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DETECTION OF PV ARRAY USING IMAGE PROCESSING

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***Abstract*— The increasing demand for energy is one of the main reasons for the integration of solar energy into electrical networks or networks. For efficient energy use, photovoltaic systems are important in order to be able to predict information reliably. The quality of service. This integration of solar energy and accurate forecasts can contribute to better energy planning and distribution. This project examines the motivation, applications and development of short-term solar forecasting using Images of the terrestrial sky for control devices in electrical networks. It also has a new technique to take features extracted from the sky camera pixel data and create a model to predict large shading events. Our proposed system can be adapted for very conservative or very aggressive operation of a solar power system with a back-up generator. The MATLAB tool has been combined with the integrated controller to show the efficiency of the proposed system.**

***Index Terms*— MPPT, Energy, sky cam**

I. INTRODUCTION

New advances in solar forecasting research are increasingly related to applications of solar energy in power grids rather than traditional uses in meteorology. Many applications attempt to predict solar radiation and solar energy, as a range of solar generation technologies achieve higher penetrations. The increasing penetration of photovoltaic's into power grids around the world is driving the need for accurate predictions to maximize the value of solar energy while minimizing the impacts associated with solar energy variability. In addition, new markets and business models are emerging, such as falling solar energy costs, increasing electricity supply costs and as electric load become more adaptable. in solar forecasting techniques and their suitability for these applications. We discuss the many complex issues that make solar energy forecasts necessary for optimal management of modern, increasingly flexible electricity networks. We also illustrate the need for short-term forecasting methods with fast update rates and show how these can be used for more energy-efficient control of electricity flows. A case study of a new sky cam system and its application to managing solar energy in a mini-grid via predictive solar inverter and generator control is provided..

II. RELATED WORK

Vishal Palaniappan et al deal with photovoltaic **systems** in

urban **areas. A** general simulation method is developed to quantify the total energy yield of photovoltaic (PV) installation sites that exploit different levels of granularity of maximum distributed power point monitoring (DMPPT). Alessandro Giustiniani et al proposes the single cycle controller design of a single stage inverter for photovoltaic applications are carried out using a multi-objective strategy to optimize the performance of inverters at high and low irradiation levels. Design constraints are adopted which take into account different weather conditions. Takayoshi Inoue described a control method for charging series-connected double-layer ultra-electric capacitors (ultraEDLC) suitable for photovoltaic generation systems in combination with maximum Power Point Tracking (MPPT) control method. Chan-Hui Jeon et al provides an energy-harvesting device that makes use of an adaptive most electricity factor tracking (MPPT) circuit for 1-mW solar-powered wi-fi sensor networks. The proposed MPPT circuit exploits a successive approximation check in and a counter to remedy the tradeoff hassle among a speedy temporary reaction and a small steady-state oscillation with low-electricity consumption. The proposed energy- harvesting circuit is fabricated the use of a 0.35 - μm CMOS process. The MPPT circuit reduces the temporary reaction time by 76.6%, dissipates handiest one hundred ten μW , and indicates MPPT performance of 99.6%.

III. EXISTING SYSTEM

Maximum power point tracking (MPPT) or sometimes just power point tracking (PPT) is a technique used commonly with wind turbines and photovoltaic (PV) solar systems to maximize power extraction under all conditions. Although solar power is mainly covered, the principle applies generally to sources with variable power: for example, optical power transmission and thermophotovoltaics. PV solar systems exist in many different configurations with regard to their relationship to inverter systems, external grids, battery banks, or other electrical loads.[5] Regardless of the ultimate destination of the solar power, though, the central problem addressed by MPPT is that the efficiency of power transfer from the solar cell depends on both the amount of sunlight falling on the solar panels and the electrical characteristics of the load. As the amount of sunlight varies, the load characteristic that gives the highest power transfer efficiency changes, so that the efficiency of the system is optimized when the load characteristic changes to keep the power transfer at highest efficiency. This load characteristic is called the maximum power point (MPP) and MPPT is the process of finding this point and keeping the load characteristic there. Electrical circuits can be designed to present arbitrary loads to the photovoltaic cells and then convert the voltage, current, or frequency to suit other devices or systems, and MPPT solves the problem of choosing the best load to be presented to the cells in order to get the most usable power out.

Solar cells have a complex relationship between temperature and total resistance that produces a non-linear output efficiency which can be analyzed based on the I-V curve. It is the purpose of the MPPT system to sample the output of the PV cells and apply the proper resistance (load) to obtain maximum power for any given environmental conditions.[8] MPPT devices are typically integrated into an electric power converter system that provides voltage or current conversion, filtering, and regulation for driving various loads, including power grids, batteries, or motors.
A load with resistance R=V/I equal to the reciprocal of this value draws the maximum power from the device. This is sometimes called the 'characteristic resistance' of the cell. This is a dynamic quantity which changes depending on the level of illumination, as well as other factors such as temperature and the age of the cell. If the resistance is lower or higher than this value, the power drawn will be less than the maximum available, and thus the cell will not be used as efficiently as it could be. Maximum power point trackers utilize different types of control circuit or logic to search for this point and thus to allow the converter circuit to extract the maximum power available from a cell.

IV. IMPLEMENTATION

When a load is directly connected to the solar panel, the operating point of the panel will rarely be at peak power. The impedance seen by the panel derives the operating point of the solar panel. Thus by varying the impedance seen by the panel, the operating point can be moved towards peak power point. Since panels are DC devices, DC-DC converters must be utilized to transform the impedance of one circuit (source) to the other circuit (load). Changing the duty ratio of the DC-DC converter results in an impedance change as seen by the panel. At a particular impedance (or duty ratio) the operating point will be at the peak power transfer point. The I-V curve of the panel can vary considerably with variation in atmospheric conditions such as radiance and temperature. Therefore, it is not feasible to fix the duty ratio with such dynamically changing operating conditions.

MPPT implementations utilize algorithms that frequently sample panel voltages and currents, and then adjust the duty ratio as needed. Microcontrollers are employed to implement the algorithms. Modern implementations often utilize larger computers for analytics and load forecasting

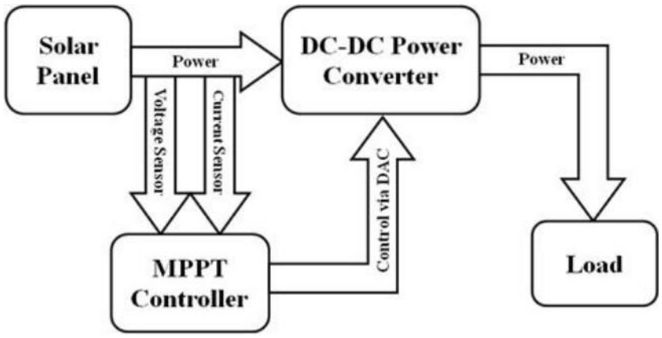

Fig. 1, Existing system

V. PROPOSED SYSTEM

Skycam forecasting

One emerging technique showing promising solar forecasting results for dealing with the effects of intermittent solar electrical generation is the use of skycams, also known as sky cameras or whole/total sky imagers. Traditionally, whole-sky imagers have been prohibitively expensive, but with the advent of inexpensive digital security cameras and more powerful graphical processing capabilities, the wider adoption of localised solar forecasting it is much more practical than ever before. Skycams can provide localised visual information about the overall state and transient characteristics of the visible sky. When combined with modern computer vision and machine learning techniques, skycams can be used to determine the motion vectors and classification of visible clouds. Solar occlusion events and changes to global and direct irradiance can be correspondingly forecast.

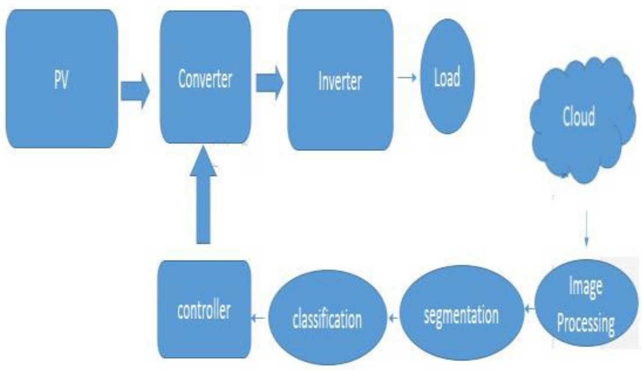

Fig. 2 Proposed system

Skycam-based forecasting techniques can make important contributions to short-term solar forecasting by identifying and predicting cloud movement and forecasting changes in solar availability. When combined with demand forecasting and storage or discretionary load control, a potent system for managing the supply–demand balance is established. Such a system enables a much more dynamic network operating range and potentially allows significantly more renewable energy to be integrated, while ensuring that sufficient generation and network capacity exists and that quality of supply is maintained. Even in the absence of demand forecasting and additional controllable elements, solar generation forecasting is becoming increasingly important to ensure that an efficient supply and demand balance is achieved as significant growth occurs in the penetration of variable renewable generation

VI IMPLEMENTATION RESULTS

A. Result

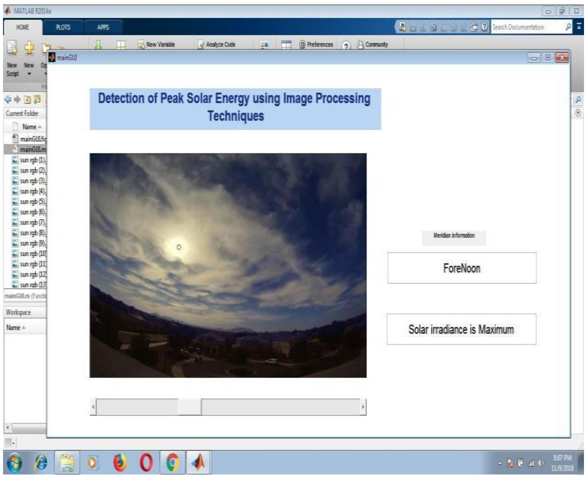

Fig 3. Cloud GUI

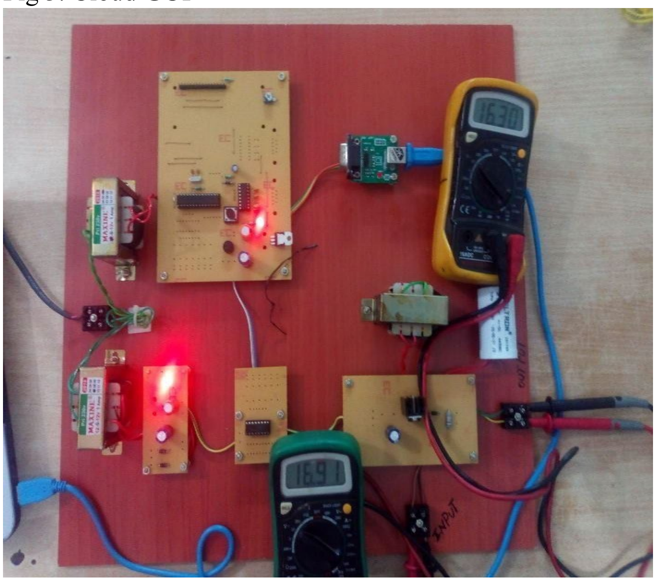

Fig 4. Hardware implementation

VII CONCLUSION

This article reviewed the state of the art in solar forecasting and examined the challenges facing global power grids due to increasing levels of solar energy. We have shown that the use of sky cam-based short-term solar forecast is widely useful for a wide range of solar energy applications, and in particular, can help solve the problem of solar intermittency. on power grids and mini-grids, allowing predictive control of loads and generation.

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