Original Research Article

Design of Battery Parameter Analysis Device Based on Labview

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ABSTRACT

Based on the design of labview battery parameter analyzer, this problem is a problem worthy of further study. The main content of this thesis is to use labview software to design a program, through DAQmx will be in the physical data (the battery of various parameters, such as: voltage, current, etc.) into the computer, through the already designed program to measure various parameters of the battery. My main goal this time is to measure the battery's power. Therefore, I need to measure the actual circuit by the battery voltage changes, current changes, and the time spent by the software in the program analysis to calculate the battery actually have the power. Not only to calculate the total power, but also to calculate the power per minute per second, and through the chart displayed. The biggest feature of this topic is the theoretical design is more important, hardware devices and devices is not too complicated, of course, only relatively speaking, so the biggest feature of this topic is that I designed the software program, the main function is reflected in the program Among them, the hardware device only played a supporting role.

KEYWORDS: labview, DAQmx, battery, power, program

1. LabVIEW background and development process

LabVIEW is a program development environment developed by the National Instruments (NI) company, similar to the C and BASIC development environment, but LabVIEW and other computer language is a significant difference: other computer language is based on text-based language code, and LabVIEW uses a graphical editing language G program, the program is generated in the form of a block diagram. Like C and BASIC, LabVIEW is a common programming system with a large library of tasks that accomplish any programming task. LabVIEW's library includes data collection, GPIB, serial control, data analysis, data display and data storage, and so on. LabVIEW also has traditional program debugging tools, such as setting breakpoints, animating the display of data and its subroutines (subVI) results and single-step execution to facilitate the commissioning of the program.

LabVIEW provides a lot of controls that look like traditional instruments (such as oscilloscopes, multimeters) that can be used to easily create user interfaces. The user interface is called front panel in LabVIEW. With icons and connections, you can programmatically control objects on the front panel. It is widely accepted by industry, academia and research laboratories as a standard data acquisition and instrumentation control software. LabVIEW integrates all the functions of communication with hardware and data acquisition cards that meet GPIB, VXI, RS-232 and RS-485 protocols. It also built a convenient application of TCP / IP, ActiveX and other software standard library functions. This is a powerful and flexible software. Use it to easily create your own virtual instrument, its graphical interface makes the programming and uses of the process are interesting and interesting.

History of LabVIEW:

In the late 1970s: At the United States Applied Research Laboratory (AppliedResearch Laboratory) generated VI prototype of the concept.

1986: Released LabVIEW 1.0 under the Macintosh platform.

1988: Released LabVIEW 2.0 under the Macintosh platform.

1990: Virtual instrument panel and structured data flow chart were two US patents.

1994: Publish LabVIEW 3.0 with additional toolkit.

1996: Releasing LabVIEW 4.0 to add custom interfaces and Application Builder.

1998: Released LabVIEW 5.0 supports multithreading.

2000: Announces LabVIEW 6i Integrated Internet Features.

2001: Release of LabVIEW 6.1 to achieve remote control and add important features such as event structure.

2003: Released LabVIEW 7 Express Added Express VI.

2004: Releasing LabVIEW 7.1 Express adds many new features.

2005: Launches LabVIEW 8.0 adds many new features.

August 2006: Release LabVIEW 8.2 has the first Chinese version of the development environment.

August 2007: Release of LabVIEW 8.5.

April 2008: Release of LabVIEW 8.5.1.

August 2008: Release of LabVIEW 8.6.

February 2009: Release of LabVIEW 8.6.1.

August 2010: Publish LabVIEW 2010.

August 2011: Publish LabVIEW 2011.

August 2012: Publish LabVIEW 2012.

LabVIEW 8.X version of the introduction of object-oriented (OOP) programming concept, so that LabVIEW closer to a complete programming language.

Development language: C / C ++

Domestic and foreign similar software: China has now developed a graphical single-chip programming system CPUVIEW; Lego company developed the software 'LEGO MINDSTROMS NXT', so that the program designer can be on the computer through the NXT-G (a visual programming language) The robot's behavior is visualized by the program design.

Foreign development process with the advent of personal computer technology people began to consider the use of computers to deal with the traditional instrument measured data. Thus GPIB technology developed in the 1970s, which is IEEE 488 and later IEEE488.2 standard. But because the GPIB bus bandwidth 1Mbytes / s limits the real-time transmission of data to the computer, so a lot of data processing work still rely on the instrument itself with the function. In the 1980s, with the further development of computer technology, personal computers could have multiple expansion slots, and a data acquisition card inserted in the computer appeared. It can carry out some simple data collection data post-processing by the computer software to complete this is the prototype of virtual instrument technology. In 1986, National Instruments Corporation (Nasdaq: NIU) introduced the 'Software as a Slogan for Instruments' to introduce NI-LabVIEW's intuitive flow chart programming style development and operation platform, which opens the door to virtual instrumentation. In the 1990s, the speed of the computer bus to further speed up the PCI bus data transmission speed reached 132Mbytes / s. At the end of 1996 the United States NI company in the PCI data bus based on the first generation of PXI system proposed technical specifications. Now PXI Technology Alliance has nearly 60 member companies to develop products for this platform.

The development of China's Shandong Institute of Vibration and Noise Technology (hereinafter referred to as COINV) began to put forward the concept of PCCATAI-PCCATAI-microcomputer card acquisition test analyzer and introduced the data acquisition and signal processing software DASP Data Acquisition And then put forward the 'carry the laboratory walk' slogan and then the virtual instrument library platform to achieve the development of the INV virtual instrument library. The DASP software concept breaks through the traditional concept of random vibration signal analyzer and FFT analyzer to realize the transition to the concept of virtual instrumentation and computer acquisition test and analysis instruments. In the meantime, COINV developed into the first virtual instrument in China - PC Carter Intel INVl01 and then introduced the desktop with INV303 and portable pen-type INV306 system and in 1993 to Toronto, Canada exhibited the realization of the VI overflight.

2. The basic content of the study and the main problem to be solved:

2.1. Battery capacity:

The battery capacity refers to the fully charged battery in the specified conditions released by the total amount of electricity, with the letter 'C' said, the unit is Amp (A · h). The battery capacity is usually the following:

Theoretical capacity: Assuming that the active substance is fully utilized, the maximum capacity that the battery can release.

Rated capacity: measured under the specified conditions, the manufacturer given the minimum capacity of the battery, also known as the capacity to ensure.

Available capacity: Under the specified conditions, the amount of electricity released from the fully charged battery is also called the actual capacity.

Remaining capacity: The amount of electricity that can be discharged from the battery at the specified discharge rate and temperature after use of the battery.

2.2. Battery energy:

In a certain standard discharge conditions, the battery can work outside the output power, the unit is watts (W · h) or kWh (KW · h). Battery energy is usually the following:

Total energy: the sum of the energy output of the battery during its life cycle.

Charging energy: Enter the battery power through the charger

Discharge capacity: the battery discharge, the output power.

In this need to pay special attention to the difference between capacity and energy: capacity that the battery output power, energy that its ability to do the power. The energy can be obtained by multiplying the discharge by the average discharge voltage. Electrical equipment is with current control, then the capacity measurement; when the voltage appears to be important, the more energy. Analysis and comparison of electric vehicle energy efficiency when the use of energy.

2.3. Battery energy density and power density:

Respectively, from the battery unit mass (or volume) obtained by the power and output power. Respectively, called the specific energy and specific power, the specific representation of the method:

Quality Energy Density: The energy obtained from the unit mass of the battery, also known as the mass energy. The unit is W • h / kg

Volume Energy Density: The energy obtained from the unit volume of the battery, also known as the volume specific energy. The unit is W · h / L

Quality Power Density: The output power obtained from the unit mass of the battery, also known as the mass ratio of power. The unit is W / KG

Volume Power Density: The output power from the unit volume of the battery, also known as the volume ratio of power, in W / L

Need to emphasize the difference between energy density and power density: the battery power to a certain extent determines the acceleration of the car, climbing and the highest speed, and the battery energy density determines the car after a charge of driving range. The weight of the battery also affects the driving force of the car to a certain extent, and the volume of the battery determines the layout of the car parts in the car chassis space. So the electric car hopes than the power and specific energy can be larger. In general, however, when the power density of the battery increases, the energy density decreases. The reason is: □ the battery generated a high current chemical reaction limits the energy density; □ in order to produce high current, the need for a large number of current collector, in order to let out of space, you have to reduce the storage of electrical energy electrode material volume.

2.4. battery open circuit voltage:

The battery is open (open circuit) state of the electrode at both ends of the potential difference is called open circuit voltage. The open circuit voltage of the battery depends on the material characteristics that make up the battery. For the same series of batteries, if the material source, crystal structure is different, open circuit will be different. If the battery's open circuit voltage drops quickly, indicating that the battery may be a chronic short circuit, or battery performance tends to decline near retirement.

2.5. Battery internal resistance:

The internal resistance of the battery discharge, including ohmic resistance and polarization resistance. The ohmic resistance is the sum of the electronic conduction resistance, ionic conductivity and contact resistance of the components

in the battery, and is related to the electrode structure and assembly process. Polarization resistance electrode formed by the reaction, and the electrode reaction of the nature and material related. The smaller the battery resistance, the battery output current when the buck is smaller, the battery will be able to output a higher operating voltage and larger current, the greater the output energy and capacity.

2.6. Battery operating voltage:

Battery discharge, the battery between the two poles, also known as discharge voltage or terminal voltage. The operating voltage should be equal to its open circuit voltage minus the internal pressure drop and the discharge system. Discharge system refers to the battery discharge conditions specified by the discharge, including the discharge mode (refers to continuous or intermittent), discharge resistance, discharge current, discharge time, discharge termination and discharge ambient temperature.

2.7. Discharge termination voltage:

Refers to the battery discharge, the voltage dropped to no longer continue to discharge the minimum operating voltage. Depending on the type of battery and the discharge conditions, the battery capacity and life requirements are different, so the specified battery discharge termination voltage is also different. Generally, when the low temperature or high current discharge, the termination voltage is low, because the electrode polarization at this time, the active material cannot be fully utilized, the battery voltage drops faster. In the small current discharge, the termination voltage is higher, because the small current discharge electrode polarization is small, and the active material can be fully utilized.

2.8 discharge curve: that under certain conditions of discharge, continuous discharge of the battery voltage over time with the relationship between the curves. As shown in the figure, the discharge curve of a battery at different discharge rates (1.3.5.8.10 hours), which can clearly see the discharge voltage of its working time with the process of change, through the discharge curve can calculate the discharge time and discharge capacity. The discharge rate is small, the voltage drop speed is fast, the termination voltage is low, the discharge time is short, also affects the actual use effect of the battery. Put the box discharge rate is great, its working voltage slow down, often can also output more energy. The rate of change of the operating voltage is also referred to as the smoothness of the discharge curve.

The rated capacity of the battery C, the unit Ah, is the product of the discharge current (A) and the room time (h). The C_{20}, C_{10}, where 'C' represents the battery capacity, the latter figures that the battery to a certain intensity of the current discharge to the set voltage of the hour number. Thus, the capacity divided by the number of hours equal to the rated discharge current. For example, an electric bicycle capacity of 10Ah, discharge rate of 2 hours, writing 10Ah2, its rated discharge current of 10Ah / 2h = 5A; a car with a battery capacity of 54Ah, discharge rate of 20 hours, Write 54Ah20, its rated discharge current is only 54 (Ah) / 20 (h) = 2.7A! In other words, the two batteries, if respectively, with 5A and 2.7A current discharge, it should be able to continue for 2 hours and 20 hours before the drop to the set voltage. Set the voltage is the termination voltage (discharge voltage drop to the minimum voltage will not damage), the termination voltage is not fixed, it keeps the discharge current increases and decreases, the same battery discharge current greater , The termination voltage can be lower, on the contrary, should be higher. That is, when the high current discharge to allow the battery voltage down to a lower value, and small current discharge is not, otherwise it will cause damage. The battery strength is expressed in terms of magnification, written as NCh, 'N' is a multiple, 'C' represents the number of hours of the capacity, and h represents the number of hours specified in the discharge rate. The magnification is often written in the form of NC without writing the subscript. Multiples of NC multiplied by capacity C are equal to current A. For example, 20Ah battery with 0.5C rate discharge, 0.5 × 20 = 10A. For an angle example: a car to start the battery capacity 54Ah, measured output current of 5.4A, then it at this time the discharge rate N is 5.4 / 54 = 0.1C. Acid batteries are representative: the same battery in a different discharge current Ah Ah (current and time of the product) the number is different. Assuming the battery capacity of 10Ah, to 0.6C magnification is 6A discharge time can only last 1 hour, can release the power of only 6A × 1h = 6Ah. And 0.05C is 0.5A discharge time can last 20 hours, release power 0.5A × 20h = 10Ah. Although the former termination voltage is much lower than the latter, but can release the power is much smaller than the latter.

2.8. Life:

Battery life refers to the battery life or the number of charge cycles expressed by the battery durability. The cycle of rechargeable batteries undergoes a charge and discharge process, known as a cycle or a cycle. In a certain charge and discharge system, the battery capacity dropped to a certain value, the battery can withstand the number of cycles, known as the battery cycle life. The main factors that affect the battery life of the battery are: in the charge and discharge process, the electrode active surface area decreases; the electrode active material fall off or transfer; electrode material corrosion; battery internal short circuit; diaphragm damage and active material crystal changes, The In each charge and discharge cycle, the chemical activity of the battery must be a reversible chemical reaction. With the increase in the number of charge and discharge, the chemical activity of the battery will gradually aging deterioration, activity

attenuation, chemical function weakened, making the battery charge and discharge efficiency gradually reduced, and finally the battery loss function and scrapped. The cycle of the battery is related to the form of charge and discharge, the use of ambient temperature and the depth of discharge, the depth of discharge 'shallow', is conducive to extend the battery life. The battery in the use of electric vehicles on the environment (including the vibration, l temperature changes), the battery pack in the battery balance and installation methods, will affect the battery cycle and the number of service life.

2.9.   Temperature characteristics:

Ambient temperature is an important factor affecting the performance of the battery. In fact the battery is also classified in the working temperature state, such as lead-acid batteries at room temperature, while the sodium-sulfur batteries need to work at high temperatures. The battery is more sensitive to ambient temperature and temperature rise. Most of which require a relatively narrow temperature range to work in order to maintain a high performance, otherwise it will be damaged. Therefore, the battery installed in the use of electric vehicles, but also pays attention to its ambient temperature and temperature regulation of the state control.

2.10. CA (starting current):

Refers to the battery at zero degrees Celsius discharge 30 seconds, the battery terminal voltage is 7.2 volts above the output of the amperage. The starting current is the amount of change in the current of the electrical equipment (inductive load) at the time of the start-up, which is the moment when the electrode or the inductive load is energized for a short period of time. This current is generally 4-7 times the rated current, in order to run the line safe and other equipment, the normal operation of high-power engine must be installed to start the device to reduce the starting current.

The inrush current is the maximum instantaneous current that is passed before the input current reaches a steady state when the input voltage is turned on or off at a specified time interval. Common AC motor start methods are: direct start string resistance star autotransforming start star delta decompression start frequency start

2.11. CCA (cold start current):

Refers to the minus 18 degrees Celsius when the battery discharge 30 seconds, the battery terminal voltage of 7.2 volts can output the number of amps.

The main problem is how to use Labview to detect the various parameters of the battery, including battery power.

3.   Conclusions

This topic involves a wide range of research, because the time is limited, so the main direction of the study or to design a set of equipment can measure the main energy of the battery.

Labview function is very powerful, the module is very much, not a day or two can be familiar with the understanding, especially for beginners. Of course, in sufficient understanding of the premise, it is also very easy to design a variety of functions with the program. It is not as abstract as the C language, it can be said that many of its modules are very image, often often just look at the outsiders are likely to know the general function of these modules.

The subject is the main realization of measuring the power of dry batteries. In particular, the use of dry batteries, resistors, voltmeter, ammeter and other hardware to connect a basic circuit, and then through the DAQmx to measure the voltage, current and other data input to the computer program, through my design of the program to calculate the dry battery The power consumed. (2) can measure the power per millisecond, that is, at any time to suspend the display at any time (1) can be measured according to the requirements of the instructor, my program to achieve the function (1) can measure the total power of the dry battery, and the curve shows; Out of the power consumption. This is also the innovation of this program. This work sounds easy, but not really, for those who are not familiar with Labview. Because the software is familiar with the various modules will take a lot of time, the other not to mention the other, has not yet begun to encounter such a big obstacle, can imagine how much trouble this work. Fortunately, in the end, I still stick to it, but also made some achievements.

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