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ELECTRONIC DIRECTION INDICATOR USING EMBEDDED SYSTEM

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Abstract **- This project proposes an innovative electronic direction indicator using Bluetooth with dual input (voice and touch) for a user-friendly navigation system. Utilizing an Arduino board and 12V power supply, the LED display shows directions based on voice commands. The system caters to diverse users, accommodating the illiterate or hearing-impaired with LCD screen visuals. Users navigate by vocalizing their destination, with the system displaying directions on the LED board and producing voice output. This multifaceted solution enhances accessibility, providing real-time guidance through both audio and visual cues, making navigation inclusive for various user needs.**

Keywords –Bluetooth, Ardunio interface, Automatic voltage regulator

I. INTRODUCTION

The Electronic Direction Indicator, designed for versatility, proves beneficial in educational institutions, shopping malls, and roadways, streamlining navigation without reliance on traditional road maps. With the prevalence of smartphones and Google Maps, this device offers a portable solution for city and town navigation.

The system efficiently converts 12V to 5V for optimal power supply. In a modern approach, it integrates with Android devices via Bluetooth, eliminating the need for a separate voice recognizer. Users install a mobile application for voice input, expanding accessibility.

The development tools include an emulator for testing Android applications, enhancing the design process. The system's adaptability to diverse environments underscores its utility in various settings, from academic institutions to public spaces.

Developed in Java using the Android SDK, the application's compatibility with Eclipse and the Android Development Tools (ADT) plugin ensures a robust and user-friendly interface.

Overall, this Electronic Direction Indicator stands as a sophisticated, mobile-driven solution, marking a shift from traditional navigation methods to a technologically advanced and accessible approach for users on the go.

II. LITERATURE REVIEW

Electronic direction indicators have become crucial in various environments, including schools, colleges, malls, and roadways, to provide efficient navigation without relying on traditional road maps.

This literature survey explores the existing research and developments in the field, focusing on technologies such as Bluetooth, Arduino boards, voice recognition, and embedded systems.

This system comprises diverse components, including a power supply, GSM modem, IR sensor, coin port, relay, and LCD, which collectively enable controlled dispensing, monitor napkin availability, and facilitate user communication. Central to its functionality is the coin acceptor, responsible for validating inserted coins.

Bluetooth technology has been widely adopted in navigation systems due to its wireless capabilities. Researchers have explored the use of Bluetooth in the unlicensed 2.4 GHz band for reliable communication over short distances. The literature discusses the advantages of Bluetooth, such as its resistance to interference and robust data transmission using frequency hopping.

Arduino, a versatile open-source microcontroller platform, plays a pivotal role in the proposed electronic direction indicator. The literature survey delves into the applications of Arduino boards in designing digital devices and interactive objects.

Discussions include the use of Arduino as a voltage regulator and its integration into navigation systems.

Voice recognition technology has evolved significantly, enabling hands-free operation of devices. The survey examines the role of voice recognition in navigation systems, emphasizing its applications in receiving user input for directions. Research in automatic speech recognition (ASR) software programs is explored, highlighting advancements in controlling devices through voice commands.

The design approach section of the literature survey focuses on the components used in the electronic direction indicator, such as input devices (LCD display with touch screen and voice recognizer), embedded systems, and output devices (speaker and LED display board). It analyzes the integration of these components to achieve an efficient navigation system.

The survey provides an overview of existing systems, emphasizing the significance of Bluetooth technology and Arduino boards in navigation. It explores the role of voltage regulators in Arduino boards and the specific functionalities of voice recognition modules in recognizing and responding to user commands.

An important aspect of the literature survey is the exploration of challenges faced in navigation systems and innovative solutions proposed by researchers. This includes overcoming limitations in voice recognition, optimizing Bluetooth communication, and addressing power supply concerns.

In conclusion, the literature survey presents a comprehensive analysis of electronic direction indicators, covering Bluetooth technology, Arduino boards, voice recognition, design approaches, existing systems, and challenges in navigation systems. This overview provides a foundation for understanding the current state of research and potential areas for future development in electronic navigation technologies.An important aspect of the literature survey is the exploration of challenges faced in navigation systems and innovative solutions proposed by researchers. This includes overcoming limitations in voice recognition, optimizing Bluetooth communication, and addressing power supply concerns.

III. Proposed Methodology

The proposed electronic direction indicator project integrates Bluetooth technology, voice recognition, and an Arduino-based system to provide directions using LED displays and speakers. The system is designed to cater to various scenarios, such as schools, colleges, malls, and roadways, replacing traditional road maps with a more interactive and user-friendly solution.

The project leverages Bluetooth technology operating in the 2.4 GHz ISM band with a range of 10 (100) meters. Bluetooth's spread spectrum transmission technology ensures resistance to interference, and its fast rate frequency hopping (FHSS) supports robust data transmission.

Arduino, a prominent computer hardware and software company, is utilized to design microcontroller kits for building digital devices. The Arduino board serves as the central processing unit, regulating power from 12V to 5V. The open-source nature of Arduino products promotes accessibility and flexibility.

Voice recognition is a key component, allowing users to provide input through voice commands. The Voice Recognition Module, capable of recognizing 15 voice instructions, communicates through a serial port interface. This feature enhances accessibility, especially for users who may be illiterate or have hearing impairments.

The design incorporates various components, including a touch screen LCD display, voice recognizer, embedded system, speaker, and LED display board. The embedded system programming focuses on code speed and size, addressing the unique requirements of embedded programming.

The system's output is displayed on a 16x2 LCD, providing clear information about the direction indicated. Users can input directions through both touch screen and voice recognition methods. The LED display board visually guides users with arrow marks, enhancing navigation.

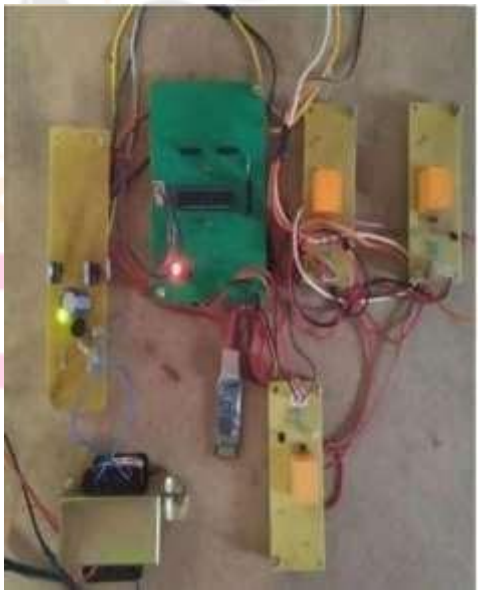

Figure 1. CONSTRUCTION OF THE ELECTRONIC DIRECTION INDICATOR.

A. Ardunio Uno interface

The Arduino Uno interface plays a pivotal role in the electronic direction indicator project. As the central processing unit, the Arduino Uno efficiently manages the input and output components, serving as the bridge between the embedded system and user interactions.

Equipped with an Automatic Voltage Regulator (AVR), it ensures stable power regulation from 12V to 5V, essential for reliable device operation. The Uno's modified Harvard architecture and 8-bit RISC single-chip microcontroller facilitate seamless program execution, storing instructions in nonvolatile flash memory.

This interface simplifies the integration of diverse elements, including the 16x2 LCD touch screen, voice recognition module, and LED display board.

Its open-source nature fosters flexibility and accessibility, making it an ideal platform for developing digital devices like the electronic direction indicator, where precision, adaptability, and user-friendly interaction are paramount

B. Automatic Voltage Regulator

An Automatic Voltage Regulator (AVR) is a critical component in the electronic direction indicator project, serving to stabilize and regulate the electrical voltage supplied to various elements within the system. In the context of this project, where precise control and reliability are crucial, the AVR plays a pivotal role in ensuring the proper functioning of the Arduino Uno interface and associated components.The AVR utilized in this project adheres to a modified Harvard architecture, featuring an 8- bit Reduced Instruction Set Computing (RISC) single-chip microcontroller.

Unlike traditional microcontrollers, the AVR family was among the pioneers to integrate on-chip flash memory for program storage, a feature that enhances flexibility and facilitates efficient execution of program instructions.One of the primary functions of the AVR in the electronic direction indicator is to regulate the power supply, converting the incoming voltage from 12V to a stable 5V. This transformation is essential as various components within the system, such as the Arduino Uno, LCD display, and LED display board, operate optimally at 5V. The AVR's ability to regulate voltage ensures that these components receive a consistent and appropriate power supply, preventing potential damage caused by fluctuations in voltage

The AVR achieves voltage regulation through a closed-loop control system. It continuously monitors the output voltage and adjusts it as needed to maintain a specified reference voltage. This closed-loop feedback mechanism ensures that the electronic direction indicator operates within the desired voltage range, enhancing the overall stability and reliability of the system.

In summary, the Automatic Voltage Regulator in the electronic direction indicator project is a fundamental component that ensures stable power regulation, optimal performance, and energy efficiency. Its role in converting and maintaining the voltage at 5V for various components highlights its importance in creating a reliable and user-friendly navigation system. The AVR's integration showcases the synergy between hardware and software, contributing success of the indicator.

C. LCD Display

A relay functions as an electrically driven switch, as illustrated in the diagram. When a current passes through the coil of the relay, it generates a magnetic field that attracts a lever, thereby altering the switch contacts. This coil current can be toggled on or off, resulting in relays having two switch positions, making them double-throw (changeover) switches. They enable one circuit to control the switching of a second, completely separate circuit.

For instance, a low-voltage battery circuit can employ a relay to control a 230V AC mains circuit. Importantly, inside the relay, there's no direct electrical connection bridging the two circuits; their connection is established through magnetic and mechanical means.

Relay coils typically carry a relatively substantial current, typically around 30mA for a 12V relay, though this can reach up to 100mA for relays designed for lower operating voltages. Since most integrated circuits (ICs or chips) cannot supply this level of current, a transistor is often utilized to amplify the small IC current to the higher value needed for the relay coil.

However, certain ICs, like the popular 555 timer IC, boast a maximum output current of 200mA, enabling them to directly power relay coils without requiring amplification. The relay in the foreground contains one set of contacts (SPDT), while another set is positioned behind them, effectively making the relay a DPDT (double pole, double throw) configuration.

D. Program Memory

The program memory in the electronic direction indicator is nonvolatile flash memory embedded within the Arduino Uno interface. Storing program instructions in this memory ensures efficient execution, with each instruction typically taking one or two 16-bit words.

This feature contributes to the reliability and responsiveness of the navigation system

The program memory's role in retaining and executing instructions ensures the accurate and reliable operation of the electronic direction indicator, facilitating seamless navigation and user interaction.

E. LED Display Board

The LED display board in the electronic direction indicator is a key output component, visually conveying directional information. Comprising arrow-shaped LEDs, it interprets signals from the embedded system, Arduino Uno, and displays arrow marks indicating the desired direction.

This visual feedback enhances user navigation, especially in scenarios where voice or touch input is utilized. The LED display board serves as an intuitive guide, simplifying directions for users.

Its integration adds a dynamic and interactive element to the electronic direction indicator, contributing to its effectiveness in schools, colleges, malls, and roadways for seamless and user-friendly navigation.

I. Embedded system programming

Embedded system programming for the electronic direction indicator is tailored to meet the unique demands of real-time performance and resource constraints. In contrast to desktop programming, embedded programming emphasizes code speed and size efficiency.

The 8-bit RISC architecture of the Arduino Uno's AVR microcontroller is optimized for this purpose.

Program instructions are stored in nonvolatile flash memory, and each instruction takes one or two 16-bit words. This efficient use of memory and processing power ensures swift and responsive execution of commands, crucial for the real-time nature of navigation systems.

Embedded system programming is intimately tied to the hardware, utilizing smaller, power-efficient components. The code's streamlined design reflects the project's commitment to providing a compact, yet powerful, solution for the electronic direction indicator's navigation capabilities.

IV. RESULT

Touch Screen after giving the input by touch screen, the device will recognize the input by connecting the Bluetooth. Suppose the input is Paavai Engineering College then the output will be indicated in the Left side of the LED. When the input is given by the touching system the following procedure is followed

When the input is given by the Voice Recognizer system the following procedure is followed. We are designing this direction indicator to avoid the road maps.

We can go any cities and towns in the universe by using google map. We can also calculate the time needed to go there. After reaching the particular place, it has many division within it. A small hardware device to indicate the direction in particular place.

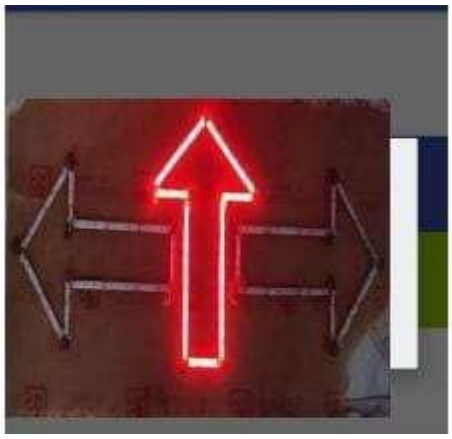

Figure 2. Inputs through the Voice

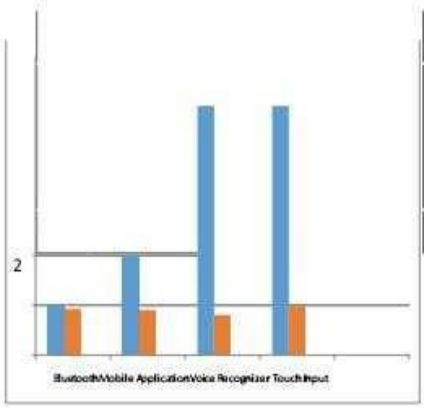

Figure 3. Output of the given Input

V. CONCLUSION

In conclusion, the electronic direction indicator leveraging embedded system technology presents a sophisticated and user-friendly navigation solution. The seamless integration of Arduino Uno, Bluetooth, and voice recognition showcases an innovative approach to directional guidance. The use of an Automatic Voltage Regulator ensures stable power supply, while the LED display board enhances visual feedback. This system, designed for schools, colleges, malls, and roadways, aligns with modern navigation trends. Overall, the project demonstrates the effectiveness of embedded system programming in creating a compact, efficient, and interactive solution for navigation challenges, promising enhanced user experience and accessibility..

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