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ABSTRACT

ELECTRIC VEHICLE CHARGING ESTIMATION DEVICE USING MACHINE LEARNING

The present invention provides a device and method for charging of an electric vehicle (EV), the method comprises: measuring heat signatures and, at least one first electrical parameter of a rechargeable battery, wherein the at least one first electrical parameter is measured before the supply of the electric energy to the rechargeable battery, from a storage unit; measuring, at least one second electrical parameter and of a rechargeable battery, wherein the at least one second electrical parameter is measured after the supply of the electric energy to the rechargeable battery, from a storage unit; calculating the amount of electric energy transfer and heat-energy dissipated at the rechargeable battery, from the storage unit generating a time of recharge corresponding to the calculated amount of electric energy and heat-produced, using pre-store information fed to the relevant machine learning algorithms which are stored in a database; notifying the time to recharge on one or more computing devices.

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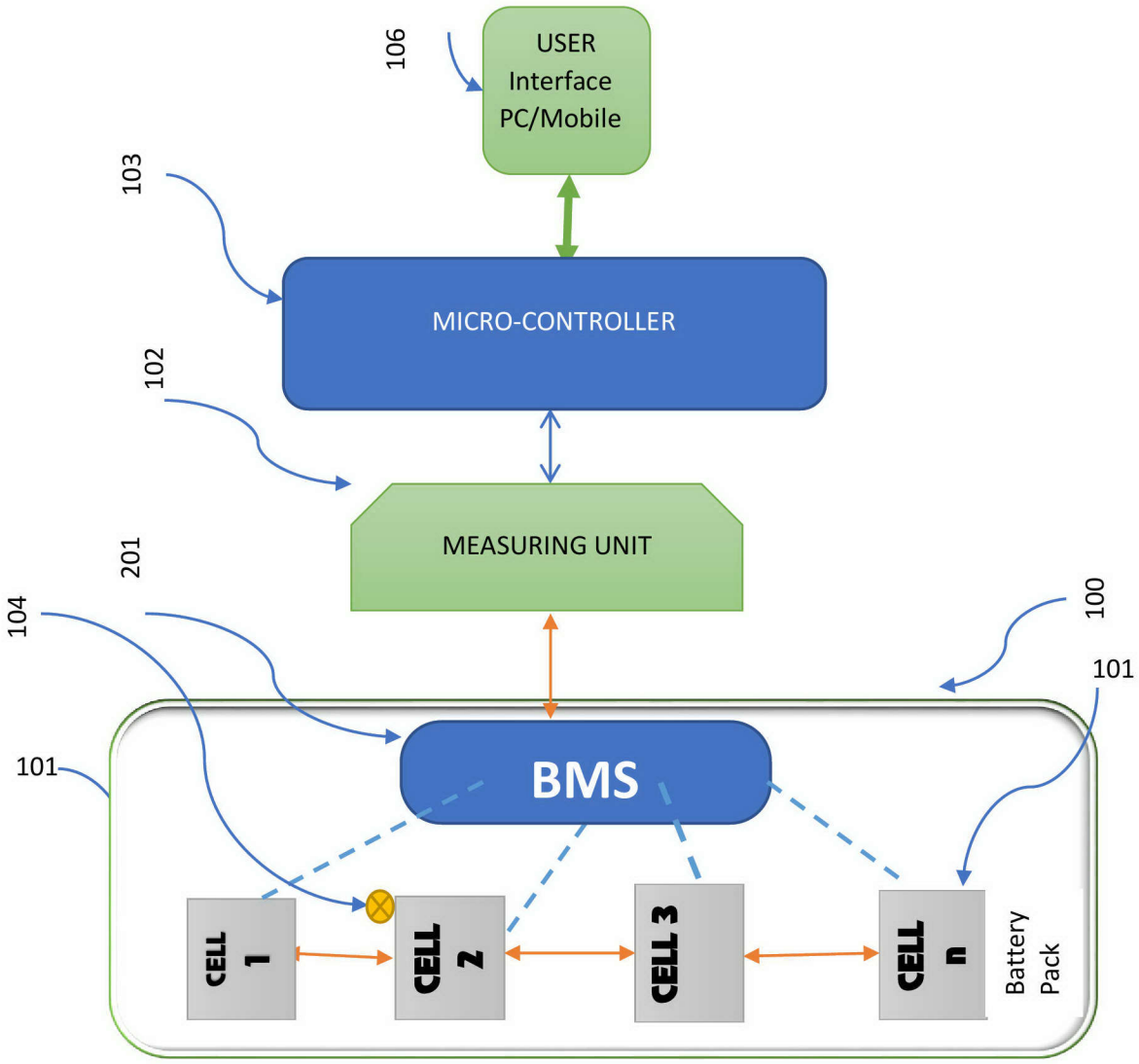

001 ELECTRIC VEHICLE CHARGING ESTIMATION DEVICE USING MACHINE LEARNING

FIG 1

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1. TITLE OF THE INVENTION:

" ELECTRIC VEHICLE CHARGING ESTIMATION DEVICE USING MACHINE LEARNING "

2. PREAMBLE TO THE DESCRIPTION

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

4. DESCRIPTION

TECHNICAL FIELD

[0001] The present disclosure generally relates to the field of Electrical Vehicles, wherein electronic controls, together with Artificial intelligence/Machine learning concepts, are used for ascertaining charging time and mileage tracking.

BACKGROUND

[0002] Electrical Vehicle (EV) deployment on a commercial basis led researchers to increase thrust on EV related topics. The most important part of an Electrical Vehicle (EV), which decides the future of an Electrical Vehicle (EV), is its battery unit and charge time and discharge time. The discharge time is nothing but the Milage of the Electrical Vehicle (EV), whereas the charge time is the time required by the battery unit to get fully charged. Most of the time, charge time depends on several electrical parameters and battery units internal parameters.

[0003] Numerous prior arts have made attempts to automate the Solar tracking process in a fragmented way rather than a complete system. Various solar collector drive mechanisms and tracker controls have been devised for maintaining this optimal angle.

[0004] The CN104051799B provides a method for evaluating a battery employed in an application that includes calculating a differential voltage during a charging event, evaluating the differential voltage to determine a peak state of the differential voltage, determining a state of charge of the battery based upon the differential voltage's peak state and controlling the operation of the application in response to the state of charge.

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[0005] In the prior art US9132742B2 to Jing D. Dai et. al; describes a system, method and program product for siting charging stations. A mobility detection module collects traffic data from vehicle sensors distributed in an area. A map matching module maps detected traffic in the area. A vehicle flow module temporally characterizes mapped traffic flow. An electric vehicle (EV) requirements (EVR) evaluator determines an optimal number of charging stations and respective locations for seting the charging stations.

[0006] Similarly, in U.S. Pat. No. US20120041855A1 discloses A charging station for recharging the battery of and electrically powered vehicle includes a diagnostic interface with the vehicle via an OBDII-type connection or the equivalent or alternatively via a wireless interface, optical interface or an electronic encoding imposed upon the charging current. Optionally a cooling system may be integrated into the charging station to enable thermal control of the energy storage system by providing heating or cooling via a second electrical circuit, or a fluid heat exchange system or by a gas heat exchange system. The charging station may produce a diagnostic test report for the EV that is sold to the vehicle operator, or the report may be provided to the vehicle operator gratis as an incentive to increase utilization of the recharging service.

[0007] U.S. Pat. US10899235B2 to Joseph W. Forbes, et al., discloses an Systems and methods for electric vehicle (EV) charging and graphic user interface for consumers, including consumer profiles and EV point of sale terminal profiles. Novel methods for consumer guidance and controls are provided coupled with graphic user interfaces for mobile applications, websites, and electric vehicle point of sale terminals.

[0008] U.S. Pat. US20100161479A1, describes an A method for delivering energy to an electric vehicle is provided, wherein the electric vehicle is associated with a customer account. The method includes identifying the electric vehicle at an energy delivery point, and determining a current balance of the customer account, wherein the current balance includes at least a portion of a prepayment amount based on a predetermined amount of energy to be delivered to the electric vehicle at the energy delivery point. The method also includes delivering energy to the electric vehicle, metering an actual amount of energy delivered to the electric vehicle, and determining a transaction amount based on the actual amount of energy delivered to the electric vehicle at the energy delivery point.

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[0009] In the prior art AU2020103212A4, disclosed systems and methods directed to a system power distribution management system wherein it was presented that an effective IoT communication protocol may help in getting better control aspects in power distribution and this same aspect is used herein for power generation.

[0010] Another Prior art AU2020104355A4 presented a method IoT and Machine Learning-Based Power Quality Improvement System For Micro-Grid which uses the WiFi mesh protocol for its communication and sends fault and utilization data to the user. The The power generated from this invention may be linked to grid for a Smart Microgrid and this invention presented herewith is capable of such an integration.

[0010] AU2020102433A4 discloses an invention of a tracking system wherein the camera apparatus is designed to track the fish and its trajectory using a relevant machine learning algorithm.

[0011] A prior art document, AU2020103212A4 titled IoT And Machine Learning-Based Power Distribution Management System, discloses an invention wherein the power distribution and related tracking of parameters are carried by applying relevant machine learning algorithm.

[0012] Another prior art document AU2020102642 titled Machine Learning-based Smart Workout Mirror and Method Thereof has disclosed an invention wherein the movement of the arm is tracked by a combination of camera images and gyroscope data which is fed to the relevant machine learning algorithm.

[0013] Another prior art document by AU 2020102473 titled Machine Learning and IoT - Based Smart Self Adjusting Potty Seat discloses a system wherein relevant machine learning algorithm is used to determine the height of the user and adjust the seating position by controlling relevant dc motors.

[0014] Referring to another document by Hayes et al., 2011, disclosed simplified EV power train models are developed for new and existing production vehicles. The models are developed based on published vehicle parameters and range information for the Nissan Leaf and the Tesla Roadster. The models are compared with published manufacturer specifications for range under various route and driving conditions, and for various drive cycles. The models are additionally

validated against test results for the Nissan Leaf and Tesla Roadster vehicles, where the test route topography is modeled using Google Earth and a GPS-based smart-phone application. Excellent correlations are demonstrated between the experimental results and manufacturer data and the vehicle models. Impacts of battery degradation with time and vehicle HVAC loads are considered in the study.

[0015] In US6356083B1 to Ramona Y. Ying in his document described a method and apparatus for determining the state of charge of a battery including the steps of determining whether the battery is in a charge decreasing, sustaining or increasing mode, integrating the charge going in and out of the battery to determine a current-based state of charge measurement if the battery is in a charge increasing or sustaining mode, and determining the open circuit voltage to determine an open circuit-based state of charge measurement if the battery is in a charge decreasing mode.

[0016] The present invention provides an electronic circuitary capable of executing Machine Learning Algorithms to track the state of charge and discharge accurately and display the same in the user interface.

[0017] The present invention addresses the shortcomings mentioned above of the prior art.

[0018] All publications herein are incorporated by reference to the same extent as if each publication or patent application were specifically and individually indicated to be incorporated by reference. Where a definition or use of a term in an incorporated reference is inconsistent or contrary to the definition of that term provided herein, the definition of that term provided herein applies, and the definition of that term in the reference does not apply.

SUMMARY

[0019] The following presents a simplified summary of the disclosure in order to provide a basic understanding of the reader. This summary is not an extensive overview of the disclosure, and it does not identify key/critical elements of the invention or delineate the scope of the invention. Its sole purpose is to present some concepts disclosed herein in a simplified form as a prelude to the more detailed description that is presented later.

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[0020] Exemplary embodiments of the present disclosure are directed towards the Electric Vehicle Charging Estimation Device Using Machine Learning.

[0021] An exemplary object of the present disclosure is directed towards a system that integrates a microcontroller with sensors that are capable of sensing electrical parameters of the battery.

[0022] An exemplary object of the present disclosure is directed towards a system to predict the time of charging and discharging of the battery by executing a relevant machine learning algorithm.

[0023] Another exemplary object of the present disclosure is directed towards the integration of Microcontroller 103 with a temperature sensor. The microcontroller aggregates the sensor's data and executes the relevant machine algorithm to predict the temperature variation of the battery.

[0024] An exemplary aspect of the present subject matter is directed towards the integration of Microcontroller 103 with the GPRS module to receive the data from the user interface about the battery specifications.

[0025] An exemplary aspect of the present subject matter is directed towards the integration of Microcontroller 103 with internal resistance measurement unit RMU to determine the internal resistance of the battery.

[0026] An exemplary aspect of the present subject matter is directed towards the implementation of the machine learning algorithm on internal resistance measurement unit RMU data to ascertain and predict the voltage drop of the battery.

[0027] Another exemplary aspect of the present disclosure is directed towards the integration of microcontroller 103 with a temperature sensor to determine theanmaly from the battery pack and avert any accidents by alerting the user through the user interface.

[0028] Another exemplary aspect of the present disclosure is directed towards the Battery Management System, which continuously checks for irregularities in cell charging.

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BRIEF DESCRIPTION OF THE DRAWINGS

[0029] In the following, numerous specific details are set forth to provide a thorough description of various embodiments. Certain embodiments may be practiced without these specific details or with some variations in detail. In some instances, certain features are described in less detail so as not to obscure other aspects. The level of detail associated with each of the elements or features should not be construed to qualify the novelty or importance of one feature over the others.

[0030] According to an exemplary embodiment of the present disclosure, FIG.1 is a diagram depicting the 001- ELECTRIC VEHICLE CHARGING ESTIMATION DEVICE USING MACHINE LEARNING.

[0031] FIG. 2 Control Circuit Layout Central-Monitoring System 002 (CMS), according to an exemplary embodiment of the present disclosure.

Detailed Description of Example Embodiments

[0032] It is to be understood that the present disclosure is not limited in its application to the details of construction and the arrangement of components outlined in the following description or illustrated in the drawings. The present disclosure is capable of other embodiments and of being practiced or of being carried out in various ways. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

[0033] The use of "including", "comprising" or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. The terms "a" and "an" herein do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced item. Further, the use of terms "first", "second", and "third", and the like, herein do not denote any order, quantity, or importance, but rather are used to distinguish one element from another.

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[0034] Referring to FIG. 1 is a diagram depicting a " ELECTRIC VEHICLE CHARGING ESTIMATION USING MACHINE LEARNING " consisting of Measuring unit 102 connected to the microcontroller 103. Measuring unit 102 collects the data of battery/ cells of battery from the Battery management system console 201. The measuring unit 102 collects the input electrical parameters and output electrical parameters during the battery's charge and discharge period. The electrical parameters thus collected is time-stamped, and as well cell/battery ID embedded in it. The data hence collected, is sent to microcontroller 103 for further usage.

[0035] Further, the microcontroller 103 collects the temperature of the battery 100 or cells 101 within a battery through the I2C protocol and stores the data with time stamping and cell ID. The data collected over a period from the measuring unit is used to train the random forest model so as to ascertain the charging and discharging pattern of the batter/ cells. It is to be noted that most of the prior arts have failed to consider the dynamic nature of the battery characteristics subjected to change with respect to time and ageing. Moreover, as the battery life deteriorates based on the climatic condition, its characteristics curve should not be assumed constant over its lifetime. This disadvantage is flabbergasted in this invention by implementing the machine learning algorithm.

[0036] Further, microcontroller 103 executes the relevant machine learning algorithm on the data received and determines the exact time required to charge the battery/cells in prescribed temperature variation fully. This is to be noted that, in accordance to the standard layout by IEV society, the temperature must be maintained according to AH rating to increase the life of the battery. As the charge Ampere Hour is increased, the heat dissipation may also increase and hence, the microcontroller, in coordination with temperature sensor 104, executes a relevant machine algorithm to predict and determine the temperature variations while charging or discharging and if any anomaly is found, it will communicate the user through GPRS/WiFi.

[0037] Referring to FIG 2, which depicts Control Circuit Layout Central-Monitoring System (CMS), wherein the Central-tracking System 004 (CTS) 004 encompassing Microcontroller 103, having an advanced microprocessor 103a and additionally equipped with WiFi/GPRS chips 103a-1. This ability gives the microcontroller to communicate to the user and console 106 in any communication media. Further, the Battery Management Chip 201/ Monitoring are integrated so as to simplify the circuit. Basically, a BMS is 201 generally

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measure the electrical parameters at each battery and observes and take care of any anomaly. This specific quality has been exploited in the present invention to extend the BMS to a monitoring system 102.

[0038] Further, the Monitoring system 102 is a custom made integrated chip capable of sensing any given electrical parameters, especially in Direct Current sources. The signals received by the BMS 201 are tapped by the monitoring system 102 and send to the microcontroller 103 in a time-phased manner. When the temperature of the cell/battery increases or any anomaly is detected by the microcontroller 103, then it activated the circuit breakers 103e so as to isolate the battery pack 100.

[0039] In an embodiment, the microcontroller 103 on detecting anomaly sends the appropriate signal on to use user interface 106 over the IoT communication protocol, that is WiFi mesh protocol, and further, the microcontroller 103 send push messages on to the user interface 106 regularly so that user can view the charging and discharging status of the battery.

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CLAIMS STATEMENT

We Claim,

1. The ELECTRIC VEHICLE CHARGING ESTIMATION DEVICE USING MACHINE LEARNING:
   consisting of Battery Management System 201 integrated with Monitoring System 102 to measure and balance the electrical parameters at the battery; and
   Battery Management System 201 and Monitoring System 102 is integrated with microcontroller 103 to form a data collection system; and
   Microcontroller 103 integrated with temperature sensor 104; and
   Data collected from the monitoring system 102 is stored and used to train the relevant random forest model.
2. The device, as claimed in claim 1, the Microcontroller 103 capable of executing relevant machine learning algorithm on battery and temperature sensor 104 data to estimate the charging or discharging time, data thus predicted is intimated to the user

3. The device, as claimed in claim 1, the Microcontroller 103, monitors electrical parameters and temperature during charging through Monitoring system 102 and executes the relevant machine learning algorithm on the data to ascertain the anomaly and isolate the battery pack intimate the user over WiFi Mesh network.

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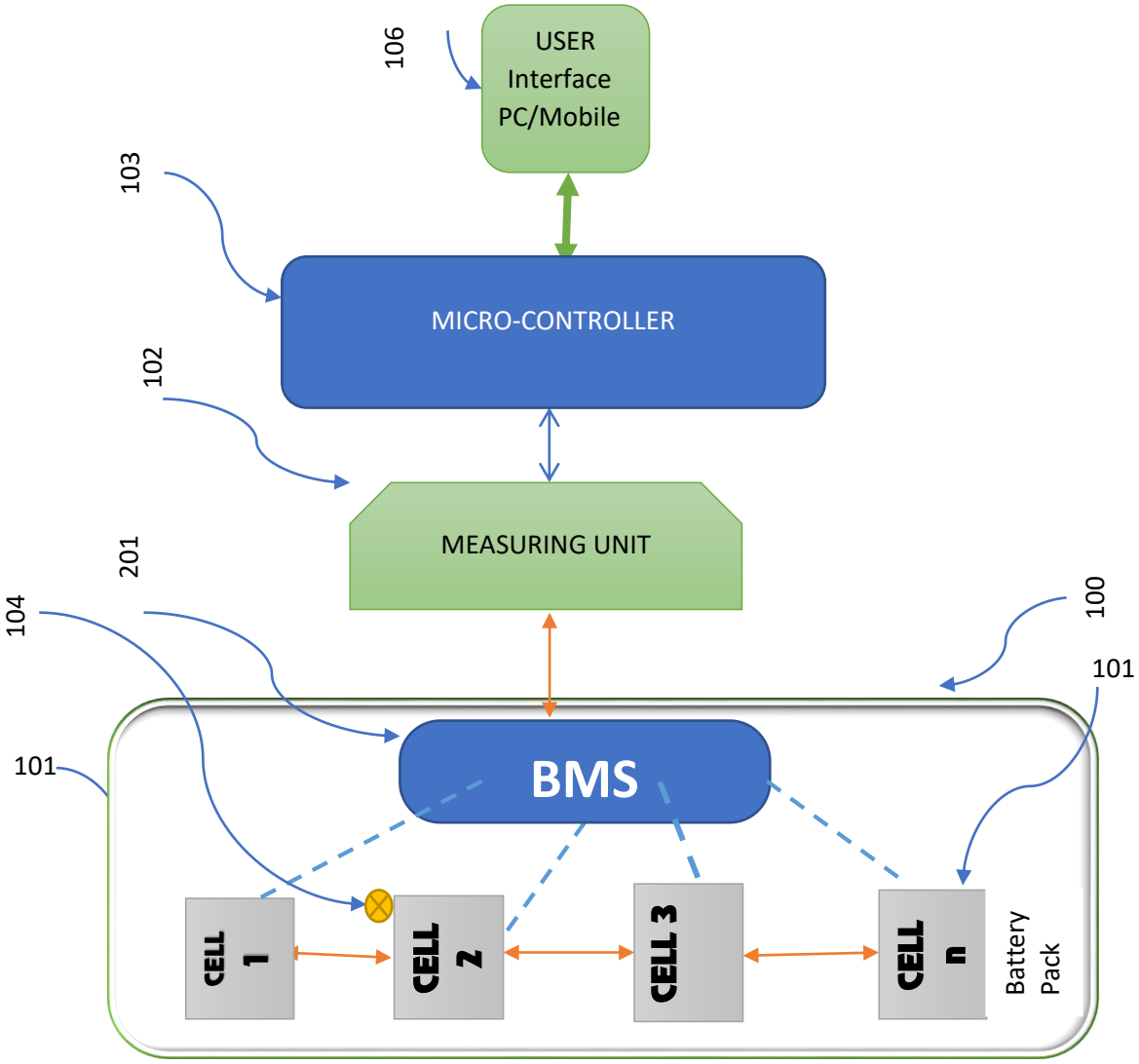

001 ELECTRIC VEHICLE CHARGING ESTIMATION DEVICE USING MACHINE LEARNING

FIG 1

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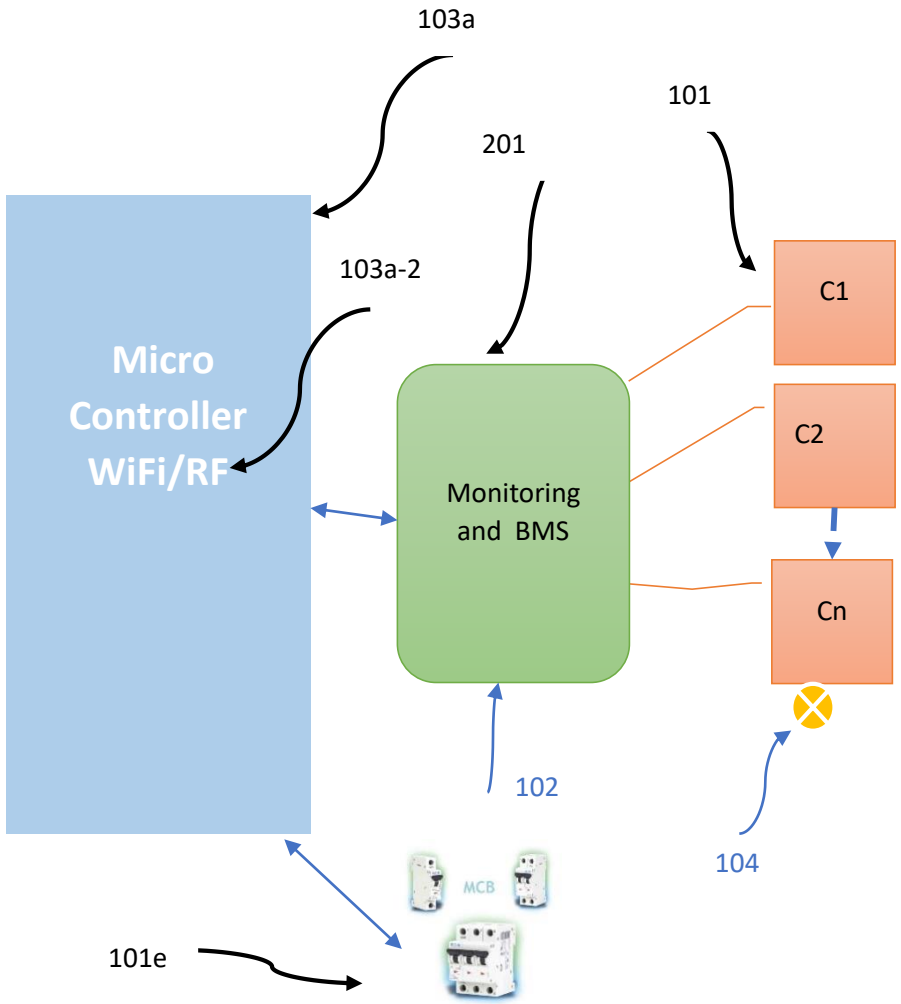

002 Fig 2 Control Circuit Layout Central-Monitoring System (CMS)

FIG 2