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Street Lighting System with Integrated Electric Vehicle Charging Station

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ABSTRACT

Technological advancements always played a major role in transforming the automobiles; from hand- pulled carts to autonomous cars. The fuel powered vehicles are one of the greatest inventions the world has ever seen, but the negative impact caused by them on the environment has laid a new path for the invention of Electric Vehicles. The electric vehicles are emission less vehicles that are powered and run on electricity solely. Like fuel pumps, these EV's require charging stations. This work provides infrastructure and maintenance of charging stations. Charging stations have been installed in various parts of the world till date. Level 1, Level 2 and fast EV charging stations have been installed in various places respectively. Detailed infrastructure report on installation and maintenance is required. Maintenance is required for any EV charging station to run efficiently. The various factors which affect the efficiency of charging stations are frequency of usage, climatic conditions, and exposure of charring unit to atmosphere. This work provides detailed overview of various power options, technologies, and energy management techniques and maintained of charging stations that are optimal for the Indian market.

INTRODUCTION

The government of India came up with National Electric Mobility plan in 2012. It states to manufacture 6to 7 million HEV's and EV's by 2020 and recently in 2017 it is also announced that fuel powered vehicles should be banned by 2030. Many cities in India have extreme levels of air pollution in form of oxides of Nitrogen and Carbon. Transport sector majorly contribute to the air pollution accounting for about 51% in India and this figure goes to 75--80%. The alternative fuel vehicles, EV's reduces negative impact of transport sector on environment. EVs have not gained wide acceptance among customers in the past. However, technological advancements, battery technology have made EVs attractive. EVs have started penetrating automobile market in India. However large scale deployment of EVs in India depends upon the charging infrastructure which includes slow charging stations at houses and fast charging stations in public places.

In this context, analysis here explains the factors affecting EV adaptation, the available charging infrastructure in India, charging standards, challenges in growth of charging infrastructure and development needs are clearly explained[1].This paper focuses on physical power transfer and contact between the EVCS and the EV. With Level 2 and Level 3 having access to the public and communicatingwith databases, these chargers introduce information security concerns, mainly regarding authentication. A public charging scenario is wider interconnected and lacks proper physical security. This makesEVCSs accessible to attacks. For instance, public charging stations demand user data, which is stored on
the user's Radio Frequency Identification (RFID) card [2] . This paper reviews electric vehicles and addresses substantial aspects of the technology, including battery charging and range, by highlighting the progress in this field in the present day. Finally, the paper emphasizes on potential future research directions regarding electric vehicle charging techniques [3]. This paper presents a review of the most relevant issues in EV charging station power topologies. This review includes the impact of the battery technology, currently existing standards and proposals for power converters in the charging stations [4]. The aim of this paper is to introduce the new emerging technology of x-electric vehicles (xEVs); where x is a general term which stands for hybrid/plug-in/battery [5]. This paper reviews the current status and implementation of battery chargers, charging power levels and infrastructure for plug-in electric vehiclesand hybrids[7]. In this paper, it review the state-of-the-art EV charging infrastructure, and focus on the XFC technology which will be necessary to support current and future EV refueling needs [8].

PROBLEM STATEMENTS

- Develop model and method, which can be provide reasonable planning scheme of EV charging stations, and also reduce the network loss and improve the voltage profile.

- To minimization of the total costs associated with EV charging stations to be planned, including the investment costs, operation costs, maintenance costs, and network loss costs in the planning period.

- To adopt EV charging unit smart street pole/light

- To improve the smart street light system including many useful technologies such asSmoke detector, SOS button, Buzzer,

BLOCK DIAGRAM

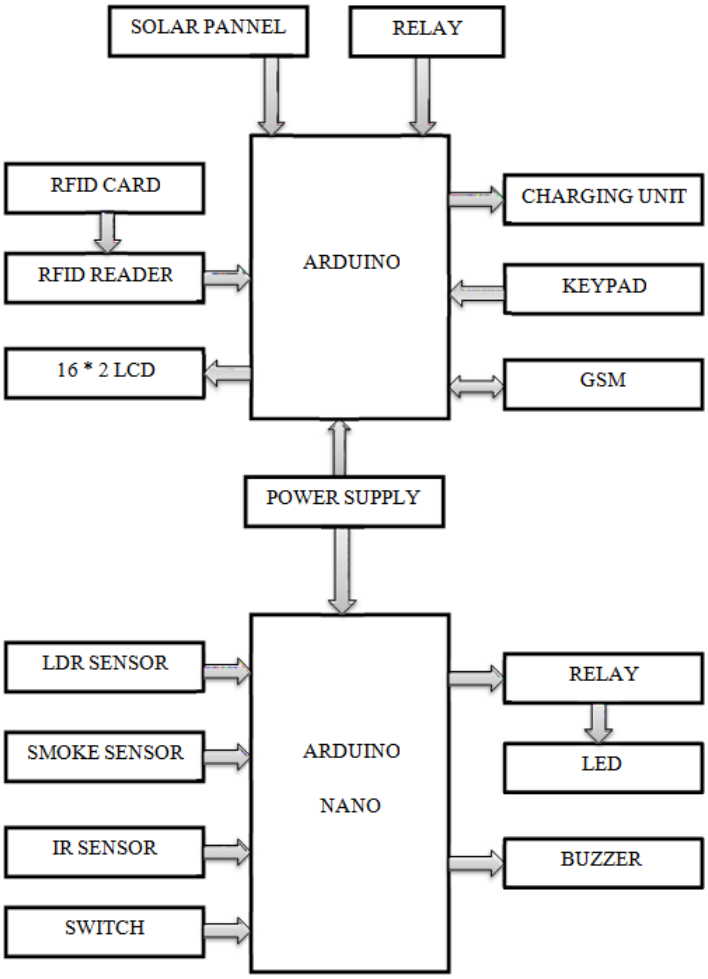


Fig.1.Block diagram

METHODOLOGY

The proposed methodology uses two types of energy sources as a supply to the project i.e.Solar and the main supply. Basically, power supply plays an important role in any of the electronic devices because each and every component needs to function properly. Arduino is the controller used here for the functionality of the complete proposed system. All the other hardware components like relay, 16*2 lcd, GSM, keypad and RFID is interfaced to the controller. Once when a user comes with his/her EV to charge in a station, firstly he should have been registered in the station for charging his vehicle. He will be received a RFID card from station to scan the card and make his vehicle charge. RFID is used for cashlesspayments which is new technology been implemented. OTP technology is also been implemented for giving security to the card which is been provided. Keypad is used to select the options and to enter the respective otp which is been received in the registered mobile number.

SOFTWARE EXPLANATION

Embedded C is a set of language extensions for the C programming language by the C Standards Committee to address commonality issues that exist between C extensions for different embedded systems.

Embedded C programming typically requires nonstandard extensions to the C language in order to support enhanced microprocessor features such as fixed-point arithmetic, multiple distinct memory banks, and basic I/O operations. In 2008, the C Standards Committee extended the C language to address such capabilities by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as fixed-point arithmetic, named address spaces and basic I/O hardware addressing. Embedded C uses most of the syntax and semantics of standard C, e.g., main() function, variable definition, datatype declaration, conditional statements (if, switch case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, etc.

Embedded software is computer software, written to control machines or devices that are not typically thought of as computers, commonly known as embedded systems. It istypically specialized for the particular hardware that it runs on and has time and memory constraints. This term is sometimes used interchangeably with firmware.

A precise and stable characteristic feature is that no or not all functions of embedded software are initiated/controlled via a human interface, but through machine-interfaces instead.

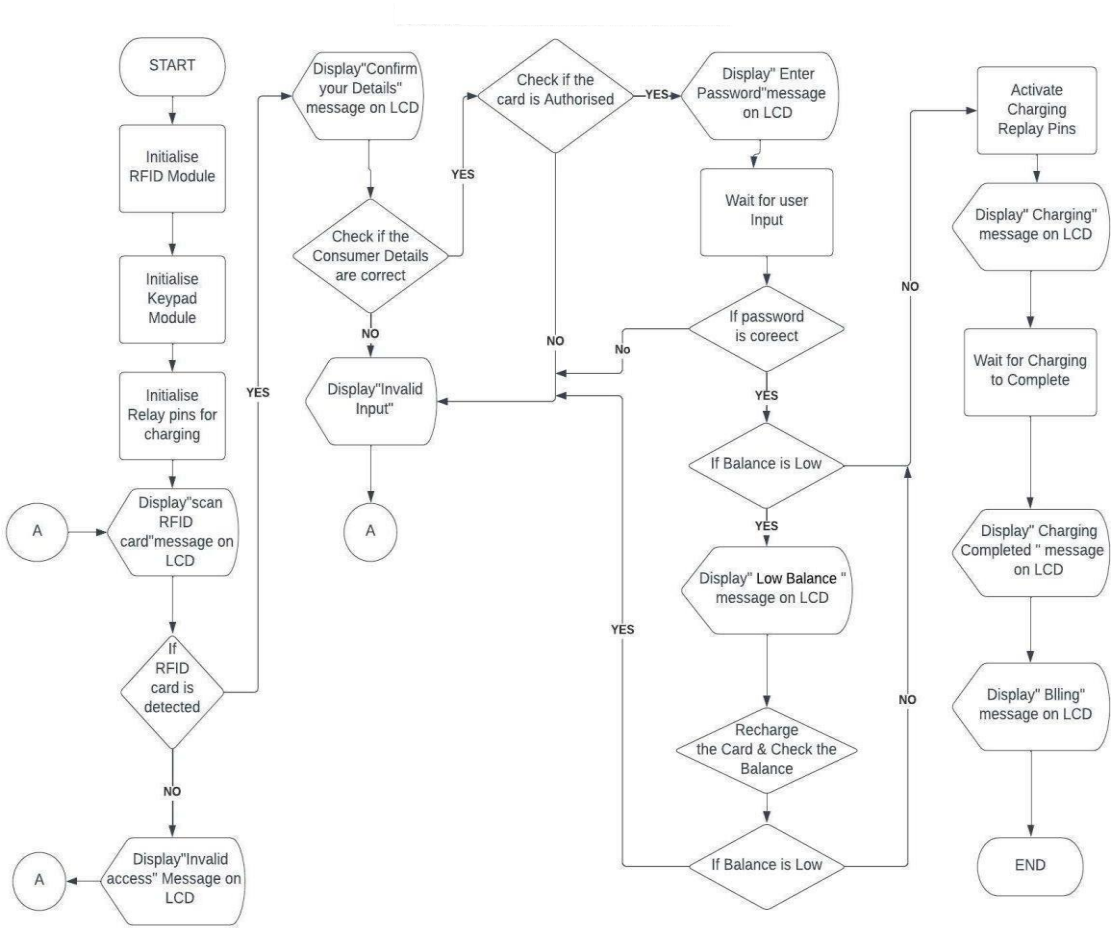
Manufacturers build embedded software into the electronics of cars, telephones, modems, robots, appliances, toys, security systems, pacemakers, televisions and set-top boxes, and digital watches, for example. This software can be very simple, such as lighting controls running on an 8-bit microcontroller with a few kilobytes of memory with the suitable level of processing complexity determined with a Probably Approximately Correct Computation framework (a methodology based on randomized algorithms), or can become very sophisticated in applications such as airplanes, missiles, and process control systems.

OPERATING SYSTEMS

Unlike standard computers that generally use an operating system such as OS X, Windows or GNU/Linux, embedded software may use no operating system, or when they do use on, a wide variety of operating systems can be chosen from, typically a real-time operating system.Code is typically written in C or C++, but various high-level programming languages, such asPython and JavaScript, are now also in common use to target microcontrollers and embedded systems. Ada is used in some military.

Fig.2. EV Charging Flowchart

EV CHARGING FLOWCHART



SMART STREET LIGHT FLOWCHART

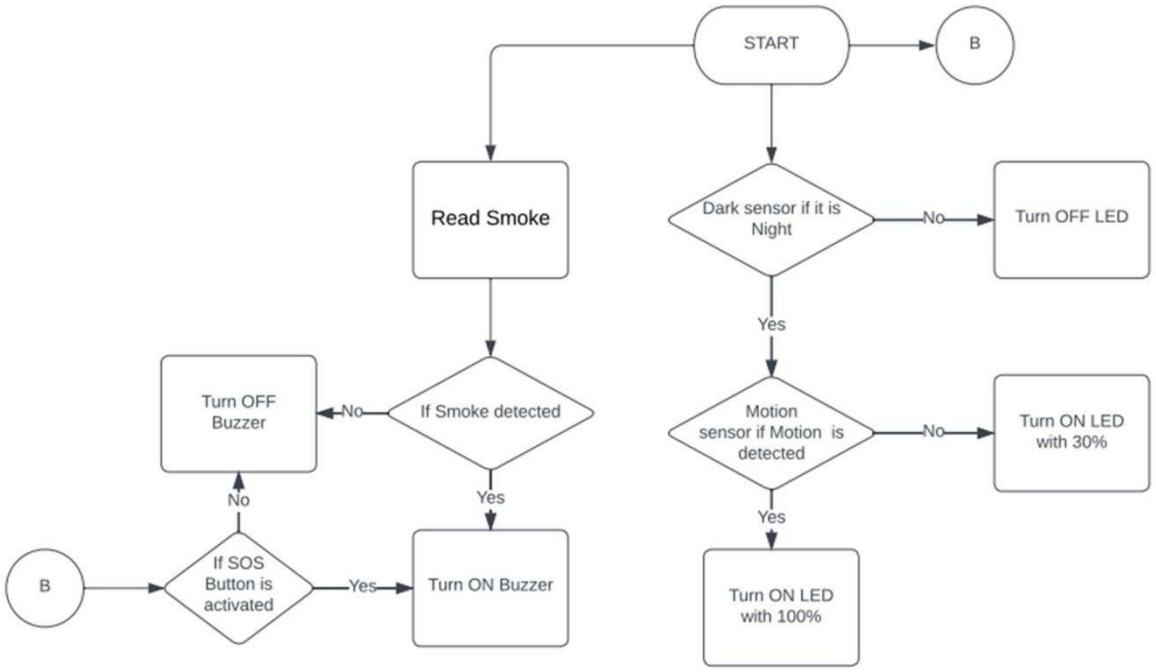


Fig.3 Smart Street Light Flowchart

APPLICATIONS

- Arduboy, a handheld game console based on Arduino
- Arduinome, a MIDI controller device that mimics the Monome
- Ardupilot, drone software and hardware
- ArduSat, a cubesat based on Arduino.
- C-STEM Studio, a platform for hands-on integrated learning of computing,science,technology, engineering, and mathematics (C-STEM) with robotics.
- OBDuino, a trip computer that uses the on-board diagnostics interface found inmostmodern cars
- OpenEVSE an open-source electric vehicle charger

EXPERIMENTAL SETUP

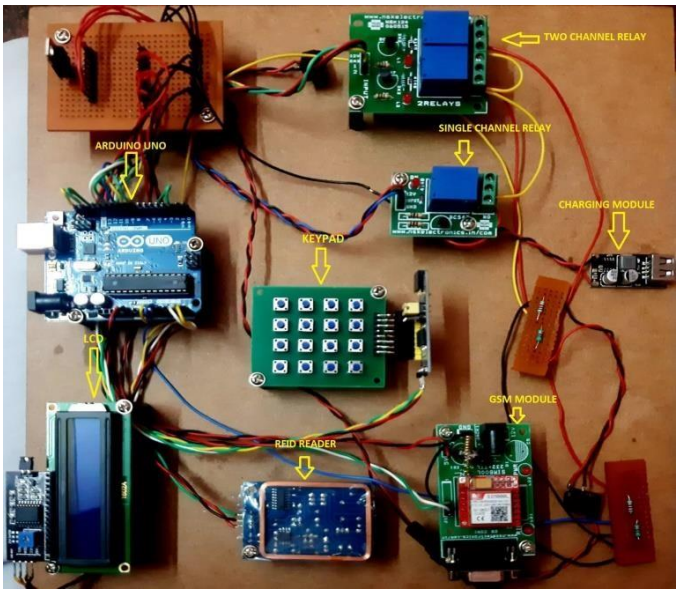


Fig.4.Hardware arrangements

RESULTS/OUTCOMES

✓ Developed model and method, which can be provide reasonable planning scheme of EV charging stations, and also reduce the network loss and improved the voltage profile.

✓ adopted EV charging unit smart street pole/light

✓ improved the smart street light system including many useful technologies such as Smoke detector, SOS button, Buzzer

CONCLUSION

An electronic circuit model has been proposed to enhance the EV Charging Station with the ordinary RFID device. The strategy is totally broad and takes into account the security enhancement of any type of charging station independent of their model, manufacturer and service provider. The effectiveness of the proposed electronic circuit model has been verified against the industry best practice and indicated outcomes better than those accomplished withdifferent methods, and that is utilized as a benchmark.

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