Automatic Turning ON/OFF Bike Indicator Using Offline GPS Navigation System

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Abstract. In the present modern world, most of the people are using the roadways for transportation purposes. The utilization of roadways increases by one side, on the other side the road accidents are also escalating. The current assessment shows that the reasons for the road accidents are not obeying the traffic rules, inappropriate usage of indicators while turning right or left while driving the vehicles and so on. In peak hours and in traffic times people are speeding up with their vehicle and forgot to use their indicator. This leads to an accident while sudden turning and braking without a proper indication. In order to overcome these types of difficulties, an automatic turning on/off bike indicators using offline GPS navigation system is proposed. The proposed system works in an offline mode and does not need any internet connectivity. By turning on the supply to the board, it will generate the hotspot and it will be connected with Wi-Fi in Mobile Phone. Then the destination is fixed in the mobile application. When turning is available in the way to destination before 100 meters of that turning, indicator will be automatically turned on and after that indicator will be automatically turned off. Thus the proposed work would help the people during the rush hours and also during the emergency situations to avoid accidents.

Keywords: Automatic, Bike indicator, Navigation, Emergency, Offline mode

1. Introduction
In all countries roadways are at most vital for the citizens to move from one place to another place for their personal, official and business work purposes. With the usage of roadways, the farmers can easily sell their products into market, factories can transport their goods to retail shops and public can easily move from one place to another place without any difficulty. Regions or Countries can function easily with adequate road facilities. Roadways in India are most tarnished in the world, so that every year 1.5 lakh citizens lost their lives due to their lack of knowledge in traffic rules [13]. The central government previously failed to take the essential steps however now government has taken strong efforts to reduce the traffic offenses.

Vehicle turn indicator signals are usually well known in the art. In most of the automotive two wheelers, the turning direction of the vehicle can be activated by the operator by make use of turn signals. Usually, the turning signal is controlled by the switches which are very sensitive to turning of
the steering column of the vehicle and generally available in the nature of flashing illumination. The indicator unit available in the two wheeler is in activated signalling condition while the steering wheel remains unmoved or continues to move in the direction of the turn. The steering column of the mechanical catch is released, when the steering wheel is moved in the direction opposite to the direction of the turn, which causes the cancellation of turn signal.

Now-a-days people who are driving their vehicles on the roadways are not properly using their vehicle's indicator while turning. In peak hours and in traffic times people are rushing with their vehicle and forgot to use their indicator this leads to an accident while sudden turning and braking without a proper indication. In order to overcome these types of difficulties, an automatic turning on/off bike indicators using offline GPS navigation [14] system is proposed.

2. Literature Review

K. Divakara Murthy et.al designs a semi automatic signal indicator for two wheeler. In this project, the authors presented a semi-automatic mechanism of indication of signal lights of a two wheeler. The system is used to prevent the accidents which may happened due to negligence of traffic rules, due to the laziness shown by the drivers at the time of turning on roads etc. The system is semi-automatic and incurs high cost. It is not fully automatic and also the navigation system is not established.

Zechun Huang et.al. developed a GPS vehicle positioning monitoring system which is integrated with CORS and mobile GIS [2]. They design and implemented a method for vehicle direction, examination of vehicle position and control system and all are merged with CORS service network and Mobile GIS. The system also surveys the feature of spatial and attributes data associated with the vehicle positioning control.

Prawat Chaiprapa et.al. Proposed a Google map based website for a real time GPS vehicle tracking system. The authors developed a vehicle tracing methodology which utilizes a global positioning system (GPS) technology. The proposed module is used to collect the spot of the vehicle. Then the location information is forwarded into microcontroller. Then the microcontroller using Internet Connection and General Packet Radio Service (GPRS) displays the position of the vehicle in a real-time mode on the website map. Since the system uses both the Internet and GPS technology causes difficulty in low network area.

Dr. Khalifa et.al. design a vehicle tracking using web-based GPS-GPRS. The authors implemented a vehicle tracking system using web based GPS-GPRS technology. [4]. The process authorizes enterprises holders to examine the present and past locality of the intended vehicle on Google Map [3] with the aid of recordings. The current locality of the vehicle was acquired by GPS device which is integrated in the intended vehicle and the site coordinates are sent via GPRS service to GSM network.[10][12]

Mahesh Kadibagil and Guruprasad H S developed a Position detection and tracking system for vehicle. The system consists of self-directed position recognition and tracking which capture the friends and family member’s location with the help of GPS and standard web technology [5]. This methodology consists of a web client, a repository, a mobile client and a map service. The mobile client is utilized to identify the location of family members or friends if they are coming around the user’s area of directions then the mobile client convey a Popup SMS to user. These location particulars can be post to the server and the same particulars can be controlled and observed using the web client by other users.

Li Liu, et.al. implemented a navigation system which is android phone based group communication model. The authors developed a technology for navigation and group transmission system using Android mobile operating system [6][10]. The system supplies a friendly group communication policy between friends in order to promptly communicate and a real-time positioning, navigation and path planning capabilities with the help of GPS.[8]

Kai Qin et.al designs an intelligent bus movement and station reporting system. In this system the location information is passed to the control centre which uses the GPS functionality. The hardware division of the system integrates voice chip also. The software part finds the station reporting system [7].
3. Existing Method

3.1 Manual Mode of Operation

The manual mode is operated by the individual whose is riding the bike. The rider can turn on/off the bike indicators whenever the rider needs to turn on/off (depends up on the situation). The Figure 1 shows the diagram of manual mode of operation. Usually the manual mode of operation is the thumb operated one, already the switch to turn on/off the bike indicators is fixed in the bike’s handle itself. Some models of bikes has a different specification like to turn on the right indicator of the bike, the control of that indicator will be on the right side of the bike’s handle and vice versa. The bike riders have to use the indicators to inform other road users when they intend to change the direction. To use the bike indicators in right time, have to give the plenty of time to other road users to react and adapt to the signal. Once the turn is completed make sure the indicators are cancelled otherwise it may confuse other road users.

![Figure 1: Manual mode operation of bike indicator](image)

The limitations of the manual mode are:
- The bike riders are forgot to use the indicator in the right time
- Confusing the other road users by not turning on the bike indicators in the right time and vice versa
- Number of accidents are increased

3.2 Semi-Automatic Turn ON/OFF Bike Indicator

The main concept of the semi-automatic turn on/off bike indicators is purely based on the steering angle of the bike handle [1]. If the bike indicator is turned left side, the left bike indicator will turned on and vice versa. This semi-automatic signal will be useful when the bike rider fails to put the indicator while entering the road from parking, during U turn, reversing the vehicle etc. On these situations both bike indicators will be turned on, when the bike rider is unable to turn on/off the bike indicators during sudden turn. The Figure 2 shows the diagram of semi-automatic indicator.
Figure 2: Semi-Automatic mode of operation of bike indicator

The limitations of semi-automatic mode are:
- Not effectively used in rush hours and emergency situations
- Cancelling of bike indicators is not done after the turning is completed
- This activates the bike indicator irregularly

4. Proposed System
The proposed system is to develop a low cost system for automatically turning on/off bike indicator using offline GPS navigation system and also to reduce the number of accidents which occurs due to improper usage of bike indicators.

4.1 Block Diagram of the Proposed System
The Figure 3 represents the block diagram of the proposed system.
4.2 Circuit Diagram of the Proposed System

The Figure 4 describes the overall circuit diagram of the proposed project. In this project ESP 32 development board is used for controlling purpose. OLED display is used to display the directions to turn and also the distance about to turn. The bike battery itself is used as the power source. Bike battery delivers of 12V to the bike accessories like bike horn, bike indicators and battery ignition, etc. Buck converter is used to regulate the voltage between 3.3V to 5V, because ESP 32 development board's operating voltage is between 3.3V to 5V. Bike battery [15] supplies the power to the ESP 32 development board via buck converter. Two channel relay is used to turn on or turn off the bike indicators based on the input received from the ESP 32 development board. In the circuit diagram 4 LED is shown as a prototype for testing.

The bike battery is used for the power supply and it is switched on by turning on the bike using the bike key. The battery supplies the power to the buck converter then this buck converter reduces and regulates the voltage between 3.3V to 5V. The hotspot gets turned on, when the ESP32 Development Board receives the power. Then Wi-Fi will be turned on in the Mobile for searching the Hotspot name and after then password will be entered for authentication purpose.

After successful authentication [11], the Sygic Navigation mobile application will be opened in the mobile phone [9] and the final destination will be setting up via the mobile application. After completing these preliminary steps automatically OLED Display will display as Connected, which is a indication of mobile application is connected to the ESP32 Development board.

When turning is available in the way to destination, before 100 meters of that turning, indicator will be automatically turned on and after that turn, indicator will be automatically turned off. After the destination is reached flag symbol will be displayed in the OLED display.

In this project, Web socket server is used to exchange facts involving client and server. Web socket establishes a continuous interrelation between a client (Mobile App) and server (ESP32) [11]. Then both the sides can begin dispatching of data at any time. Web socket handshake technology is used to establish a connection in the client side. This process begins with the client (Mobile App) transmitting a standard HTTP request to the server (ESP32).

Sygic Navigation App has some predefined numerals (data) may be in hexadecimal format which is used to exchange between the client (Mobile App) and server (ESP32). These numeral data indicates
some information regarding the turnings in the way to the destination like right turn, left turn, etc. For example, if there is a right turn in the way to the destination the client (Mobile App) will send the numeral data Four (4) to the server (ESP32), the server analyses and it displays that information in the OLED Display. Thus, the Web socket Server plays a major role in this project. The Table 4.1 represents the Numeral Data between the Client and Server.

Table 4.1 Numeral Data between the Client and Server

| Direction between client and server | Numerical Data | Direction between client and server | Numerical Data |
|-----------------------------------|---------------|-----------------------------------|---------------|
| Direction Start                   | 20            | Direction Easy Left               | 6             |
| Direction Easy Right              | 4             | Direction End                     | 19            |
| Direction Via                     | 15            | Direction Keep Left               | 2             |
| Direction Left                    | 10            | Direction Out of Route            | 21            |
| Direction Right                   | 8             | Direction Sharp Left              | 14            |
| Direction Sharp Right             | 12            | Direction Straight                | 42            |
| DirectionStraight_1               | 16            | Direction U Turn Left             | 18            |
| Direction U Turn Right            | 17            | Direction Round about SE          | 23            |
| Direction Round aboutE            | 24            | Direction Round about NE          | 25            |
| Direction Round aboutN            | 26            | Direction Round about NW          | 27            |
| Direction Round aboutW            | 28            | Direction Round about SW          | 29            |
| Direction Round aboutS            | 30            | Direction Tunnel                  | 50            |
| Direction S bend Right            | 51            | Direction S bend Left             | 52            |

4.3 Hardware Components used in the Proposed System

The hardware components and the software used in the proposed system are

- Buck Converter
- ESP 32 Development Board
- OLED Display (0.96”)
- Two Channel Relay
- Sygic Navigation App (Software)

4.3.1 Sygic GPS Navigation Application

The Figure 5 shows the Sygic application. The Sygic GPS Navigation application guides the user to reach the destination securely even in the absence of a network link. This app includes premium 3D maps. Regular map and application are updated with free of cost. With this app, the user can simply get away from the traffic or locate the finest parking point. The user can also view the latest information concerning fuel cost on petrol stations.
5. Hardware implementation of proposed system

The Figure 6 shows the Hardware Setup of the proposed project.

The Figure 7 shows the Hardware Setup with the Bike. The supply to the Hardware setup is connected to the bike battery and for controlling the bike indicators the wiring is also done using the wiring tag which used in automobiles. The Two channel relay module is used to control the bike indicators based on the input which sent by the ESP32 Development Board.
6. Results and Discussion

The flag symbol displayed in the OLE display shown in the figure 8 indicates the user the corresponding destination is reached.
The first figure of 9 highlights that 170 meters more for the user to turn left and the speed limit of the bike is 55Km and the second figure indicates that 80 meters more for the user to turn left and the speed limit is 55Km.

![Image of navigation system](image1.png)

**Figure 10: Indication of Navigation**

The figure 10 indicates the navigation of the bike system. The first figure indicates the navigation system is ready to pair with the mobile application automatically and the second figure indicates the navigation system is connected with the mobile application.

![Image of navigation system](image2.png)

**Figure 11: Indication of Light and Left turn of a vehicle**

The figure 11 indicates the automatic turn on of a bike indicator. The first figure shows that the right indicator is turned on automatically by the mobile navigation application when the right turn in the real time is reached. Similarly the second figure represents the automatic turn on of the left indicator of the bike automatically by the mobile navigation system.

**7. Conclusion**

In the proposed system, an automatic turning on/off bike indicator using offline GPS navigation system is developed. Thus it would help the people during the rush hours and also it would helpful during the emergency situation. This project is used to turn on/off the bike indicators (both right and left). The Bike indicators are controlled before the 100 meters of the way to the fixed destination. The main motto of the project is to reduce the number of road accidents which occurs due to improper usage of bike indicators. It is a portable system and also it receives the power from the bike battery itself. It also has the OLED Display which indicates, which direction the user have to turn, how much meters are more to the next turn and also the speed limit.
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