IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 12, Issue 4, April 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 | Monthly Peer Reviewed & Referred Journal |

|| Volume 12, Issue 4, April 2024 ||

| DOI: 10.15680/IJIRCCE.2024.1204326 |

Enhancing Ambulance Alert Lights for Safer Navigation of Traffic Roads

S. R. Desai, Anuja.A.Jadhav, Mayuri.M. Patil, Shreeyash.P.Patil

Assistant Professor, Department of Electronics and Telecommunication Engineering, Sant Gajanan Maharaj College of Engineering, Mahagaon, India

Engineering Student, Department of Electronics and Telecommunication Engineering, Sant Gajanan Maharaj College of Engineering, Mahagaon, India

Engineering Student, Department of Electronics and Telecommunication Engineering, Sant Gajanan Maharaj College of Engineering, Mahagaon, India

Engineering Student, Department of Electronics and Telecommunication Engineering, Sant Gajanan Maharaj College of Engineering, Mahagaon, India

ABSTRACT: The implementation of GSM-based ambulance alert light in traffic areas before an ambulance arrives, providing safer navigation in the current environment, traffic congestion is a big problem. A large number of vehicles on the road and an excessive population are the causes of traffic congestion. This leads to far more accidents than are typical each day and raises the risk of imminent road violence. This technology is going to put into practice a model that finds traffic jams on the route and notifies the ambulance driver of them one kilometre in advance.

KEYWORDS: sensors; micro controller; ESP32; GSM; Module; Antenna; power supply; HighIntensity; led Lights

I. INTRODUCTION

Human life is a serious matter, so we should not neglect anything that might threaten it. It must be protected in all possible ways. Consequently, all health services such as hospitals, medicines, ambulances and so on need to evolve continuously to overcome life-threatening problems. Since many people could lose their life because of an ambulance delay. We proposed a system that provides a way to overcome the ambulance delay problem. With the current traffic light system, the ambulance can get stuck in the traffic or may cause an accident while it crosses the red light.
Generally speaking, traffic jams are also linked to a few other issues with traffic, such as blocked emergency vehicles like fire engines and ambulances. Specifically, traffic congestion frequently obstructs the emergency vehicles path, which can occasionally be fatal. Additionally, there have been more fatalities recently as a result of emergency vehicles arriving late.

The issue of traffic congestion in cities is getting worse all the time. The number of vehicles and people both continue to expand, which is causing traffic to increase. It is now very difficult for emergency vehicles, like an ambulance, to get through traffic in an emergency because of the growing population and greater use of cars.

II. RELATED WORK

1. Design and Construction:
In this project I have used some of the components like GPS, ESP8266, traffic lights, and RFID readers, let's modify the design to incorporate these components into your RFID-based smart traffic signal system for ambulance prioritization.

GPS Module: To track the ambulance's location and speed.
ESP8266 Wi-Fi Module: For wireless communication and data transmission.
Traffic Lights: LED or conventional traffic lights for signal indication.
RFID Reader: To detect RFID tags attached to ambulances.
Power Supply: To power the components

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2. Operational Mechanisms:
1. Ambulance Detection:
The RFID reader continuously scans for RFID tags attached to ambulances within its range. When an ambulance with an RFID tag approaches the traffic signal, the RFID reader detects the tag.

2. Location and Speed Tracking:
The GPS module tracks the ambulance's real-time location and speed. This information is sent to the ESP8266 module.

3. Communication and Data Transmission:
The ESP8266 module receives the ambulance's location and speed data from the GPS module. It establishes a wireless connection to the central traffic control system or a local server.

4. Traffic Signal Prioritization:
Upon detecting an ambulance with an RFID tag and receiving its location and speed data, the central traffic control system or server determines the ambulance's priority status.
If the ambulance needs priority due to its emergency status, the traffic light system is instructed to change the signal to green for the ambulance's direction, ensuring a clear path.

5. Traffic Light Control:
The traffic light system receives instructions from the central traffic control system or server via the ESP8266 module. Based on the received instructions, the traffic lights change their signals accordingly. For an ambulance with priority, the traffic light turns green, and other directions receive a red signal to stop the traffic.

3. Testing and Validation:
ESP8266 is dedicated to RFID functionality, equipped with an RFID reader that identifies approaching ambulances by reading unique RFID tags attached to them. Upon detecting an ambulance, this ESP8266 sends the RFID tag information to Firebase, a cloud-based real-time database. Firebase, in turn, updates the traffic signal status to prioritize the ambulance by signalling a change in the traffic lights. The ESP8266 microcontroller sends the RFID tag value ("1") to the Firebase database.

Upon receiving this RFID tag value update, the Firebase database triggers a notification or event that the mobile app detects. The app, recognizing the RFID tag value as "1," then executes a designated function to signal a traffic signal change. This function communicates with the traffic light control system, sending a command to adjust the traffic signal.

III. BLOCK DIAGRAM

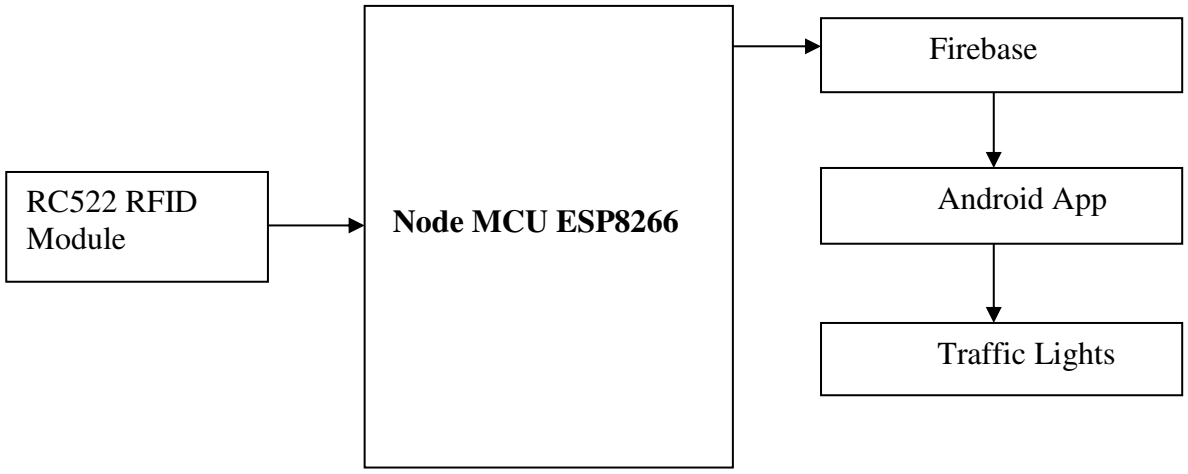

Fig. shows the block diagram of implemented system.

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Using an RC522 RFID module to enhance ambulance alert lights for safer navigation through traffic sounds like a great application! The RFID technology could potentially help prioritize the ambulance's route by communicating with traffic signals or other infrastructure

IV. HARDWARE IMPLEMENTATION

ESP8266 12-E Node MCU Kit

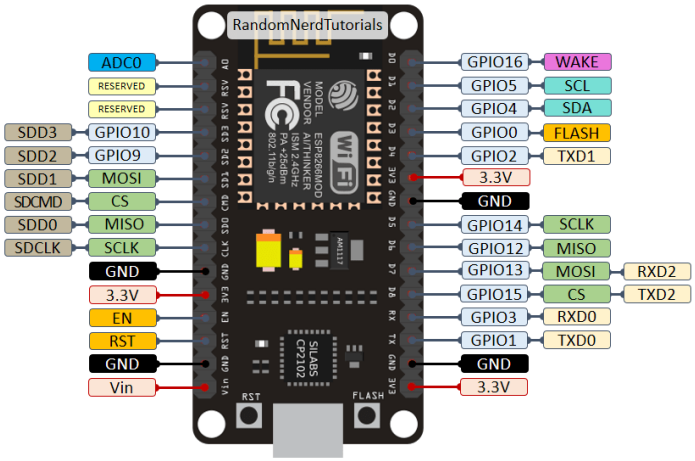

Fig. The ESP8266 12-E Node MCU kit pinout diagram is shown below

Node MCU is an open-source Lua based firmware and **development board** specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Express if Systems, and hardware which is based on the ESP-12 module.

NEO-6MV2 GPS Module

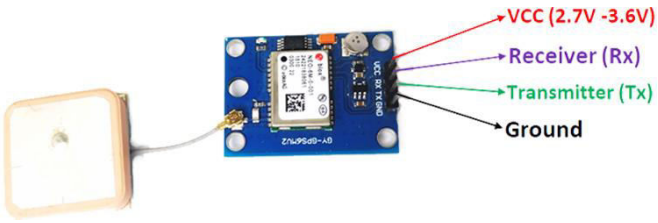

Fig. NEO-6MV2 GPS Module

The **NEO-6MV2** is a **GPS** (Global Positioning System) module and is used for navigation. The module simply checks its location on earth and provides output data which is longitude and latitude of its position. It is from a family of stand-alone GPS receivers featuring the high-performance u-box 6 positioning engine. These flexible and cost-effective receivers offer numerous connectivity options in a miniature (16 x 12.2 x 2.4 mm) package. The compact architecture, power and memory options make **NEO-6 modules** ideal for **battery operated mobile devices** with very strict cost and space constraints. Its Innovative design gives **NEO-6MV2** excellent navigation performance even in the most challenging environments

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RC522 RFID Module

The RC522 RFID Reader module is designed to create a 13.56MHz electromagnetic field that it uses to communicate with the RFID tags (ISO 14443A standard tags). The reader can communicate with a microcontroller over a 4-pin Serial Peripheral Interface (SPI) with a maximum data rate of 10Mbps. It also supports communication over I2C and UART protocols.

V. SOFTWARE IMPLEMENTATION

In this section, the following applications are used to design the IoT Based Smart Poultry Farm Application in which the real time data display on the mobile screen. The application is developed in embedded C++. For designing this android application, the Arduino IDE and Kodular software is used. Some information about the applications is as follows:

1.Arduino IDE

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

Fig. Arduino IDE

The source code for the IDE is released under the License version. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provide many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main () into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino ID Employs the programmer glued to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmwa

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2. Kodular App

Creating an app with Kodular is a relatively simple process, especially if you're new to app development. Kodular uses a block-based interface that makes it easy to create Android apps without needing to write code. Here's a step-by-step guide to creating a basic app using Kodular:

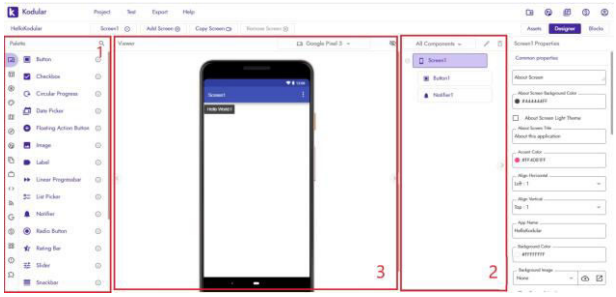

Fig..kodular app snapshot

Step 1: Create an Account

If you haven't already, visit the Kodular website (**https://www.kodular.io/**) and create a free account. You'll need this account to save and manage your projects.

Step 2: Start a New Project

Once you're logged in, click on the "Create Project" button or "My Projects" to access your existing projects and start a new one.

Step 3: Design Your App

Kodular uses a visual interface for designing your app's user interface. You'll find a variety of components and layout options to choose from. Here's a brief overview:

Step 4: Add Components

Drag and drop components from the palette to the viewer to build your app's layout. You can arrange them as you like and configure their properties using the right-side panel.

Step 5: Customize Component Properties

Select each component in the viewer and customize its properties as needed. For example, you can change the text on a button, adjust its color, or change its visibility.

Step 6: Add Functionality

Click on the "Blocks" button at the top to open the blocks editor. This is where you'll add functionality to your app using visual blocks. You can use blocks to handle user interactions, perform calculations, and more.
Here are some common actions you can perform in the block's editor:

Step 7: Test Your App

Click the "Connect" button in the top-right corner to connect your Kodular account to the Kodular Companion app on your Android device. This allows you to preview and test your app on your device in real-time.

Step 8: Build Your App

Once you're satisfied with your app, you can click the "Build" button to generate an APK file. This file can be installed on Android devices.

Step 9: Publish Your App

If you're ready to share your app with others, you can publish it on the Google Play Store or other Android app distribution platforms.
Remember that this is just a basic overview of creating an app with Kodular. Depending on your app's complexity, you may need to explore more advanced features and blocks in the platform. Additionally, you can refer to Kodular's documentation and community forums for more specific guidance and support.

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VI. SIMULATION RESULTS

The RFID-based smart traffic signal system has proven to be a viable solution for enhancing emergency response efficiency by prioritizing ambulance traffic. By leveraging advanced technologies like RFID, GPS, IoT devices, and Firebase, the system ensures timely and safe passage for ambulances during emergencies. This innovative approach not only reduces response times but also improves overall traffic management by dynamically adapting to changing emergency scenarios. While the system has shown promising results in controlled testing environments, further real-world testing and refinement may be necessary to optimize its performance and reliability. Nevertheless, the potential benefits of this system in saving lives by expediting emergency medical services make it a valuable addition to modern urban traffic management solutions. Future iterations and enhancements could further refine this system, paving the way for safer and more efficient emergency response systems in smart cities.

VII. CONCLUSION AND FUTURE WORK

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Incorporating smart sensors into the grain insect removal machine could enhance its efficiency and automation. These sensors could monitor environmental conditions such as temperature, humidity, and insect activity, allowing the machine to adjust its operation dynamically based on real-time data. Additionally, sensors could detect the presence of insects more accurately, triggering the activation of specific mechanisms only when needed, thereby optimizing energy consumption and reducing unnecessary operation.

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INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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