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MULTI-POINT TEMPERATURE MONITORING SYSTEM FOR PROCESS CONTROL INSTRUMENTATION

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ABSTRACT

The project aims to develop a Multi-Point Temperature Monitoring System for process control instrumentation, focusing on the sequential switching of heaters to maintain the required temperature without exceeding predefined limits. This approach is crucial for optimizing heating processes in industrial settings, where heating accounts for a significant portion of energy consumption. By implementing a tried-and-tested strategy, industries can achieve substantial energy savings and reduced power consumption. The system employs a fixed frequency oscillator to generate pulses, driving a sequential control circuit that includes oscillators, counters, voltage limiters, and current amplifiers. A 555 IC is used to produce continuous pulses, ensuring sequential activation of each heater. The temperature of each heater increases sequentially, and once the desired temperature is reached, the system maintains it by alternating heater operation, leveraging the thermal inertia of the heating elements. This sequential heating method allows for energy-efficient operation by ensuring only one heater is active at any given moment, reducing overall power consumption while maintaining the required temperature levels. This technique is particularly beneficial in industries such as steel mills, textile manufacturing, and food processing, where precise temperature control and high power ratings are essential. By preventing temperature drop in liquid-containing vessels and optimizing heater usage, the system offers a practical solution for industries requiring continuous, accurate temperature regulation. The primary goal of this project is energy conservation, providing a reliable method for enhancing the efficiency of industrial heating processes.

Keywords: Multi-Point Temperature Monitoring, Sequential Switching, Process Control Instrumentation, Fixed Frequency Oscillator Etc.

I. INTRODUCTION

The primary objective of this project is to implement sequential switching of heaters while maintaining the required temperature and preventing it from exceeding a specific limit throughout the operation. In many industrial processes, heating accounts for a significant portion of energy consumption, meaning there is considerable potential for energy optimization. Industrial facilities have strong incentives to improve their heating processes. The question isn't whether to make improvements, but rather which improvements to prioritize. A proven approach is to start with methods that have demonstrated substantial energy savings and reduced power consumption.

In this project, we use a fixed-frequency oscillator to generate pulses, which are then supplied to a sequential control circuit. The system includes a thermostat, heater, sensor, and temperature controller circuit. The sequential control circuit comprises oscillators, counters, voltage limiters, and current amplifiers. The oscillator generates continuous pulses, enabling sequential monitoring and control of all heaters.

For the first pulse, the first heater activates and its temperature increases. With the second pulse, the second heater activates and its temperature rises. This process continues, with each heater sequentially increasing in temperature. Once the required temperature is reached, all heaters maintain this temperature through sequential heating. A 555 timer IC is used to generate the continuous pulses.

Temperature has a unique property: even after a heating device is turned off, the temperature continues to rise for a short period before it starts to decrease. This characteristic is utilized in the Multiple Point Temperature Controlled Circuit. By leveraging this property, the sequential operation of the heaters ensures that the temperature levels in liquid-containing vessels do not drop. Each heater is turned off only momentarily while the temperature rises, and it is turned back on as the temperature begins to fall. Thus, at any given moment,

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Designing Electric Vehicle Battery Charging

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Abstract -
A pioneering technology for electric vehicle power converters is the double-star modular multilevel converters with embedded battery cells. In this topology, the battery cells are connected in series via half bridge DC–DC buck converters, enabling independent discharge and recharge. This paper presents a novel control system designed specifically for this converter topology. The proposed control system aims to charge the battery cells from the grid at unity power factor while simultaneously balancing their state of charges, all without impacting grid voltages and currents. The grid current controller is developed and implemented in the stationary reference frame using a proportional-resonant controller. Meanwhile, the state of charge balancing algorithm is designed using a sorting algorithm and circulating current control. Simulation and experimental results validate the effectiveness of the proposed control strategy. They demonstrate that the strategy can charge the battery cells with minimal distortion of the grid current and ensure cell balance during recharge without affecting grid current.

Keywords: Electric Vehicle, Battery Charging, LCD display, Solar Panel etc.

1. INTRODUCTION

India is the world's third largest producer and third largest consumer of electricity. Energy use has doubled since 2000, with 80% of demand still being met by coal, oil and solid biomass (Fossil Fuel). Share of Renewable energy is around 20%. According to NITI Aayog's energy policy report, India's demand for energy is expected to double by 2040, and that for electricity to potentially triple as a result of increased ownership of electric vehicles. As electric vehicles are going to increase in future, this will create heavy load on electricity demand in future. There should be development of charging infrastructure for electric vehicles, which should be operated with the help of renewable energy. Solar charging stations is the best option.

First, electrification will change our global energy consumption habits from the need for fuels that are burned on site - gasoline, oil, natural gas and others - to the need to use electricity. This means that our country's demand for fossil fuels will decrease, while our overall electricity demand will increase. Solar power generation is very influential in India. The geographical location of the country is favourable for the production of solar energy. The reason is that India is a tropical country and receives solar radiation almost all year round, which amounts to 3,000 hours of sunshine yearly. The use of solar power can reduce our dependency on fossil fuels for electricity generation.

At present, the power converters used in Battery Electric Vehicles (BEVs) are traditional 2-level voltage-source inverters. The DC link of the inverter is connected to the battery pack, which consists of a series connected low voltage cells to reach the required DC voltage. Due to the series connection of the cells, the charging and discharging process causes a state of charge (SOC) imbalance, as cells have different leakage currents and electrochemical characteristics; this may damage the cells and reduce their lifetime. For this reason, a battery management system (BMS) is used to balance the cells by shifting the energy from the cells with highest SOCs to the cells with lowest SOCs. However, the BMS increases the size and cost of the BEV and reduces the efficiency of the conversion system. Additionally, the output waveform of a 2-level inverter has a significant harmonic content. Therefore, the inverter can be used also for battery charging only if passive L or LCL bulky filters are added between the converter and the grid. Also, the converter does not allow single-phase or DC charging.

2. PROBLEM DEFINATION

The transport sector generates more than 35% of total CO2 emissions. As you can see in the current scenario the electric vehicles are the future of every transport system and the demand for electric vehicles are growing tremendously. The government is also supporting the electric vehicle system and big company like Tata is investing huge on electric charging stations across India. The electricity generation in

Smart Visitor Counting System: Efficient Energy Management

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Abstract — This paper introduces a Bidirectional Visitor Counter system coupled with automatic control for lights and fans. The system is designed to monitor the number of people entering or exiting a room and display this count on an LCD screen. It also regulates the operation of lights, fans, and other electrical devices based on human presence, light levels, and room temperature. The system employs an IR sensing mechanism to detect visitor entry and exit, and a microcontroller manages the counting process. When someone enters the room, the counter increments by one, and it decrements by one when someone leaves. Additionally, the LCD screen shows the total number of people inside the room at any given time through this setup, the microcontroller effectively tracks entries and exits, ensuring efficient energy use and providing real-time visitor count information on the LCD display.

Keywords: Bidirectional Visitor Counter, Automatic Light Control, IR Sensing Mechanism

I. Introduction

This paper introduces a technological solution aimed at automating household functions and addressing electricity wastage to alleviate energy scarcity. The project focuses on detecting individuals entering or exiting a room and utilizes an up and down counter displayed on a seven-segment display. When the room's occupancy reaches zero, the system automatically turns off all lights and fans, contributing to power conservation. The "automatic room light controller with visitor counter using microcontroller" project is a dependable method for accurately monitoring room occupancy. Upon someone's entry, the room lights switch on, and they remain on until everyone exits the room. The total number of individuals inside the room is also prominently displayed on the seven-segment displays, enhancing visibility and control over room usage. By automatically turning off lights and fans when the room is unoccupied, the system contributes significantly to energy conservation. Studies show that implementing such automated systems can lead to energy savings of up to 30% in residential settings, thereby reducing electricity bills and easing strain on the power grid. The project's design allows for scalability, making it suitable for various room sizes and configurations. Additional sensors can be integrated to enhance accuracy, and the microcontroller's programming can be customized to accommodate specific user preferences or energy-saving strategies.

II. Objectives

The primary goal is to save energy by accurately monitoring the number of people entering and exiting a space. By doing so, the system can intelligently control lighting, HVAC (Heating, Ventilation, and Air Conditioning), and other electrical devices based on real-time occupancy data. This targeted approach prevents unnecessary energy usage during periods of low or no occupancy, leading to significant energy savings over time.

Contributing to a greener environment is another key objective. By reducing energy consumption, the bidirectional visitor counter energy saver system helps minimize the carbon footprint associated with buildings and facilities. This aligns with global efforts to mitigate climate change and promote sustainable practices in various sectors.

The system aims to enhance the overall user experience by providing optimal environmental conditions based on occupancy levels. For instance, maintaining comfortable lighting and temperature levels in occupied areas improves comfort and productivity for occupants. Additionally, the system's automation reduces the need for manual adjustments, ensuring a hassle-free and user-friendly environment.

Cost savings play a significant role in the objectives of this system. By lowering energy consumption, organizations and individuals can reduce their utility bills and operating expenses. This financial benefit encourages the adoption of energy-efficient technologies and contributes to long-term economic sustainability.

To gather valuable occupancy data for analysis and optimization purposes. By tracking visitor patterns and usage trends, the system can provide insights into space utilization, peak hours, and efficiency opportunities. This data-driven approach enables continuous improvement and informed decision-making regarding energy management strategies.

III. Methodology

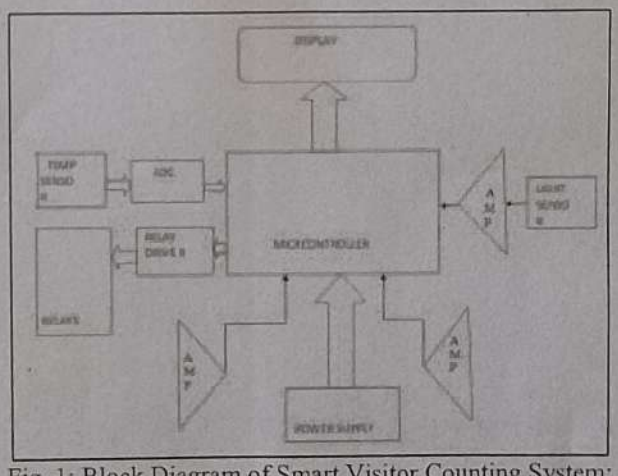

Fig. 1: Block Diagram of Smart Visitor Counting System: Efficient Energy Management

IV. Working

In our innovative project, we have integrated a bidirectional counter with an energy-saving mechanism, with the central intelligence managed by the AT89S52 microcontroller. This

Arduino Based Wireless LED Matrix

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Abstract — In today's fast-paced, information-driven world, digital display technology has become a necessity. The LED Matrix Display stands out as a versatile solution, capable of showcasing programmed information with engaging graphic designs. Beyond mere advertising, it finds utility as a dynamic scoreboard and stopwatch for a wide range of indoor and outdoor sports and games. The Bluetooth application software integrated with Arduino microcontrollers used for this project. The development process involved utilizing MTT App Inventor software to craft Android applications, along with the DS3231RTC for transmitting real-time information to the LED display. This comprehensive approach enables real-time customization of messages displayed on the matrix, enhancing user interactivity. The project's primary objective is to create a user-friendly phone application for controlling the display, enabling seamless message swapping without the need for physical connections. This innovation addresses common issues such as static displays and limited customization options. The Wireless LED Dot Matrix display achieved excellent reliability and minimal maintenance requirements, thanks to its Bluetooth-enabled flexibility in displaying text, time, date, and scoreboard information. By harnessing Bluetooth technology, this project offers a unique and efficient solution for digital display needs, ensuring dynamic and customizable content delivery without cumbersome cable connections.

Keywords: Arduino, Bluetooth, MTT App, LED Matrix

I. Introduction

LED displays have become an invaluable means of conveying information, yet imbuing the message with dynamism poses a challenge as users must tailor the content to suit specific needs. These displays have emerged as a consequence of urban evolution in the digital age, swiftly gaining popularity owing to their diverse applications and advantages. Contrasted with traditional display technologies like neon lights, fluorescent tubes, and LCD displays, LEDs offer benefits such as exceptional brightness, wide viewing angles, energy efficiency, prolonged service life, resilience to environmental conditions, and cost-effectiveness [1-4,8-11]. Numerous projects have leveraged LED matrix displays. For instance, [4] devised an SMS-driven automatic electronic display using a GSM MODEM. Similarly, [5] engineered a wireless scrolling message board that could be updated via Bluetooth or Wi-Fi. [6] also utilized a Bluetooth module interfaced with Arduino and Android development tools through an APK application. Another innovative project involving LED matrix displays, proposed by [7], utilized Google's speech-to-text feature to convert spoken input from an authority figure into text displayed on an LED matrix notice board. Furthermore, LED panels find utility in general, task, and stage lighting. These displays proficiently showcase messages in various forms, including alphanumeric characters and numbers, in static or scrolling formats. LED technology stands out as a paragon of energy efficiency and practicality [8,10]. These systems typically comprise red matrix display panels. One groundbreaking initiative involves designing an LED display system for wireless mobile-to-display communication via Bluetooth. This project, envisioned as a real-time scoreboard with matrix display capabilities, empowers users to modify messages on the fly. The primary objective is to create a compelling and interactive display that captivates human attention.

II. Design and Process

The system comprises two distinct components: the message transmission module, which operates through an Android phone, and the reception and display module. The MIT app investor employed the Android application depicted in Figure 1 to develop this system, which is designed to transmit text messages displayed on an LED matrix board. Input is received from the Android phone, acting as the transmitter. On the receiving end, a Bluetooth receiver interfaces with an Arduino development board. This board is then connected to a P10 LED display with 16 rows and 32 columns.

The Android application communicates information to the Arduino via Bluetooth using the HC-05 application. The LED matrix receives data from the Arduino and also sends information to a buzzer acting as a speaker, generating a notification sound. The display on the LED matrix includes the date, time, and scoreboard information.

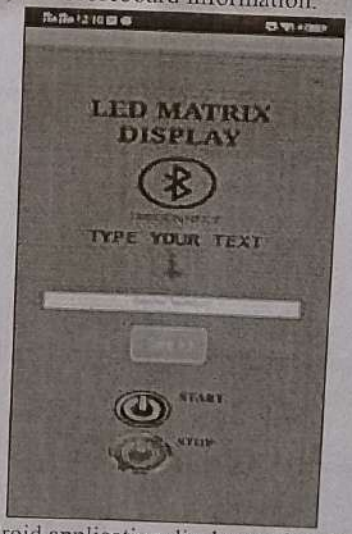

Fig. 1: An android application displays to key in message to LED display

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AN REVIWE ON SOLAER TREE SYSTEM

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Abstract::-

Solar energy is rapidly gaining notoriety as an important means of expanding renewable energy resources. As such, it is vital that those in engineering fields understand the technologies associated with this area. Our project will include the design and construction of a microcontroller-based solar panel tracking system with look like a Solar Tree. Solar tracking allows more energy to be produced because the solar array is able to remain aligned to the sun. This system builds upon topics learned in this course. A working system will ultimately be demonstrated to validate the design. Problems and possible improvements will also be presented. Dual axis makes it more efficient and reliable.

Introduction:-

Renewable energy solutions are becoming increasingly popular. A photovoltaic (solar) system is one example. Maximizing power output from a solar system is desirable to increase efficiency. In order to maximize power output from the solar panels, one needs to keep the panels aligned with the sun. As such, a means of tracking the sun is required. This is a far more cost effective solution than purchasing additional solar panels. It has been estimated that the yield from solar panels can be increased by 30 to 60 percent by utilizing a tracking system instead of a stationary array. This project develops an automatic tracking system that will keep the solar panels aligned with the sun in order to maximize efficiency.

This project report begins with presenting background theory in light sensors, Op amp and DC motors as they applied to the project built by someone else. The report continues with specific design methodologies for Sensor Op amp, RTC, DC motors and drivers, microcontroller selection, voltage Regulation, physical construction, and a software/system operation explanation. LDR based solar tracking systems generally fails in cloudy conditions, so we improve by introducing Real Time Clock based methodology. The project concludes with a discussion of design results and future work.

Project Design Methodology Previous Version:-

The project consists of reading of Sensor values in every sec, comparing them, and then positioning a motor to align with the greatest value that corresponds to the sun's position. That concept works fine with clear weather conditions, but in cloudy conditions the sensors starts false sensing and whole tracking system fails. For reliability of such a system sensor alignment and software treatment required which is very crucial.

The project consists of RTC (Real Time Clock) which is very reliable and not affected by weather conditions. We know that sun rises from the East Direction and starts moving towards the West direction with respect to time. So we need to move the solar panel with respect to time. We employed RTC for this task.

Apart from this RTC, Microcontroller, LCD, Memory and Motor drivers ICs are used. Hardware design and software part are described below.

Block Diagram

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IOT Based Heart Defect Monitoring System

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Abstract -

This paper describes the design of a simple Electrocardiogram (ECG) monitoring system using AD8232 and Arduino Microcontroller. The system gets the pulse input using Ag/Cl 3-lead electrodes placed on the arms and right leg of the patient under inspection. The model comprehends ECG module(AD8232) which is used for signal conditioning of the input pulse from the patient's body and viewed on Serial Monitor Window as the ECG waveform. Thus conditioned signal is also processed by the microcontroller Arduino Uno to control and transmit the function of ECG wave to monitor and Displaying the condition of the ECG wave in LCD display and IOT, whether it is a normal ECG or Abnormal.

Keywords: Electrocardiogram (ECG), Electrodes, LCD display, Arduino, IOT, Patient etc.

1. INTRODUCTION

At the present time, people suffering from heart diseases are increasing at an alarming rate. The ECG is one of the medical kits that can measure the heartbeat per unit time, convert it into a signal and display the data on a display device. An ECG is a recording of the electrical activity on the body surface generated by the heart muscles. ECG information is collected by electrodes placed at selected locations on the patient's body. It is the best way to monitor and diagnose abnormal rhythms of the heart muscles, mainly abnormal rhythms caused by damage to the conductive tissue that carries electrical signals. It is possible to be in cardiac arrest with a normal ECG signal (a condition known as pulseless electrical activity).

Electrocardiogram (ECG) is one of the frequently used and accurate methods for monitoring the electrical activity of the heart. ECG is an high-priced equipment and its use for the measurement of the heart rate only below an economic level. Low-cost devices are available in the form of wrist watches for the instantaneous measurement of the heart rate. Such devices can give accurate data but they are expensive. Most hospitals and diagnostic centers in India use incorporated devices designed to measure the heart rate, temperature, and blood pressure of the patient. Although such devices are valuable, their cost is usually uneconomical. This paper depicts the design of an ECG monitoring system which monitors ECG subject by Ag / Cl sticking electrode on the arms and then showing the ECG on monitor window and Liquid Crystal Display[1].

2. SYSTEM ARCHTECTURE

Figure.1 represents the block diagram of the proposed system. It consists of the Electrodes which are placed on the Left Arm, Right Arm and Right leg of the patient's body. The input is taken from the human body and then it is transmitted to ECG module (AD8232). The ECG module processes the data and it produces the continuous analog values according to the input given by the electrodes to the Arduino microcontroller. The Bluetooth module is connected to