

AMENDED SPECIFICATION MARKED COPY

THE PATENTS ACT, 1970

(39 OF 1970)

AND

THE PATENT RULES, 2003

**COMPLETE SPECIFICATION**

(See section 10 and rule 13)

Title:

**“SHORT DISTANCE TELEMETRY SYSTEM FOR ELUCIDATION”**

Name of Applicant	Nationality	Address
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The following specification describes the invention and the manner in which it is to be performed:

## **TECHNICAL FIELD OF THE INVENTION**

The subject matter described herein relates to the field of telemetry, particularly it relates to telemetry in laboratories and museums.

5

## **BACKGROUND OF THE INVENTION**

In laboratories and also in museums there are skilled persons specifically employed to assist people visiting the laboratory or museum to know the details of the object placed in there. Such an instructor for industrial laboratories, engineering laboratories and territories gives a brief information or description, applications, working principles and uses of a specific machines or instruments which is installed in a laboratory while in the museum they are to provide brief information or description of historical, scientific, artistic or cultural objects which is exhibited in the museum. It may often so happen such instructor may miss convey a crucial data or valuable information, since such humans are prone to such errors. Further, there is a requirement that employed person be available all the time, at the beck and call of the visitor. A possible solution to this is to employ multiple persons. However, such solution is not economical as well.

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A virtual instructor can replace human assistance and provide more accurate and precise information as compare to laboratories or Territories humans. Most of laboratories or museums instructor are android/iOS software applications which restrict its feasibility to update with new instruments or machine data as well as museum objects.

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Reference is made to literature, 'Aljuhani,K., Sonbul,M., Althabiti,M., Meccawy,M., (2018). *Creating a Virtual Science Lab (VSL): the adoption of virtual labs in Saudi schools*. DOI: 10.1186/s40561-018-0067-9' that discloses about a Virtual lab instructor used in the Saudi Schools are embedded in the special design lab which should have internet service either provided in the form

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of Ethernet or Wi-Fi router. All the interactive session between lab virtual environment and students takes place through web architecture.

Reference is made to ‘Cambre,J., Liu,Y., Taylor,R.E., &Kulkarni,C.,  
5 (2019). *Vitro: Designing a Voice Assistant for the Scientific Lab Workplace*. DOI: 10.1145/3322276.3322298’ that focuses on the implementation of voice enabled devices on the lab equipment but are not the virtual lab assistance.

Yet another reference is made to ‘Ahamed S.I., Sharmin M., Ahmed S.,  
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15 party.

Known in the art is a solution of a Virtual Assistant to the Lab: A Voice User Interface for the Intuitive Control of Laboratory Instruments uses IOT as the mode of communication. The Human to machine communication takes  
20 place through HTTP and MQTT protocol. But this communication fails when internet is disconnected hence such solutions system need to be configurable through specific connection of the lab. The other solutions known in the art include patent literature like EP2208039B1 and EP3174600A4.

25 In the light of the above detailed prior art solutions, it is observed that there is a dire need of a virtual assistance in laboratory and museums, that is reliable and efficient having less complexities.

## **SUMMARY OF THE INVENTION**

The following presents a simplified summary of one or more aspects in order to provide a basic understanding of such aspects. This summary is not an  
5 extensive overview of all contemplated aspects, and is intended to neither identify key or critical elements of all aspects nor delineate the scope of any or all aspects. Its sole purpose is to present some concepts of one or more aspects in a simplified form as a prelude to the more detailed description that is presented later.

10

An object of the present invention is to provide a reliable and efficient virtual assistance having self-triggering feature especially one for laboratories and museums.

15

Another object of the present invention is to provide a system functioning as virtual assistance which is portable and having compact design that allows system to operate without any internet connectivity.

20

Yet another object of the present invention is to provide a system that allows a third party to manipulate data in its storage device thereby removing complexity of the system.

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A further object of the present invention is to provide a system that facilitates reliable communication preventing superposition of the signals during communication.

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A still further object of the present invention is to provide a system having interactive session with Local network established between machines and a user.

In an aspect of the present invention is disclosed a short distance telemetry system for elucidation comprising a master unit comprising a storage unit to store data related to an object; at least one output unit and a first communication unit configured to communicate data to the user and a slave unit comprising a Radio-frequency identification (RFID) unit having a unique identification ID of the object and a second communication unit, wherein the master unit and the slave unit are communicably coupled and the slave unit is adapted to be on the object; and when the said object is in operation, the master unit is adapted to self-configure to the slave unit on the object and acquire the identification ID to initiate a machine-user interface, wherein the output unit is configured to describe the data of the object based on communication between the master unit and the slave unit.

To the accomplishment of the foregoing and related ends, the one or more aspects comprise the features hereinafter fully described and particularly pointed out in the claims. The following description and the annexed drawings set forth in detail certain illustrative features of the one or more aspects. These features are indicative, however, of but a few of the various ways in which the principles of various aspects may be employed, and this description is intended to include all such aspects and their equivalents.

### **BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS**

The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views, together with the detailed description below, are incorporated in and form part of the specification, and serve to further illustrate embodiments of concepts that include the claimed invention, and explain various principles and advantages of those embodiments.

Figure 1 illustrates a short distance telemetry system for elucidation in accordance with an embodiment of the present invention.

5        Figures 1 (a) illustrates a schematic diagram of a master unit of the system in accordance with an embodiment of the present invention.

      Figure 1(b) illustrates a schematics diagram of a slave unit of the system in accordance with an embodiment of the present invention.

10        Figure 2 illustrates a future scope of application of an embodiment of the present invention.

      Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of embodiments of the present invention.

## **DETAILED DESCRIPTION OF THE PRESENT INVENTION**

20

      Various aspects are now described with reference to the drawings. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or more aspects. It may be evident, however, that such aspect(s) may be practiced without these specific details. Further, the elements, and their configuration thereof which are well known in the art are omitted from the disclosure made herein for purposes clarity and conciseness.

30        Accordingly, those skilled in the art will derive various changes and modifications of the embodiments described herein can be made without departing from the scope of the invention.

Figure 1 illustrates a short distance telemetry system 100 for elucidation in accordance with an embodiment of the present invention.

As illustrated in Figure 1, system 100 includes one or more master units 102a, 102b,...102n, a storage unit 104a, 104b,...104n configured in one or more master unit 102a, 102b,...102n to store data related to an object. The object can be, but need not be limited to, machine or instrumented installed in a laboratory or exhibited in a museum.

Subsequently, one or more master units 102a, 102b,...102n are configured with one or more output units and a first communication unit to communicate data related to the object to a user.

In order to communicate with the object, one or more slave units 108a, 108b,...108n are positioned on the object by assigning a unique identification (ID) which may include, but need not be limited to, a radio frequency identification (RFID). Also, one or more slave units 108a, 108b,...108n includes a second communication unit which is used to communicably coupled with one or more master units 102a, 102b,...102n utilizing a LORA (long range) network 106.

In accordance with an embodiment, the user entering museum or laboratory is provided with a master unit 102a, which is adapted to automatically configure with one or more slave units 108a, 108b,...108n positioned on the object while the user is moving across or near the objects in a predefined distance. Subsequently, the user reaching the object configured with slave unit 108a receives the unique ID to initiate a machine-user interface. The one or more output units included in one or more slave units 108a, 108b,...108n describes the data of the object based on communication between one or more master units 102a, 102b,...102n and one or more slave units 108a, 108b,...108n.

In an embodiment of the present invention is disclosed a short distance telemetry system for elucidation comprising one or more a master units 102a, 102b,...102n comprising a one or more storage units 104a, 104b,...104n to store data related to an object. The object may be a machine at the laboratory or the object in a museum. It includes ~~at least~~ one or more output units and a first communication unit configured to communicate data to the user. The one or more output units may be a speaker or an audio jack for connecting to earplugs. The device provides at least two audio modes for perceiving data: Earphone plug-in mode and External Speaker plug-in mode. An exemplary embodiment of the master unit is shown in figure 1 (a).

The system further includes a one or more slave units 108a, 108b,...108n comprising Radio-frequency identification (RFID) unit having a unique identification ID of the object and a second communication unit. The second and first communication units are configured to communicably be connected. ~~The~~ One or more slave units 108a, 108b,...108n is adapted to be on the object, which is in the laboratory or the museum. An exemplary embodiment of the master unit is shown in figure 1 (b).

In the system, the communication between the machine and user is through local created network. Each object which is an instrument or machine installed in the laboratory or objects exhibited in the museum are defined under unique Identification Code which is stored in the slave unit attached to it. When the system is in operation with the object the master unit is adapted to self-configure to ~~the~~ one or more slave units 108a, 108b,...108n on the object and acquire the identification ID to initiate a machine-user interface. The output unit like a speaker is configured to describe the data of the object based on communication between ~~the~~ one or more master units 102a, 102b,...102n and ~~the~~ one or more slave units 108a, 108b,...108n.



There is a certain range around the instrument or machine or museum object upon which the communication between Human and Machine in the laboratory as well as Human and Object in the museum will trigger. This consequently minimizes the chances false operation of the virtual instructor when the user is a far away from the instrument(s) or machine(s) installed in the laboratory and museum object(s) exhibited. The system supports at least two languages – Hindi, English as medium of communication. The virtual instructor has ability to operate at least 15 instruments or machines presented in the lab and also 15 objects exhibited in the museum. Since the disclosed system provides self-triggering independency to a student or visitor who reach within object vicinity as well. There are no such devices till now that provide such integrity with its surrounding.

Advanced Virtual Reduced Instruction Set Computing (AVR) supports RISC (Reduced Instruction Set Computing) architecture. The present invention is configured to remove the error generated due to a person's position with respect to the equipment, i.e. it can remove precision error. For instance, if we consider diametrical range around machine is 150 cm within which the Master unit will trigger and give description of the machine but in case if person stands at a distance of 155 cm then a distortion in the short distance telemetry will be generated between user and equipment. The present invention removes this error by including precision of  $150 \pm 20$  which led telemetry between master and slave units to be lucid with AVR architecture.

~~The~~ One or more master units 102a, 102b,...102n after receiving signal from ~~the~~ one or more slave units 108a, 108b,...108n attached to the object, it will send back acknowledgement signal to ~~the~~ one or more slave units 108a, 108b,...108n on the equipment. Thus after confirmation, i.e. after ensuring that it has reached the vicinity of the equipment by ~~the~~ one or more master units 108a, 108b,...108n, the initiation of the audio description is made.

The main advantage of the disclosed system is that once devices are in operation then ~~the~~ one or more master units 102a, 102b,... 102n has the capability to self-configure to ~~the~~ one or more slave units 108a, 108b,...108n on the equipment and fetch unique identification number to initiate a human–  
5 machine interface in the laboratory and human – object interface in the museum. The whole communication takes place through local network created between embedded units.

The telemetry system is operating at the baud rate of 38400 baud i.e. it is  
10 communicating data at 38400 bits per seconds i.e. 26uS per bit. But to use less processing power of the AVR chips the sample speed has been set to a minimal 300 samples per minute which allows feasible working the disclosed system. The system involves low cost and requires minimum power i.e. 12V 1A and can easily be powered by any 12 V battery as compared large monitoring pads  
15 existent in the prior art. Thus, the disclosed system is having compact design, thereby making it portable as well.

Figure 1 illustrates a prototype of the system herein in. Figure 1 (a) illustrates ~~the~~ one or more master units 102a, 102b,...102n that includes the  
20 RFID unit, a secure digital (SD) card, a wireless communication module (here HC05 u), a speaker, an auxiliary jack to initiate the audio description of the equipment stored in the SD card. Figure 1(b) shows ~~the~~ one or more slave units 108a, 108b,...108n of the invention that includes a communication module (HC05) and an RFID unit. Both the units are connected to respective power  
25 supply. The details of the prototype are herein below.

In the following are detailed that the master unit connection.

<b>SD CARD</b>	<b>ARDUINO(ATmega 328)</b>
<b>CS</b>	<b>4</b>
<b>SCR</b>	<b>13</b>
<b>MOSI</b>	<b>11</b>
<b>MISO</b>	<b>12</b>
<b>VCC</b>	<b>VCC</b>
<b>GND</b>	<b>GND</b>

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<b>HC05</b>	<b>ARDUINO (ATmega 328)</b>
<b>RX</b>	<b>1</b>
<b>TX</b>	<b>0</b>
<b>VCC</b>	<b>VCC</b>
<b>GND</b>	<b>GND</b>

<b>Arduino</b>	<b>Amplifier</b>
<b>9</b>	<b>B, R</b>

<b>Amplifier</b>	<b>Speaker</b>	<b>AUX</b>
<b>IN1</b>	<b>+</b>	<b>+</b>
<b>IN2</b>	<b>+</b>	<b>+</b>
<b>GND</b>	<b>-</b>	<b>-</b>

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In the prototype, is illustrated that the information about the instrument in laboratory or entity in museum is stored in the SD card and upon

communication between the master and slave units audio output about the instrument or object is obtained.

This process is describe in the procedure below.

- 5           ➤ The SD card which holds the data can be easily connected to a terminal, like a personal computer or laptop using suitable connector like USB SD-card reader.
- The SD card is secured and hence is password protected and will be revealed only to the authorized person.
- 10          ➤ Data in the SD card is arranged in the segmented order as defined by machine in a laboratory or objects in a museum. For example-

Segment No	Equipment's Name	Audio Files
1.	Lab(s) Entrance	Entrance – audio
2.	Machine(s) or Apparatus(s)	Machine(s) or Apparatus(s) – Audio
3.	Museum(s) Entrance	Entrance – Audio
4.	Historical Object(s)	Historical Object(s) – Audio

Therefore, such features enable the laboratory in charge or the museum in charge to update the data in the storage unit as per the new details of a particular machine or apparatus in a laboratory and also the historical objects in a museum. The manner of storage of data in the card is in such a way that the updation may be done easily and every other entity need not to be changed. Therefore, the present invention is not a mere coalition of known facts, but involves an inventive step.

Commercial application of the herein disclosed system is basically for institutions, industrial laboratory and museum. The invention is capable of creating local network which can be expanded using LORA (Long Range) technology to interconnect different laboratory and monitor its functionality under common created database. Reference is made to figure 2 that illustrates the expandability of the invention. Figure 2 illustrates the future scope of the invention, which represents an enhanced version of instant invention. In the said enhanced version, an operator can monitor the total number of the virtual instructor activated at different times in different laboratories on a common database. This could be achieved by using Internet of Things (IOT) technology which will update the status of the virtual instructor periodically on the database. Hence provide real time monitoring of the activated devices in a particular laboratory or museum. This will help to track operational time of the equipment's in the laboratory thereby serve as novel approach in enhancing universities laboratories. The present invention focuses on industrial laboratories, engineering laboratory and territories in which, the disclosed system can function as laboratory or territory instructor and reduce the human interference. The system accurately, conveniently and efficiently gives brief information or description of a specific machines or equipments which is installed in a laboratory and also brief information or description of historical, scientific, artistic or cultural objects which is exhibited in museum.

The extended embodiment of the invention thus includes the provision of connecting to multiple laboratories and to analyse data from them on a common database. This could be achieved using LORA network 106 whose range extend to 2-3km. As illustrated in figure 2, LORA unit 106 is connected to the ground station and as soon as ~~the~~ LORA network 106 gets activated it will act as a hotspot for different one or more masters units 102a, 102b,...102n. Thus, ~~the~~ one or more Mmaster units 102a, 102b,...102n will automatically connect to the LORA network 106 and start communicating with the database. In the

future, the implementation of the disclosed invention will be executed in Hydraulics and Pneumatics Laboratory, PLC and HMI, Robotics and Control laboratory, Electronics Laboratory, Electrical Machines Laboratory in which slave unit represented by abbreviation 's' in the figure will be installed on laboratory equipment which serves as equipment id's. After visualization of the real time activated virtual instructor unit in laboratories on the database, user will be able to monitor device status, operational coherency and devices operational time in different laboratories will be displayed in the segmented order according to year, month, date, time format. Hence, figure 2 illustrates the enhanced version of the invention by interconnecting multiple laboratories.

Some of the note-worthy features of the system in accordance with the present invention:

- The communication between human-machine in the laboratory and human-object in the museum is by means of using Local network.
- The system involves self-configuration of the master unit and the slave unit when in an operational range.
- The system includes at least two modes of audio communication i.e. Hindi, English.
- The system involves a lucid mode of operation and it is compatible with AVR architecture as well. The present invention includes simple framework of data handling, thereby allowing the user to modify encrypted data in its memory. Hence data can be inserted or removed according to a particular laboratory or museum requirement.

Some of the advantages of the system detailed in the foregoing are:

- The system involves smart interactive session created with local network 106 established between machines and user which can in an implementation be embedded in any laboratory or museum. And it does not rely on the availability of the internet.

- The system is portable, has a compact design and is having a low operating power.
- The system is compatible with AVR architecture and requires minimum processing speed as compared to hard core devices which operates on the Machine learning and Artificial Intelligence principles.
- The system prevents superposition of the signals which if not prevented may led to distorting or triggering of multiple slave system on the various objects.
- The system includes easy updation of data about the objects.

While the present disclosure includes many embodiments shown and described in detail, various modifications and improvements thereon will become readily apparent to those skilled in the art. Accordingly, the essence and scope of the invention disclosed herein is not to be limited by the foregoing examples, but is to be understood in the broadest sense allowable by law.

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10 An object of the present invention is to provide a reliable and efficient virtual assistance having self-triggering feature especially one for laboratories and museums.

15 Another object of the present invention is to provide a system functioning as virtual assistance which is portable and having compact design that allows system to operate without any internet connectivity.

20 Yet another object of the present invention is to provide a system that allows a third party to manipulate data in its storage device thereby removing complexity of the system.

25 A further object of the present invention is to provide a system that facilitates reliable communication preventing superposition of the signals during communication.

A still further object of the present invention is to provide a system having interactive session with Local network established between machines and a  
30 user.

In an aspect of the present invention is disclosed a short distance telemetry system for elucidation comprising a master unit comprising a storage unit to store data related to an object; at least one output unit and a first communication unit configured to communicate data to the user and a slave unit comprising a Radio-frequency identification (RFID) unit having a unique identification ID of the object and a second communication unit, wherein the master unit and the slave unit are communicably coupled and the slave unit is adapted to be on the object; and when the said object is in operation, the master unit is adapted to self-configure to the slave unit on the object and acquire the identification ID to initiate a machine-user interface, wherein the output unit is configured to describe the data of the object based on communication between the master unit and the slave unit.

To the accomplishment of the foregoing and related ends, the one or more aspects comprise the features hereinafter fully described and particularly pointed out in the claims. The following description and the annexed drawings set forth in detail certain illustrative features of the one or more aspects. These features are indicative, however, of but a few of the various ways in which the principles of various aspects may be employed, and this description is intended to include all such aspects and their equivalents.

### **BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS**

The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views, together with the detailed description below, are incorporated in and form part of the specification, and serve to further illustrate embodiments of concepts that include the claimed invention, and explain various principles and advantages of those embodiments.

Figure 1 illustrates a short distance telemetry system for elucidation in accordance with an embodiment of the present invention.

5        Figures 1 (a) illustrates a schematic diagram of a master unit of the system in accordance with an embodiment of the present invention.

Figure 1(b) illustrates a schematics diagram of a slave unit of the system in accordance with an embodiment of the present invention.

10        Figure 2 illustrates a future scope of application of an embodiment of the present invention.

Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of embodiments of the present invention.

### **DETAILED DESCRIPTION OF THE PRESENT INVENTION**

20        Various aspects are now described with reference to the drawings. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of one or more aspects. It may be evident, however, that such aspect(s) may be practiced without these specific details. Further, the elements, and their configuration thereof which are well known in the art are omitted from the disclosure made herein for purposes clarity and conciseness.

30        Accordingly, those skilled in the art will derive various changes and modifications of the embodiments described herein can be made without departing from the scope of the invention.

Figure 1 illustrates a short distance telemetry system 100 for elucidation in accordance with an embodiment of the present invention.

As illustrated in Figure 1, system 100 includes one or more master units 102a, 102b,...102n, a storage unit 104a, 104b,...104n configured in one or more master unit 102a, 102b,...102n to store data related to an object. The object can be, but need not be limited to, machine or instrumented installed in a laboratory or exhibited in a museum.

Subsequently, one or more master units 102a, 102b,...102n are configured with one or more output units and a first communication unit to communicate data related to the object to a user.

In order to communicate with the object, one or more slave units 108a, 108b,..108n are positioned on the object by assigning a unique identification (ID) which may include, but need not be limited to, a radio frequency identification (RFID). Also, one or more slave units 108a, 108b,...108n includes a second communication unit which is used to communicably coupled with one or more master units 102a, 102b,...102n utilizing a LORA (long range) network 106.

In accordance with an embodiment, the user entering museum or laboratory is provided with a master unit 102a, which is adapted to automatically configure with one or more slave units 108a, 108b,..108n positioned on the object while the user is moving across or near the objects in a predefined distance. Subsequently, the user reaching the object configured with slave unit 108a receives the unique ID to initiate a machine-user interface. The one or more output units included in one or more slave units 108a, 108b,...108n describes the data of the object based on communication between one or more master units 102a, 102b,....102n and one or more slave units 108a, 108b,...108n.

In an embodiment of the present invention is disclosed a short distance telemetry system for elucidation comprising one or more a master units 102a, 102b,...102n comprising a one or more storage units 104a, 104b,...104n to store data related to an object. The object may be a machine at the laboratory or the object in a museum. It includes one or more output units and a first communication unit configured to communicate data to the user. The one or more output units may be a speaker or an audio jack for connecting to earplugs. The device provides at least two audio modes for perceiving data: Earphone plug-in mode and External Speaker plug-in mode. An exemplary embodiment of the master unit is shown in figure 1 (a).

The system further includes one or more slave units 108a, 108b,...108n comprising Radio-frequency identification (RFID) unit having a unique identification ID of the object and a second communication unit. The second and first communication units are configured to communicably be connected. One or more slave units 108a, 108b,...108n is adapted to be on the object, which is in the laboratory or the museum. An exemplary embodiment of the master unit is shown in figure 1 (b).

In the system, the communication between the machine and user is through local created network. Each object which is an instrument or machine installed in the laboratory or objects exhibited in the museum are defined under unique Identification Code which is stored in the slave unit attached to it. When the system is in operation with the object the master unit is adapted to self-configure to one or more slave units 108a, 108b,...108n on the object and acquire the identification ID to initiate a machine-user interface. The output unit like a speaker is configured to describe the data of the object based on communication between one or more master units 102a, 102b,...102n and one or more slave units 108a, 108b,...108n.

There is a certain range around the instrument or machine or museum object upon which the communication between Human and Machine in the laboratory as well as Human and Object in the museum will trigger. This consequently minimizes the chances false operation of the virtual instructor when the user is a far away from the instrument(s) or machine(s) installed in the laboratory and museum object(s) exhibited. The system supports at least two languages – Hindi, English as medium of communication. The virtual instructor has ability to operate at least 15 instruments or machines presented in the lab and also 15 objects exhibited in the museum. Since the disclosed system provides self-triggering independency to a student or visitor who reach within object vicinity as well. There are no such devices till now that provide such integrity with its surrounding.

Advanced Virtual Reduced Instruction Set Computing (AVR) supports RISC (Reduced Instruction Set Computing) architecture. The present invention is configured to remove the error generated due to a person's position with respect to the equipment, i.e. it can remove precision error. For instance, if we consider diametrical range around machine is 150 cm within which the Master unit will trigger and give description of the machine but in case if person stands at a distance of 155 cm then a distortion in the short distance telemetry will be generated between user and equipment. The present invention removes this error by including precision of  $150 \pm 20$  which led telemetry between master and slave units to be lucid with AVR architecture.

One or more master units 102a, 102b,...102n after receiving signal from one or more slave units 108a, 108b,...108n attached to the object, it will send back acknowledgement signal to one or more slave units 108a, 108b,...108n on the equipment. Thus after confirmation, i.e. after ensuring that it has reached the vicinity of the equipment by one or more master units 108a, 108b,....108n, the initiation of the audio description is made.



The main advantage of the disclosed system is that once devices are in operation then one or more master units 102a, 102b,... 102n has the capability to self-configure to one or more slave units 108a, 108b,...108n on the equipment and fetch unique identification number to initiate a human-machine interface in the laboratory and human – object interface in the museum. The whole communication takes place through local network created between embedded units.

The telemetry system is operating at the baud rate of 38400 baud i.e. it is communicating data at 38400 bits per seconds i.e. 26uS per bit. But to use less processing power of the AVR chips the sample speed has been set to a minimal 300 samples per minute which allows feasible working the disclosed system. The system involves low cost and requires minimum power i.e. 12V 1A and can easily be powered by any 12 V battery as compared large monitoring pads existent in the prior art. Thus, the disclosed system is having compact design, thereby making it portable as well.

Figure 1 illustrates a prototype of the system herein in. Figure 1 (a) illustrates one or more master units 102a, 102b,...102n that includes the RFID unit, a secure digital (SD) card, a wireless communication module (here HC05 u), a speaker, an auxiliary jack to initiate the audio description of the equipment stored in the SD card. Figure 1(b) shows one or more slave units 108a, 108b,...108n of the invention that includes a communication module (HC05) and an RFID unit. Both the units are connected to respective power supply. The details of the prototype are herein below.

In the following are detailed that the master unit connection.

<b>SD CARD</b>	<b>ARDUINO(ATmega 328)</b>
<b>CS</b>	<b>4</b>
<b>SCR</b>	<b>13</b>
<b>MOSI</b>	<b>11</b>
<b>MISO</b>	<b>12</b>
<b>VCC</b>	<b>VCC</b>
<b>GND</b>	<b>GND</b>

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<b>HC05</b>	<b>ARDUINO (ATmega 328)</b>
<b>RX</b>	<b>1</b>
<b>TX</b>	<b>0</b>
<b>VCC</b>	<b>VCC</b>
<b>GND</b>	<b>GND</b>

<b>Arduino</b>	<b>Amplifier</b>
<b>9</b>	<b>B, R</b>

<b>Amplifier</b>	<b>Speaker</b>	<b>AUX</b>
<b>IN1</b>	<b>+</b>	<b>+</b>
<b>IN2</b>	<b>+</b>	<b>+</b>
<b>GND</b>	<b>-</b>	<b>-</b>

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In the prototype, is illustrated that the information about the instrument in laboratory or entity in museum is stored in the SD card and upon

communication between the master and slave units audio output about the instrument or object is obtained.

This process is describe in the procedure below.

- 5           ➤ The SD card which holds the data can be easily connected to a terminal, like a personal computer or laptop using suitable connector like USB SD-card reader.
- The SD card is secured and hence is password protected and will be revealed only to the authorized person.
- 10          ➤ Data in the SD card is arranged in the segmented order as defined by machine in a laboratory or objects in a museum. For example-

Segment No	Equipment's Name	Audio Files
1.	Lab(s) Entrance	Entrance – audio
2.	Machine(s) or Apparatus(s)	Machine(s) or Apparatus(s) – Audio
3.	Museum(s) Entrance	Entrance – Audio
4.	Historical Object(s)	Historical Object(s) – Audio

Therefore, such features enable the laboratory in charge or the museum in charge to update the data in the storage unit as per the new details of a particular machine or apparatus in a laboratory and also the historical objects in a museum. The manner of storage of data in the card is in such a way that the updation may be done easily and every other entity need not to be changed. Therefore, the present invention is not a mere coalition of known facts, but involves an inventive step.

Commercial application of the herein disclosed system is basically for institutions, industrial laboratory and museum. The invention is capable of creating local network which can be expanded using LORA (Long Range) technology to interconnect different laboratory and monitor its functionality under common created database. Reference is made to figure 2 that illustrates the expandability of the invention. Figure 2 illustrates the future scope of the invention, which represents an enhanced version of instant invention. In the said enhanced version, an operator can monitor the total number of the virtual instructor activated at different times in different laboratories on a common database. This could be achieved by using Internet of Things (IOT) technology which will update the status of the virtual instructor periodically on the database. Hence provide real time monitoring of the activated devices in a particular laboratory or museum. This will help to track operational time of the equipment's in the laboratory thereby serve as novel approach in enhancing universities laboratories. The present invention focuses on industrial laboratories, engineering laboratory and territories in which, the disclosed system can function as laboratory or territory instructor and reduce the human interference. The system accurately, conveniently and efficiently gives brief information or description of a specific machines or equipments which is installed in a laboratory and also brief information or description of historical, scientific, artistic or cultural objects which is exhibited in museum.

The extended embodiment of the invention thus includes the provision of connecting to multiple laboratories and to analyse data from them on a common database. This could be achieved using LORA network 106 whose range extend to 2-3km. As illustrated in figure 2, LORA unit 106 is connected to the ground station and as soon as LORA network 106 gets activated it will act as a hotspot for different one or more masters units 102a, 102b,...102n. Thus, one or more master units 102a, 102b,...102n will automatically connect to the LORA network 106 and start communicating with the database. In the future, the implementation of the disclosed invention will be executed in Hydraulics and

Pneumatics Laboratory, PLC and HMI, Robotics and Control laboratory, Electronics Laboratory, Electrical Machines Laboratory in which slave unit represented by abbreviation 's' in the figure will be installed on laboratory equipment which serves as equipment id's. After visualization of the real time activated virtual instructor unit in laboratories on the database, user will be able to monitor device status, operational coherency and devices operational time in different laboratories will be displayed in the segmented order according to year, month, date, time format. Hence, figure 2 illustrates the enhanced version of the invention by interconnecting multiple laboratories.

Some of the note-worthy features of the system in accordance with the present invention:

- The communication between human-machine in the laboratory and human-object in the museum is by means of using Local network.
- The system involves self-configuration of the master unit and the slave unit when in an operational range.
- The system includes at least two modes of audio communication i.e. Hindi, English.
- The system involves a lucid mode of operation and it is compatible with AVR architecture as well. The present invention includes simple framework of data handling, thereby allowing the user to modify encrypted data in its memory. Hence data can be inserted or removed according to a particular laboratory or museum requirement.

Some of the advantages of the system detailed in the foregoing are:

- The system involves smart interactive session created with local network 106 established between machines and user which can in an implementation be embedded in any laboratory or museum. And it does not rely on the availability of the internet.
- The system is portable, has a compact design and is having a low operating power.

- The system is compatible with AVR architecture and requires minimum processing speed as compared to hard core devices which operates on the Machine learning and Artificial Intelligence principles.
- The system prevents superposition of the signals which if not prevented may led to distorting or triggering of multiple slave system on the various objects.
- The system includes easy updation of data about the objects.

While the present disclosure includes many embodiments shown and described in detail, various modifications and improvements thereon will become readily apparent to those skilled in the art. Accordingly, the essence and scope of the invention disclosed herein is not to be limited by the foregoing examples, but is to be understood in the broadest sense allowable by law.