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Design and Implementation of Renewable Based EV Charging Station

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ABSTRACT: A significant transformation occurs globally as transportation switches from fossil fuel-powered to zero emission E-Vehicles. The transition to the electric vehicle requires an infrastructure of E-Vehicle charging stations everywhere. The rapid adoption of electric vehicles (EVs) calls for the widespread installation of EV charging stations. To maximize the profitability of charging stations, intelligent controllers that provide both charging and electric grid services are in great need. However, it is challenging to determine the optimal charging schedule due to the uncertain arrival time and charging demands of EVs. In this paper, we propose solar energy based three phase voltage source inverter fed grid. In this research solar energy is maintain a consistent output voltage to the load or grid. In this research PV system with a NeuroFuzzy-based MPPT algorithm and a Switched Z source Boost converter.

KEYWORDS: Fossil Fuel, Solar energy, Fed grid, Neuro Fuzzy, E-Vehicle

I.INTRODUCTION

Renewable energy sources are viable options for supplying electricity in locations where connecting to the utility network is either impractical or excessively expensive in the current trend. Many trends have emerged as electric distribution technology enters the twenty-first century, changing the requirements for energy supply. The ever-rising need for energy, the rising cost and finite supply of fossil fuels, as well as the deteriorating global environment, have increased interest in green power generation technologies. Due to the rapid depletion of fossil fuels and rising energy demand, renewable alternatives have drawn attention from all around the world. Renewable energy sources provided 19% of the world's energy consumption. Renewable energy is energy that is obtained from sources that naturally replenish themselves over timescales comparable to the humans, such as sunshine, wind, rain, tides, waves, and geothermal heat.

According to REN21's 2016 study, people generated 23.7% of the electricity they used globally in 2014 and 2015, and 19.2% of it, respectively, came from renewable sources. Its energy consumption is broken down into 4.2% of energy (modern biomass, energy, and solar heat), 3.9% of hydroelectricity, 2.2% of electricity from wind, solar, geothermal, and ancient biomass, and 8.9% from ancient biomass. In 2015, countries including China and the United States invested a total of about US$286 billion in renewable technologies, including wind, hydro, solar, and biofuels. In the renewable energy sector, there are 7.7 million employment worldwide, with solar photovoltaic being the largest employer. Almost half of all newly added power capacity worldwide as of 2015 was renewable. Using wind to propel ships across sea is arguably the second-oldest kind of renewable energy. This observation can be traced back 7000 years to river ships during the period of written history. Human work, animal power, water power, grain crushing windmills, and conventional biomass were the initial sources of ancient renewable energy. Oil and fossil fuels were just as important in 1900 as wind and solar were in 2010, according to a graph of American energy use up until that point.

II.PURPOSE OF MICROGRID

The traditional configuration of today's huge power grids offers a number of advantages. Big producing units are frequently affordable and only require a relatively small number of operators. The integrated high voltage transmission network enables the most cost-effective producing plant to be put up whenever necessary and bulk power to be transferred over great distances with minimal electrical losses. The distribution network is frequently sized for client loads exclusively and constructed for one-way power flows. Yet, a number of factors have come together. Major

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power quality challenges for both grid-connected and stand-alone systems include harmonics, voltage and frequency fluctuation, and they are more severe in weak grid situations. By using optimal design, modern rapid response control systems, and hybrid system optimization, this can be greatly alleviated.

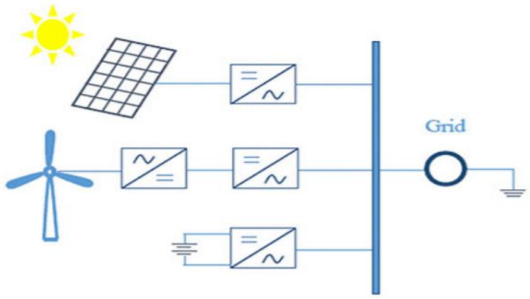

Fig1.Grid connected hybrid system at common AC bus

III.OBJECTIVE

• To deploy solar energy based three phase voltage source inverter fed grid.

• To use a solar energy-based system to maintain a consistent output voltage to the load or grid.

• To develop a PV system with a Neuro Fuzzy-based MPPT algorithm and a Switched Z source Boost converter.

IV. GLIMPSE OFLITERATURE ANALYSIS

Maximum Power Point Tracking Approaches for Photovoltaic Power Systems: A Comparative Analysis (B.Subudhi, R.Pradhan, 2013). The DC to DC converter in this work receives solar power; as a result, the load receives a constant voltage. In this study, various MPPT approaches are tested. The hills clamping algorithm ultimately pulls the most power from the panel. It is not an effective one without a DC to DC converter, and its ripple factor is significant. Voltage for the grid cannot be supplied only by solar networks.A grid-supported solar energy conversion system with an adjustable dc link voltage for common point of interconnection (CP) voltage changes is presented by Bhim Singh (2015) et al. To improve the dynamic response for meteorological changes and CPI voltage volatility, a feed-forward term for the solar PV contribution is also used.

V.EXISTING SYSTEM

This study presents a real-time implementation of the optimal operation of a single-stage three-phase grid inter faced solar photovoltaic (PV) system with active shunt filter capabilities. The control approach is based on the least logarithmic absolute difference with an adaptive filtering technique. It serves manifold objectives of power quality improvements in the distribution network as well as grid side abnormalities such as voltage distortions, voltage sag and voltage swell. A three-phase grid, a ripple filter, a solar PV array, interacting inductors, a VSC, and a DC-link capacitor make up the proposed system. The proposed system's configuration is shown in . For a three-phase grid connected to a PV array with loads connected at the point of common coupling, it is modelled and its behaviour is simulated (PCC).Using the LLAD adaptive filter and P&O-based MPPT algorithm, a quick and versatile control solution for a single-stage, three-phase grid-tied PV system has been developed. The lowered THDs of grid currents, load balancing, and UPF operating even under non-linear load and variable insolation circumstances have all been effectively proved by simulation results. It has been successfully proved with numerous benefits how proposed and traditional control algorithms compare in terms of performance. The system performance has improved in steady-state and dynamical settings due to the repeatable nature of the control responses. Also, test findings showed that utilising a single-stage topology has minimal losses and leads to higher efficiency in the VSC than a double-stage grid interfaced system, which increases the penetration of solar power into the distribution network.

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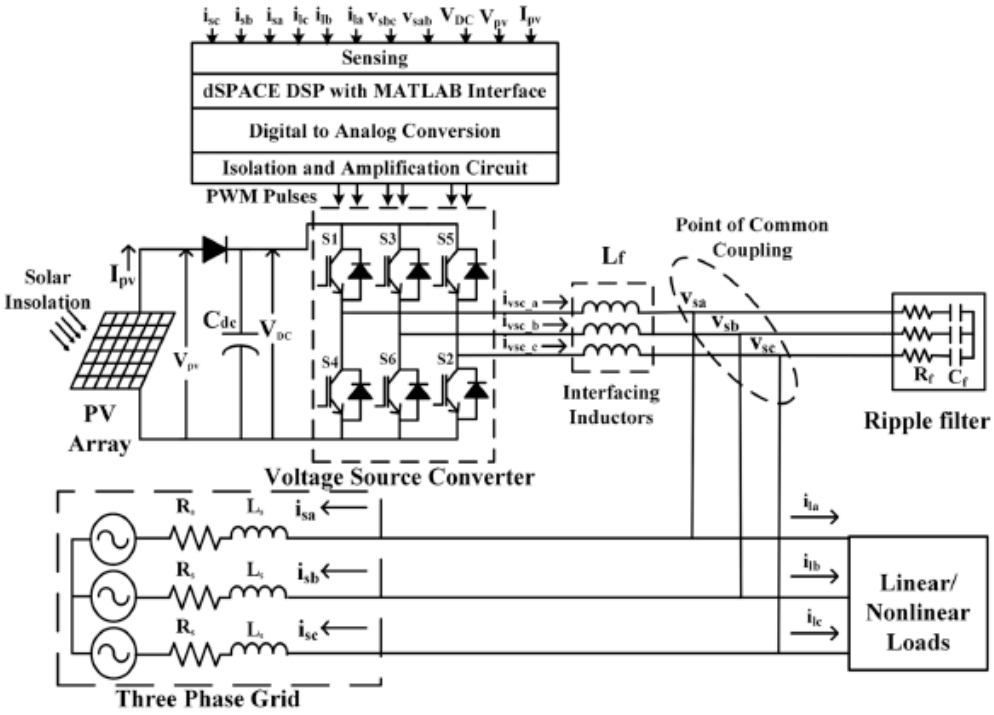

Fig2.Existing system circuit diagram

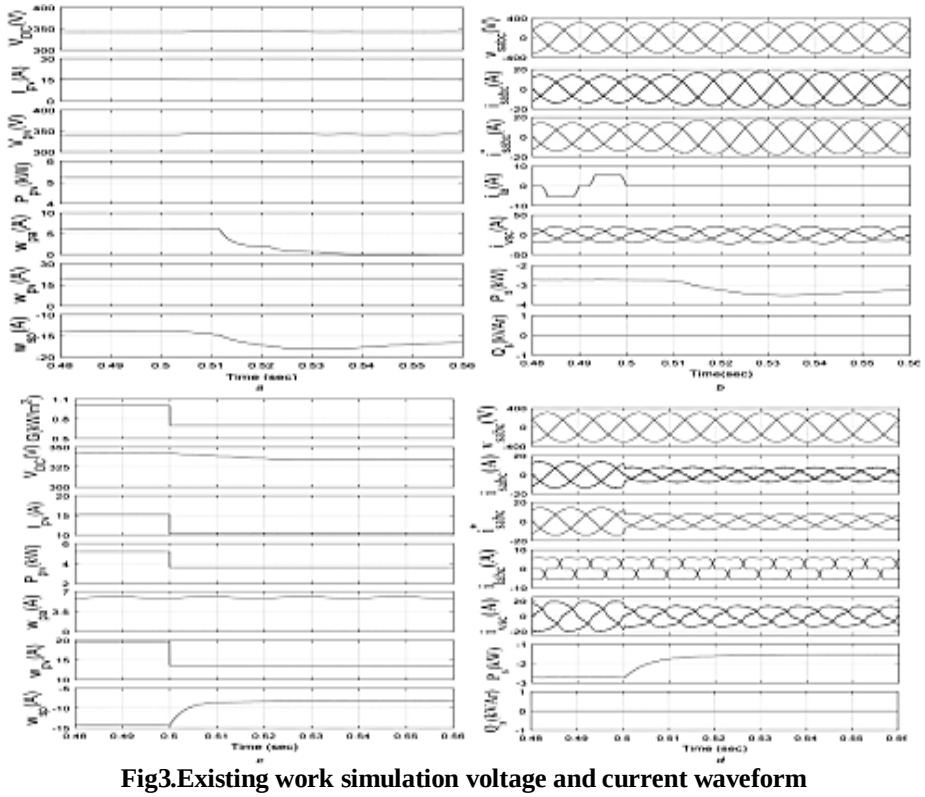

Fig3.Existing work simulation voltage and current waveform

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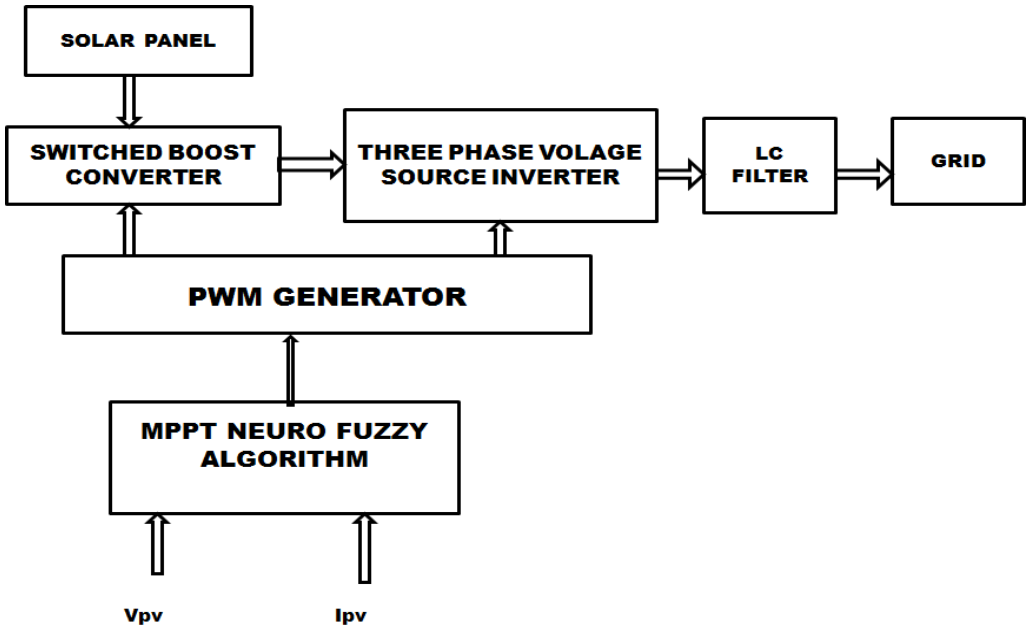
According to experimental findings, the grid's power quality is enhanced by load unbalancing, changeable insulation conditions, and even by weak grid characteristics like voltage distortion and voltage sag. In a grid-integrated renewable energy system, the THDs of grid currents and grid voltages are found to be 5% or less within the parameters of an IEEE-519 standard.

VI.PROPOSED SYSTEM

The rising concern over non-renewable energy sources, rising fossil fuel prices, ecosystem damage, and environmental issues have led to an apparent increase in the promotion of renewable energy sources and an increase in public awareness of it as an alternative to non-renewable energy sources. In terms of renewable energy sources, solar energy is the most efficient and long-lasting. This is in contrast to other energy sources like wind, tidal, fuel cells, etc. PV arrays convert solar energy (rays from the sun) into electricity. In a grid-connected PV system, the boost converter and MPPT are used to link the PV system to the grid and govern grid system coordination. Due to their numerous types of applications in distributed generation and also the efficient use of the PV array power plant, grid-connected PV plants have been promoted more suitably. When all of the power is transferred using local renewable energy sources, there is no longer a requirement for long-distance transmission lines with greater voltage. The AC micro grids have been delegated for the improvement of the connecting of renewable energy sources to conventional ac networks. On the other hand, in order to connect to an ac grid, power produced (DC) using fuel cells or photovoltaic (PV) panels must be converted into ac using PV panels, dc/ac inverters, and dc/dc boost converters. For different types of office buildings and homes to increase different dc voltages, an ac grid needs ac/dc and dc/dc converters.

The various parts that make up a grid-connected solar plant with two tiers that generate and transport PV power. The system's components are specifically designed for PV arrays, which convert solar energy into DC power through a matrix, a boost converter (DC to DC) that raises the voltage level of the array to a modestly level DC voltage, and a DC to AC two-level inverter that converts the DC power into AC power. Local loads are able to use the established AC power that an inverter boosts into the grid.



Solar energy systems are calculated using photovoltaic (PV) installations, in which power can be precisely delivered to an electrical device or redeemed in the public electricity grid.

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Power electronic conversion is necessary, as well as system stability, to improve the efficiency of the PV array in the solar system. While the grid voltage is pulsing (AC) in nature, the power circuit includes a Boost Converter (high step-up) DC to DC converter and an inverter with multilevel to convert DC to AC in these systems. With PV systems' output voltage at the load side constantly varying in nature, the control circuit must obtain constant (DC) voltage at the output. This analysis uses MPPT to examine a grid-connected solar power plant with a DC boost converter.

VII.MPPTALGORITHM

Fuzzy logic controllers are among the crucial control mechanisms used in soft computing. Even though the system uses a traditional controller, as the network grows larger, it has not been able to manage the power flow between the generator and the load. In order to improve dynamic performance, intelligent controllers are created. The same way that human brain stimulation and commands operate, so does fuzzy logic. The fuzzy logic controller and straightforward interpretation of the expert knowledge system require less expensive components to run. The process of developing the rules for the fuzzy system's functioning is the most difficult and time-consuming instead of using standard controllers, a water power plant uses power control. The neural network, on the other hand, is used to address nonlinear issues in the electrical power system. It is composed of synthetic neurons that are interconnected through a network. As a result of the neural network's integration into the system, it has been shown to have a greater dynamic reaction and easier control over how power is distributed across the various regions than fuzzy logic. The neural network requires more practise, though, in order to function like the human brain. In order to manage the power flow and maintain the target voltage and frequency, it was suggested in this project that fuzzy and artificial neural networks be integrated. When renewable energy technologies are integrated into the power management system, AFINS plays a crucial role. The ANFIS controller, as opposed to a conventional, fuzzy, or neuro controller, demonstrates effective dynamic performance and power flow regulating.

VIII.ADVANTAGES

- Low switch voltage operation
- High static gain at low line voltage
- Reduced hardware usage
- No need for separate input filters for PFC, and s
- Soft commutation with a straightforward regenerative snubber circuit

IX.CONCLUSION

A single phase grid-connected DC/AC inverter with reactive power (VAR) control was provided in this project for use with home PV systems. It was demonstrated that with the current need for renewable energy, home PV power generation has attracted a lot of interest. The power quality of the local DR power injection is regulated by grid interconnection standards like IEEE-1547. In order to guarantee that the power quality meets grid standard, single phase, low power VSIs are frequently employed for the connectivity between PV modules and the utility grid. Also, the trend of DR units actively supplying reactive power to the grid has emerged as more dispersed resources, including nearby PV generation, are incorporated into the grid at the distribution level.

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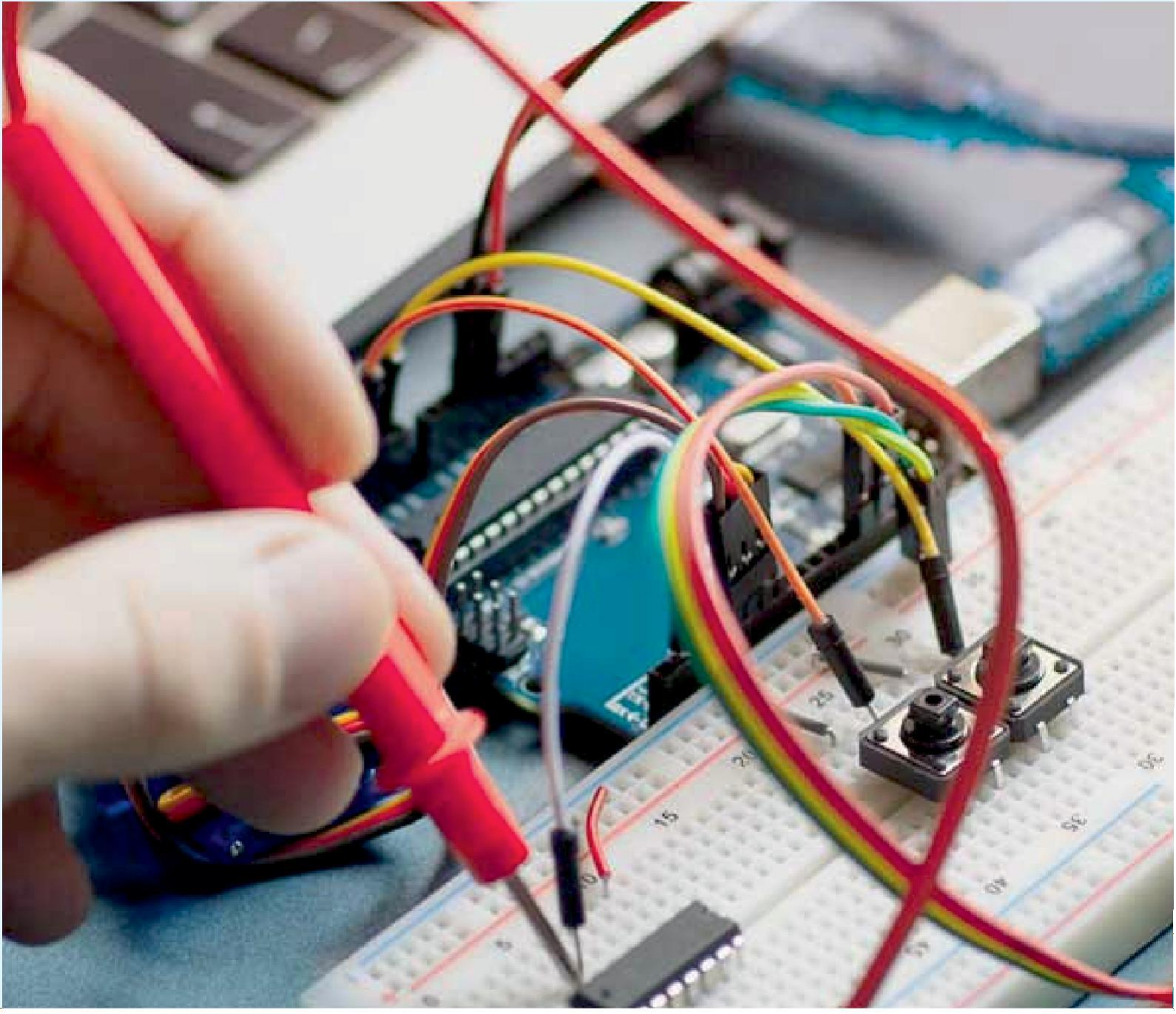

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