FORM 2

THE PATENTS ACT, 1970

(39 OF 1970)

AND

THE PATENT RULES, 2003

COMPLETE SPECIFICATION

(See section 10 and rule 13)

Title:

“ROBOTIC APPARATUS”

Name of Applicant	Nationality	Address
University of Petroleum and Energy Studies	**Indian**	**Energy Acres, Bidholi, Premnagar, Dehradun, Uttarakhand, India-248007**

The following specification describes the invention and the manner in which it is to be performed.

FIELD OF INVENTION

[0001] The present invention is generally related to a robotic apparatus that acts as an arm mounted on a maneuver robot and method to provide thereof.

BACKGROUND OF INVENTION

[0002] The subject matter discussed in the background section should not be assumed to be prior art merely as a result of its mention in the background section. Similarly, a problem mentioned in the background section or associated with the subject matter of the background section should not be assumed to have been previously recognized in the prior art. The subject matter in the background section merely represents different approaches, which in-and-of-themselves may also be inventions.

[0003] Typically, robots are programmed to perform specific technological actions with high precision. These actions are determined by programmed routines that specify the direction, acceleration, velocity, deceleration, and distance pertaining to a series of coordinated motions of robots. Further, the robots are increasingly being used to reduce human labor and manually induced errors by automating industrial manufacturing processes.

[0004] US patent US8332072B1 filed by Schaible, et al. discloses a robotic hand controller, having 8 Degrees of Freedom, with force feedback mechanisms in one or more and preferably all available degrees of freedom is provided. The hand controller is used with a plurality of end effectors such as forceps and scissors. The plurality of robotic arms and the plurality of end effectors are controlled by a

surgeon working on a robotic console. The robotic console includes the robotic hand controller which allows the surgeon to perform motion in 8 Degrees of Freedom using the end effectors.

[0005] US patent publication US20060149421A1 filed by Akiyama; Kazuhiko; et al. talks about a robot controller is disclosed in which a specific target position is predetermined in order to define approaching and leaving paths for a robot hand, and a plurality of different path patterns are stored in a path pattern storage means as the approaching and leaving paths along which the robot hand approaches and leaves the predetermined specific target position. Next, based on a workpiece position detected by a visual sensor, one of the path patterns stored in the path pattern storage means is selected, and the selected path pattern is modified so that the target position of the robot hand is coincident with the actual workpiece position. The modified path pattern is defined as revised approaching and leaving paths and the robot hand is moved along the revised approaching and leaving paths.

[0006] However, the existing robotic controllers do not manage the task in the areas where human intervention is restricted such as narrow ventilation pipes to hazardous gaseous regions where detection of any problem and graphical imaging is not possible. Therefore there is a need for a hand motion control robot that can be implemented on the maneuver robot to travel through narrow passageways.

[0007] Thus, in view of the above, there is a long-felt need in the industry to address the aforementioned deficiencies and inadequacies.

[0008] Further limitations and disadvantages of conventional and traditional approaches will become apparent to one of skill in the art through comparison of described systems with some aspects of the present disclosure, as set forth in the remainder of the present application and with reference to the drawings.

[0009] In some embodiments, the numbers expressing quantities or dimensions of items, and so forth, used to describe and claim certain embodiments of the invention are to the as being modified in some instances by the term "about." Accordingly, in some embodiments, the numerical parameters set forth in the written description and attached claims are approximations that can vary depending upon the desired properties sought to be obtained by a particular embodiment. In some embodiments, the numerical parameters should be construed in light of the number of reported significant digits and by applying ordinary rounding techniques. Notwithstanding that the numerical ranges and parameters setting forth the broad scope of some embodiments of the invention are approximations, the numerical values set forth in the specific examples are reported as precisely as practicable. The numerical values presented in some embodiments of the invention may contain certain errors necessarily resulting from the standard deviation found in their respective testing measurements.

[0010] As used in the description herein and throughout the claims that follow, the meaning of "a," "an," and "the" includes plural reference unless the context clearly dictates otherwise. Also, as used in the description herein, the meaning of "in" includes "in" and "on" unless the context clearly dictates otherwise.

[0011] The recitation of ranges of values herein is merely intended to serve as a shorthand method of referring individually to each separate value falling within the range. Unless otherwise indicated herein, each individual value is incorporated into the specification as if it were individually recited herein. All methods described herein can be performed in any suitable order unless otherwise indicated herein or otherwise clearly contradicted by context. The use of any and all examples, or exemplary language (e.g. “such as”) provided with respect to certain embodiments herein is intended merely to better illuminate the invention and does not pose a limitation on the scope of the invention otherwise claimed. No language in the specification should be construed as indicating any non-claimed element essential to the practice of the invention.

[0012] Groupings of alternative elements or embodiments of the invention disclosed herein are not to be construed as limitations. Each group member can be referred to and claimed individually or in any combination with other members of the group or other elements found herein. One or more members of a group can be included in, or deleted from, a group for reasons of convenience and/or patentability. When any such inclusion or deletion occurs, the specification is herein deemed to contain the group as modified thus fulfilling the written description of all groups used in the appended claims.

SUMMARY OF THE INVENTION

[0013] A robotic apparatus that acts as arm mounted on a maneuver robot and method to provide thereof are provided substantially, as shown in and/or described in connection with at least one of the figures.

[0014] An aspect of the present disclosure relates to a robotic apparatus mounted on a maneuver robot. The robotic apparatus includes an Internet of things (IoT) device, a network, a plurality of robotic arm actuators, and a solar panel. The Internet of things (IoT) device captures sensory data and transmits the sensory data to an IoT database. The network establishes a communication with the maneuver robot and transmits the sensory data to the maneuver robot. The robotic arm actuators convert electrical energy detected over the network from a hand gesture of a user into physical motion. The solar panel energizes a battery to power the Internet of things (IoT) device and the plurality of robotic arm actuators.

[0015] In an aspect, the Internet of things (IoT) device includes a camera and a location device. The camera is configured to monitor the surroundings. The location device is configured to capture the geolocation of the maneuver robot and facilitate a user to remotely track the maneuver robot.

[0016] In an aspect, the sensory data comprising location data of the maneuver robot, temperature data and humidity data of the surrounding, air quality data of the surrounding and real-time visualization data of the surrounding, and a battery status of the battery installed within the maneuver robot.

[0017] In an aspect, the network utilizes a LORA 868 MHz mechanism to transmit the sensory data to the maneuver robot present within the 2 Kilometers range.

[0018] In an aspect, the physical motion is selected from at least one of rotational motion and linear motion.

[0019] An aspect of the present disclosure relates to a method to provide a robotic arm mounted on a maneuver robot. The method includes a step of capturing sensory data and transmitting sensory data to an IoT database through an Internet of things (IoT) device. The method includes the step of establishing a communication with the maneuver robot and transmitting the sensory data to the maneuver robot through a network. The method includes the step of converting electrical energy detected over the network from a hand gesture of a user into physical motion through a plurality of robotic arm actuators. The method includes the step of energizing a battery for powering the Internet of things (IoT) device and the plurality of robotic arm actuators through a solar panel.

[0020] In an aspect, the Internet of things (IoT) device includes a camera and a location device. The camera is configured to monitor the surroundings. The location device is configured to capture the geolocation of the maneuver robot and facilitate a user to remotely track the maneuver robot.

[0021] In an aspect, the sensory data comprising location data of the maneuver robot, temperature data and humidity data of the surrounding, air quality data of the surrounding and real-time

visualization data of the surrounding, and a battery status of the battery installed within the maneuver robot.

[0022] In an aspect, the network utilizes a LORA 868 MHz mechanism to transmit the sensory data to the maneuver robot present within the 2 Kilometers range.

[0023] In an aspect, the physical motion is selected from at least one of rotational motion and linear motion.

[0024] Accordingly, one advantage of the present invention is that it transmits real-time data of the surrounding domains to users at a different location using IoT technology.

[0025] Accordingly, one advantage of the present invention is that it enables the users to perform the task in the areas where human intervention is restricted.

[0026] Accordingly, one advantage of the present invention is that it is utilized in various applications where robotic arm actuators are used to bomb disarmament, detect choke areas in ventilation pipe, drilling, welding, etc.

[0027] Accordingly, one advantage of the present invention is that the robotic arm actuators are used as a small size robotic arm that can be mounted on maneuver robots to pass through narrow regions like ventilation pipes to hazardous gaseous chambers.

[0028] Accordingly, one advantage of the present invention is that it allows real-time monitoring of surrounding through video visualization.

[0029] Accordingly, one advantage of the present invention is that it allows the user to track its geolocation from any part of the world.

[0030] These features and advantages of the present disclosure may be appreciated by reviewing the following description of the present disclosure, along with the accompanying figures wherein like reference numerals refer to like parts.

BRIEF DESCRIPTION OF DRAWINGS

[0031] The accompanying drawings illustrate the embodiments of systems, methods, and other aspects of the disclosure. Any person with ordinary skills in the art will appreciate that the illustrated element boundaries (e.g., boxes, groups of boxes, or other shapes) in the figures represent an example of the boundaries. In some examples, one element may be designed as multiple elements, or multiple elements may be designed as one element. In some examples, an element shown as an internal component of one element may be implemented as an external component in another and vice versa. Furthermore, the elements may not be drawn to scale.

[0032] Various embodiments will hereinafter be described in accordance with the appended drawings, which are provided to illustrate, not limit, the scope, wherein similar designations denote similar elements, and in which:

[0033] FIG. 1 illustrates an architecture of the present robotic apparatus mounted on a maneuver robot, in accordance with an embodiment of the present subject matter.

[0034] FIG. 2 illustrates a flowchart of the present method for providing a robotic arm mounted on a maneuver robot, in accordance with at least one embodiment.

[0035] FIG. 3 illustrates an exemplary diagram of the present robotic apparatus connected with a hand glove, in accordance with an embodiment of the present subject matter.

DETAILED DESCRIPTION

[0036] The present disclosure is best understood with reference to the detailed figures and description set forth herein. Various embodiments have been discussed with reference to the figures. However, those skilled in the art will readily appreciate that the detailed descriptions provided herein with respect to the figures are merely for explanatory purposes, as the methods and systems may extend beyond the described embodiments. For instance, the teachings presented and the needs of a particular application may yield multiple alternative and suitable approaches to implement the functionality of any detail described herein. Therefore, any approach may extend beyond certain implementation choices in the following embodiments.

[0037] References to “one embodiment,” “at least one embodiment,” “an embodiment,” “one example,” “an example,” “for example,” and so on indicate that the embodiment(s) or example(s) may include a particular feature, structure, characteristic, property, element, or limitation but that not every embodiment or example necessarily includes that particular feature, structure, characteristic, property, element, or limitation. Further, repeated use of the phrase “in an embodiment” does not necessarily refer to the same embodiment.

[0038] Methods of the present invention may be implemented by performing or completing manually, automatically, or a combination thereof, selected steps or tasks. The term “method” refers to manners, means, techniques and procedures for accomplishing a given task including, but not limited to, those manners, means, techniques, and procedures either known to or readily developed from known manners, means, techniques and procedures by practitioners of the art to which

the invention belongs. The descriptions, examples, methods, and materials presented in the claims and the specification are not to be construed as limiting but rather as illustrative only. Those skilled in the art will envision many other possible variations within the scope of the technology described herein.

[0039] FIG. 1 illustrates an architecture of the present robotic apparatus 100 mounted on a maneuver robot, in accordance with an embodiment of the present subject matter. The robotic apparatus 100 includes an Internet of things (IoT) device (not shown), a network (not shown), a plurality of robotic arm actuators 104a, 104b, 104c, and 104d and a solar panel (not shown). The Internet of things (IoT) device (not shown) captures sensory data and transmits the sensory data to an IoT database. In an embodiment, the Internet of things (IoT) device includes a camera 106 and a location device 108. The camera 106 is configured to monitor the surroundings. In an embodiment, the camera 106 is connected with an infrared light 120 and an infrared driver 122 to detect infrared energy and to convert it into an electronic signal, which is then processed to produce a thermal image and perform temperature calculations.

[0040] The location device 108 is configured to capture the geolocation of the maneuver robot and facilitate a user to remotely track the maneuver robot. In an embodiment, the location device 108 is a Global Positioning System (GPS) module. In an embodiment, the sensory data includes but not limited to location data of the maneuver robot, temperature data and humidity data of the surrounding, air quality data of the surrounding and real-time visualization data of the surrounding,

and a battery status of the battery 110 installed within the maneuver robot.

[0041] The network establishes a communication with the maneuver robot and transmits the sensory data to the maneuver robot. In an embodiment, the network utilizes a LORA 868 MHz mechanism to transmit the sensory data to the maneuver robot present within the 2 Kilometers range.

[0042] The plurality of robotic arm actuators 104a, 104b, 104c, and 104d convert electrical energy detected over the network from a hand gesture of a user into physical motion. In an embodiment, the physical motion is selected from at least one of rotational motion and linear motion. The robotic arm actuators 104a, 104b, 104c, and 104d are arms which are robotic arms or robotic hands which can be replaced with different tools such as scissors, plier, small motor drills. Thus, the arms can be modified according to the task requirement. The camera 106 and location device 108 provide the surrounding visualization data so that the user can estimate the different coordinated at which he/she needs to operate using a robotic arm.

[0043] The solar panel energizes a battery 110 to power the Internet of things (IoT) device 102 and the plurality of robotic arm actuators 104a, 104b, 104c, and 104d. When the maneuver robot is in the region where the intensity of light is enough to power the battery 110. The solar panel starts charging the battery 110 automatically.

[0044] In an embodiment, the present robotic apparatus 100 includes an Internet of Things (IoT) hardware platform 102, a microcontroller 112, and a computing device 114. In an embodiment, the Internet of

Things (IoT) hardware platform 102 is a NUTTYFI IoT which includes a wireless chip (Wi-Fi) to interface various sensors as well as the microcontroller 112 equipped with the sensors and other devices to control using the internet. In an embodiment, the microcontroller 112 is an Atmega 328 which is an 8-bit AVR microcontroller with 32-kilo bytes of FLASH program memory. So basically 32 and 8 give information about memory. In an embodiment, the computing device 114 is a Raspberry Pi plugged into a computer monitor or TV, and uses a standard keyboard and mouse.

[0045] The maneuver robot includes a plurality of drivers 116a, and 116b to drive a plurality of wheels 118a, 118b, 118c, and 118d attached with the drivers. The wheels 118a, 118b, 118c, and 118d allow the maneuver robot to move around the surroundings.

[0046] The present robotic apparatus manages different tasks in the region where human intervention is restricted such as narrow ventilation pipes to hazardous gaseous regions where detection of any problem and graphical imaging is not possible or prohibited. The present robotic apparatus provides surrounding visualization and allows real-time geolocation of the robot with continuous monitoring of surrounding data i.e. temperature and humidity, air quality. Thus, after gaining all these information users can take the decision to operate a robotic arm in the desires manner to resolve issues at the particular location.

[0047] As used herein, and unless the context dictates otherwise, the term “configured to” or “coupled to” is intended to include both direct coupling (in which two elements that are coupled to each other contact each other) and indirect coupling (in which at least one additional

element is located between the two elements). Therefore, the terms “configured to”, “configured with”, “coupled to” and “coupled with” are used synonymously. Within the context of this document terms “configured to”, “coupled to” and “coupled with” are also used euphemistically to mean “communicatively coupled with” over a network, where two or more devices are able to exchange data with each other over the network, possibly via one or more intermediary device.

[0048] It should be apparent to those skilled in the art that many more modifications besides those already described are possible without departing from the inventive concepts herein. The inventive subject matter, therefore, is not to be restricted except in the spirit of the appended claims. Moreover, in interpreting both the specification and the claims, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms “comprises” and “comprising” should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced.

[0049] FIG. 2 illustrates a flowchart 200 of the present method for providing a robotic arm mounted on a maneuver robot, in accordance with at least one embodiment. The method includes a step 202 of capturing sensory data and transmitting sensory data to an IoT database through an Internet of things (IoT) device. In an embodiment, the Internet of things (IoT) device includes a camera and a location device. The camera is configured to monitor the surroundings. The

location device is configured to capture the geolocation of the maneuver robot and facilitate a user to remotely track the maneuver robot. In an embodiment, the sensory data comprising location data of the maneuver robot, temperature data and humidity data of the surrounding, air quality data of the surrounding and real-time visualization data of the surrounding, and a battery status of the battery installed within the maneuver robot.

[0050] The method includes the step 204 of establishing a communication with the maneuver robot and transmitting the sensory data to the maneuver robot through a network. In an embodiment, the network utilizes a LORA 868 MHz mechanism to transmit the sensory data to the maneuver robot present within the 2 Kilometers range.

[0051] The method includes the step 206 of converting electrical energy detected over the network from a hand gesture of a user into physical motion through a plurality of robotic arm actuators. In an embodiment, the physical motion is selected from at least one of rotational motion and linear motion. The method includes the step 208 of energizing a battery for powering the Internet of things (IoT) device and the plurality of robotic arm actuators through a solar panel.

[0052] The present robotic apparatus and method are used in various applications where handling issues in the narrow passages such as ventilation pipes in which there is a need for the periodic check during failure of the heating/cooling system. Further, the present apparatus and method detect the surrounding parameters such as temperature, humidity, air quality with the surrounding’s visualization and robot geolocation on the google map.

[0053] FIG. 3 illustrates an exemplary diagram 300 of the present robotic apparatus 100 connected with a hand glove 302, in accordance with an embodiment of the present subject matter. In operation, the arms of the robotic apparatus 100 moves with the hand gestures of a user when he/she wears the hand glove 302. The following table depicts various movements of the arms of the robotic apparatus 100 with respect to the hand gestures of the user.

When our hand tilt	Arms of the robotic apparatus
Left	Arms moves in upward direction/ Arms move in the backward direction/
Right	Arms moves in downward direction/ Arms move in the forward direction/
Up	It will release the object/Rotates in an anticlockwise direction
Down	It will grip the object/Rotates in a clockwise direction

[0054] Thus the present robotic apparatus provide allow the arms to control small operations and facilitates the robotic apparatus interface with maneuver robots to travel through rough terrains and are capable of moving through narrow passageways. Further, the present robotic

apparatus allows the user to track the geolocation of the arm on an IoT server database and can monitor surrounding temperature, humidity, air quality with real-time visualization even in the darkest surrounding which will help the operator to operate on the problem using robotic hand control and resolve it.

[0055] The present robotic apparatus and method provide various advantages such as allowing the monitoring and operation on the problems which generally generates in the narrow passageways and hazardous surroundings where human intervention is restricted. The present robotic apparatus and method are used by any domestic to industrial because of its feasibility of operation i.e. user can control the robot movement with help of IoT applications and can control the precise movement of the robotic arm using hand motion gloves.

[0056] No language in the specification should be construed as indicating any non-claimed element as essential to the practice of the invention.

[0057] It will be apparent to those skilled in the art that various modifications and variations can be made to the present invention without departing from the spirit and scope of the invention. There is no intention to limit the invention to the specific form or forms enclosed. On the contrary, the intention is to cover all modifications, alternative constructions, and equivalents falling within the spirit and scope of the invention, as defined in the appended claims. Thus, it is intended that the present invention cover the modifications and variations of this invention, provided they are within the scope of the appended claims and their equivalents.

CLAIMS:

We claim:

1. A robotic apparatus mounted on a maneuver robot, the robotic apparatus comprising:

an Internet of things (IoT) device to capture sensory data and to transmit to an IoT database;

a network to establish a communication with the maneuver robot and to transmit the sensory data to the maneuver robot;

a plurality of robotic arm actuators to convert electrical energy detected over the network from a hand gesture of a user into physical motion; and

a solar panel to energize a battery to power the Internet of things (IoT) device and the plurality of robotic arm actuators.

2. The robotic arm according to claim 1, wherein the Internet of things (IoT) device comprises a camera configured to monitor surrounding; and a location device configured to capture geolocation of the maneuver robot and facilitate a user to remotely track the maneuver robot.

3. The robotic arm according to claim 1, wherein the sensory data comprising location data of the maneuver robot, temperature data and humidity data of the surrounding, air quality data of the surrounding and real-time visualization data of the surrounding, and a battery status of the battery installed within the maneuver robot.

4. The robotic arm according to claim 1, wherein the network utilizes a LORA 868 MHz mechanism to transmit the sensory data to the maneuver robot present within 2 Kilometers range.

5. The robotic arm according to claim 1, wherein the physical motion is selected from at least one of rotational motion, and linear motion.

6. A method to provide a robotic arm mounted on a maneuver robot, the method comprising steps of:

capturing sensory data and transmitting sensory data to an IoT database through an Internet of things (IoT) device;

establishing a communication with the maneuver robot and transmitting the sensory data to the maneuver robot through a network;

converting electrical energy detected over the network from a hand gesture of a user into physical motion through a plurality of robotic arm actuators; and

energizing a battery for powering the Internet of things (IoT) device and the plurality of robotic arm actuators through a solar panel.

7. The method according to claim 6, wherein the Internet of things (IoT) device comprises a camera configured to monitor surrounding; and a location device configured to capture geolocation of the maneuver robot and facilitate a user to remotely track the maneuver robot.

8. The method according to claim 6, wherein the sensory data comprising location data of the maneuver robot, temperature data and humidity data of the surrounding, air quality data of the surrounding and real-time visualization data of the surrounding, and a battery status of the battery installed within the maneuver robot.

9. The method according to claim 6, wherein the network utilizes a LORA 868 MHz mechanism to transmit the sensory data to the maneuver robot present within 2 Kilometers range.

10. The method according to claim 6, wherein the physical motion is selected from at least one of rotational motion, and linear motion.

Dated this 15/05/2020

Vikas Asawat
Patent Agent & Advocate
INPA 1407
On Behalf of Applicant
Digitally Signed

ABSTRACT

ROBOTIC APPARATUS

Disclosed is a robotic apparatus mounted on a maneuver robot. The robotic apparatus includes an Internet of things (IoT) device, a network, a plurality of robotic arm actuators, and a solar panel. The Internet of things (IoT) device captures sensory data and to transmit to an IoT database. The network establishes a communication with the maneuver robot and to transmit the sensory data to the maneuver robot. The robotic arm actuators convert electrical energy detected over the network from a hand gesture of a user into physical motion. The solar panel energizes a battery to power the Internet of things (IoT) device and the plurality of robotic arm actuators. **The most illustrative drawing: FIG. 1.**