by executing the instructions, and in which the instructions executing in the processor cause the processor to configure each of the plurality of field devices by:

establishing, using the transceiver, wireless communication between the HMI and a particular field device in response to the HMI being placed in proximity to the particular field device,

determining the respective starting position occupied by the particular field device in the formation, in which the respective starting position is a relative position within the formation,

automatically defining configuration settings for the particular field device including assigning at least a respective device identifier (ID) as a function of the respective starting position of the particular field device within the formation, and

transferring, using the wireless transceiver, the configuration settings to the particular field device to configure the particular field device; and

in which the plurality of field devices are configured to perform non-identical operations in a coordinated manner according to the control program and the respective configuration settings including at least the respective device ID.

17. A system according to Claim 16, in which the respective device ID is assigned on an incremental basis and as a function of the respective starting position of the particular field device within the formation and in which the respective device ID is defined irrespective of any pre-existing unique identifier assigned to the particular field device.

18. A system according to Claim 17, in which the control program is identical for each of the plurality of field devices and in which the respective device ID is unique such that, during operation based on the control program, the respective device ID enables unique operation of the respective field devices and coordinated operation of the respective field device relative to the operation of one or more other field devices as a function of the respective starting position in the formation.

19. A system according to Claim 16, further comprising:

in which the processor is configured to configure the plurality of field devices in a sequence defined by a prescribed formation-dependent order beginning with a first starting position in the formation; and

in which the processor of the HMI is configured to determine the respective starting position occupied by the particular field device as a function of the prescribed formation-dependent order and a record of any previous configurations of one or more field devices among the plurality of field devices, and in which the device ID is incremented by the processor as each field device is configured

20. A system according to Claim 16,

in which the HMI wireless transceiver is a radio frequency transceiver configured for short-range inductive wireless communication,

in which the one or more position sensors are selected from the group consisting of: a GPS receiver, an accelerometer, and a gravity magnetometer, and

in which the processor is configured to determine the respective starting position by:

detecting, using the position sensor, a current position of the HMI,

comparing the current position to a reference layout of one or more of the formation and the operational environment, and

identifying the respective starting position based on the comparison.