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RESEARCH ON AURDINO BASED EV CHARGING STATION

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ABSTRACT:

In an era marked by the burgeoning demand for sustainable transportation solutions, the adoption of electric vehicles (EVs) is steadily rising. However, one of the key challenges hindering their widespread acceptance is the convenience and accessibility of charging infrastructure. To address this issue, we propose an innovative automatic EV charger system. Leveraging an Uno based Arduino module and embedded C programming, this paper aims to streamline the EV charging process by integrating various components. These include a voltage sensor to ensure compatibility, an IR sensor to detect the presence of EVs at charging stations, and a wireless coil for electricity transmission. The system provides real-time feedback to users through an LCD display, displaying charging voltage when an EV is detected and prompting users to locate a

charging station otherwise. By automating the charging process and enhancing user convenience, this paper endeavours to accelerate the transition to sustainable transportation solutions.

Keywords – Automatic EV charger system, Embedded C programming, Wireless electricity transmission.

I. INTRODUCTION

In an era propelled by the urgency of environmental sustainability, the widespread adoption of electric vehicles (EVs) emerges as a pivotal solution to mitigate carbon emissions and reduce reliance on fossil fuels. However, the realization of this vision is contingent upon the development of robust charging infrastructure that seamlessly integrates into daily life. Recognizing this imperative, our paper embarks on the design and implementation of an innovative automatic EV charger system. At its core, this endeavor seeks to revolutionize the EV charging experience by leveraging cutting-edge technology and intuitive design principles

By harnessing the power of an Uno based Arduino module programmed in embedded C, our system endeavors to bridge the gap between EV users and charging stations, propelling forward the transition to sustainable transportation. Key to its functionality are components such as voltage sensors ensuring seamless compatibility with EVs, and infrared (IR) sensors discerning the presence of vehicles at charging stations. Building upon these foundations, the system employs wireless coils for efficient electricity transmission, offering users a hassle-free and intuitive charging experience. A pivotal aspect of our paper lies in its provision of real-time feedback through LCD displays, enlightening users on charging progress and ensuring an informed decision-making process. With a commitment to enhancing accessibility and convenience, our paper sets forth to redefine the paradigm of EV charging, paving the way for a greener and more sustainable future.

II. LITERATURE REVIEW

Ghoderao, Rohit Bal, et al. In this paper, the author discusses computerized charging systems for electric vehicles. To detect tethered charging, a fully automated system aids in the process. The first section of the painting discusses the advantages of computerized conductive charging structures in relation to various computerized principles and the necessity for such structures. The second component provides information on the country of origin of the artwork. Thus, its miles attested to the structures that had previously developed and been published. Following that, difficult scenarios and difficulties associated with computerized conductive structures are shown. Thus, the character flaws are deconstructed and presented.

Ahmed, Mohamed A., et al. In this paper, the author aims to investigate the underlying communication networks for remote monitoring of EVCSs in a smart campus parking lot. The communication network consists of two subnetworks: parking area network (PAN) and campus area network (CAN). PAN covers communication among EVs, charging stations and PLLC, while CAN enables dedicated communication between PLLCs and a global controller of the university. As one of the major obstacles in EV systems is the lack of unified communication architecture to integrate EVCS in the power grid, they develop communication models for the in-vehicle system and EVCSs based on the logical node concept of IEC 61850 standard. Furthermore, they implement network models for EVCSs using the OPNET modeler.

Wellisch, D., J. Lenz, et al. In this paper, the author proposed a smart charging capable AC charging station for hardware and software evaluation. This system is based on OCPP 2.0 and the ISO 15118 standard. An electric powered vehicle provides heavy stress for the grid, especially when many vehicles are loading their accumulators simultaneously. To counteract these negative effects, smart charging is developed. With intelligent vehicle-to-grid communication, the stress for the grid, during the charging process, can be reduced.

Carcangiu, Sara, et al. In this paper, the author proposed a procedure to design a power line communication (PLC) system to perform the digital transmission in a distributed energy storage system consisting of fleets of electric cars. In this paper, a procedure is presented, called Chimera, which allows one to solve the multi-objective optimization problem with respect to a unique frequency response, representing the whole set of lines connecting each charging station with the central node. Among the provided Pareto solutions, the designer will make the final decision based on the control system requirements and/or the hardware constraints.

Chung, Ching-Yen, et al. In this paper, the author proposes, designs, and executes many upgrades to WINSmartEV. These upgrades include new hardware that makes the level 1 and level 2 chargers faster, more robust, and more scalable. It includes algorithms that provide a more optimal charge scheduling for the level 2 (EVSE) and an enhanced vehicle monitoring/identification module (VMM) system that can automatically identify PEVs and authorize charging.

Y. Xiong, B. Wang, et al. In this paper, the author introduces the extension of IEC 61850 with smart EV scheduling algorithms, considering current multiplexing, power sharing strategies and user behaviors. They have developed an IEC 61850 abstract data model for the information exchanged among components of smart EV charging infrastructures, including the EV charging control center, intelligent Electric Vehicle Supply Equipment (EVSE) and the EV users with mobile applications. Real-world EV usage data on UCLA campus is utilized in the simulation experiment, which is based on the predictive control paradigm. The data model is instantiated by a web service on EV control center by converting the raw data streams from EVSEs in various formats, such as JSON or raw string, etc. into a standardized IEC 61850 SCL file, which contains the critical meter data and charging session parameters.

Lewandowski, Christian, Sven Gröning, et al. In this paper, the author introduces an electric mobility test- and development-environment for communication systems and in particular an ISO/OSI layer 1 and 2 test bed. With this testbed the interferences on PLC that are caused by the PWM signal and vice versa can be analyzed regarding PLC data rate and the limitations of IEC

61851-1. It is illustrated that PLC has a performance loss of up to 66.3% for inappropriate PWM parameters. The interference analyses of PLC on the PWM signal for HomePlug AV has depicted that the PWM signal with superposed PLC has a higher standard deviation but the limitations of 61851-1 are adhered to.

Wellisch, Daniel, Stefan Kunze, et al. In this paper, the author proposed a modular software implementation for smart charging stations. As a programming platform Node. JS is chosen, due to its asynchronous programming, as well as its non-blocking functionality. For evaluation purposes this software is implemented on a demonstrator, which is made mostly from off-the-shelf modules.

Ma, Lin Guo, Yan Nian Wu, In this paper, the author describes the characteristics and applications of PLC technology, introduces functions and an overall design plan for the communication network of EV charging and swapping stations. Meanwhile, it provides the hardware realization and protocol establishment of communications network interfaces for PLC-based EV charging and swapping stations as well as a design for information management systems.

Chauvenet, Cedric, Gerard Etheve, et al. In this paper, the author presents a system design for one such use in the field of Smart Grids. The solution runs commonly used IoT protocol Constrained Application Protocol (CoAP) over a G3-PLC network to monitor sensor data. Field results are provided from one such installation that implements the system design presented in this paper, thus proving the practicality of the approach and also underlining the significant advantages that such systems can bring to end-users

III. METHODOLOGY

The proposed automatic EV charger system integrates several components to streamline the charging process for electric vehicles (EVs). The system utilizes an Uno based Arduino module programmed in embedded C to orchestrate its operations. The proposed automatic EV charger system operates as follows: Firstly, the voltage sensor continuously monitors the EV's voltage level to ensure compatibility. Next, the IR sensor detects whether the EV is correctly positioned at the charging station. If the IR sensor confirms the presence of an EV, the system activates the wireless coil for electricity transmission. Simultaneously, it triggers the LCD display to showcase the charging voltage, providing real-time feedback to users. However, if the IR sensor fails to detect an EV, the LCD display prompts a message indicating the need to locate a charging station. This integrated approach optimizes the EV charging process, ensuring compatibility, automating power transmission, and providing informative feedback to users for a seamless charging experience.

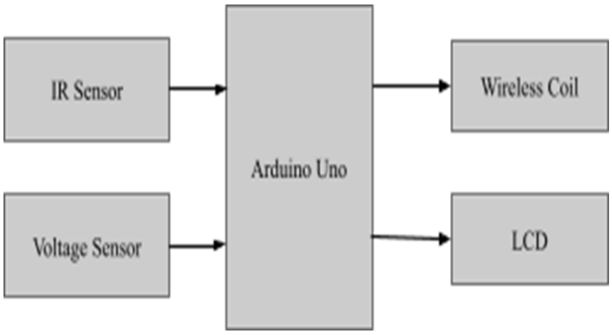

Figure 3.1. Block diagram

In the above Block diagram, we have used an Arduino Uno as a microcontroller. In the input device we have used a Voltage Sensor and IR Sensor. And we have used the Wireless Coil and LCD as an output device connected to the microcontroller.

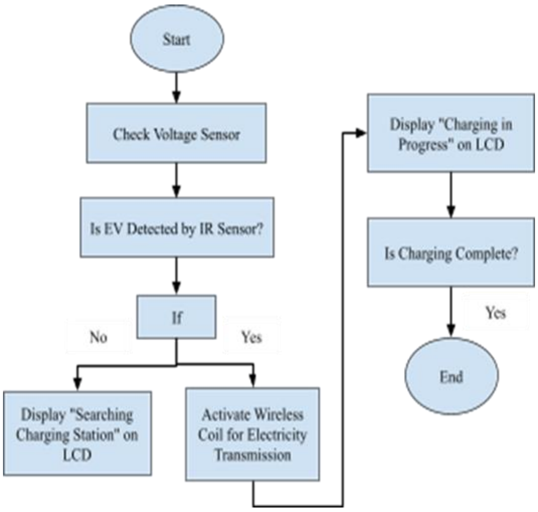

Figure 3.2 Project Circuit Diagram

The paper title is "Automatic EV Charger". The automatic EV charger system operates by utilizing an Uno based Arduino module programmed in embedded C to orchestrate its functions. Upon an electric vehicle (EV) approaching the charging station, a voltage sensor verifies compatibility, while an infrared (IR) sensor confirms the EV's presence. Once validated, the system activates a wireless coil for electricity transmission, enabling charging. Simultaneously, a real-time LCD display showcases the charging voltage, providing users with instant feedback. Should the IR sensor fail to detect an EV, the LCD prompts users to locate an available charging station. This integrated approach aims to automate and optimize the EV charging process, ensuring seamless operation and user convenience.

IV. SYSTEM REQUIREMENT

HARDWARE REQUIREMENT
Arduino Uno
Voltage Sensor
IR Sensor
LCD
Wireless Coil
SOFTWARE REQUIREMENT
Arduino IDE
Proteus

V. EXPERIMENTAL SETUP AND RESULT

The result of this paper demonstrates the successful development and implementation of an automatic EV charger system that significantly enhances the efficiency and convenience of the EV charging process. Through rigorous testing and validation, the system reliably detects the presence of electric vehicles, initiates charging seamlessly, and provides real-time feedback to users via the LCD display.

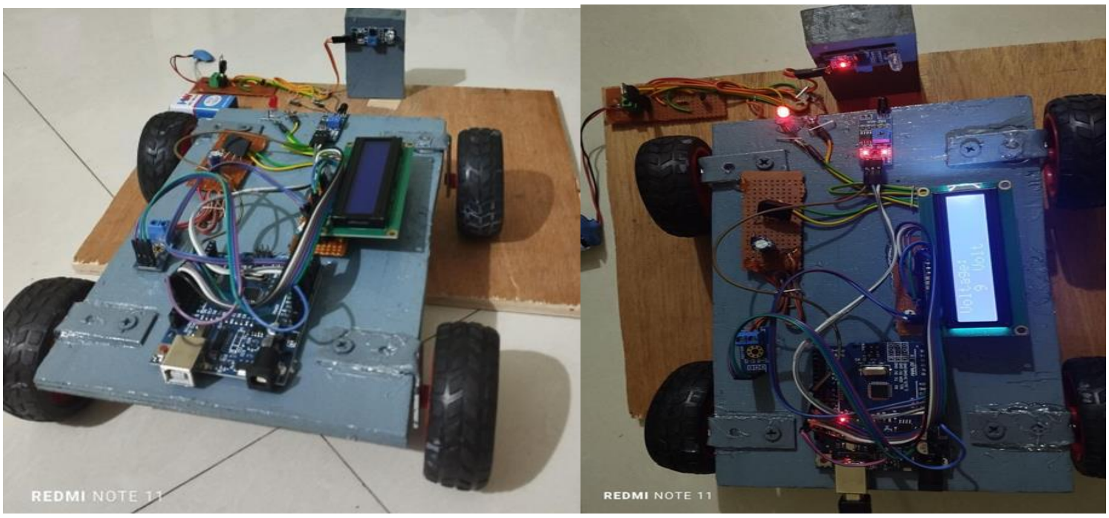

Figure 5.1 Project Experimental setup design

Additionally, the integration of advanced technologies such as the Uno based Arduino module and embedded C programming ensures compatibility with diverse EV models and enables efficient electricity transmission through the wireless coil. Overall, the result showcases a promising solution to address the challenges of current EV charging infrastructure, paving the way for broader adoption of electric vehicles and contributing to the advancement of sustainable transportation initiatives.

VI. CONCLUSSION

The creation of an automatic EV charger system stands as a beacon of progress in our collective journey towards a sustainable future. By amalgamating sophisticated technologies such as the Uno based Arduino module and embedded C programming, this paper transcends the conventional boundaries of EV charging infrastructure. Through meticulous design and meticulous attention to detail, our system not only streamlines the charging process but also redefines the user experience, offering seamless integration into daily life. As we navigate the complexities of modern transportation, it becomes increasingly evident that sustainable solutions are not just desirable but imperative. In this context, our paper emerges as a catalyst for change, propelling the transition to electric vehicles by enhancing accessibility, efficiency, and convenience. By laying the groundwork for a robust charging ecosystem, we sow the seeds for a greener, cleaner tomorrow, where our dependence on fossil fuels wanes, and our commitment to environmental stewardship flourishes. As we bid adieu to the era of emissions and embrace the dawn of electrification, let this paper serve as a testament to our unwavering dedication to shaping a brighter, more sustainable future for all.

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