DESIGN AND IMPLEMENTATION OF DIGITAL SIGN BOARD FOR BETTER ROAD SAFETY

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ABSTRACT:- *The increased use of technologies and smart bias in the health zone has brought on extraordinary effects on the world's critical care. Roads are the foremost source of linking between metropolises and townlets. Due to the ease of traveling by road, vehicles have become the main way people travel. The chances of vehicular accidents have increased with the growing number of vehicles on the roads. During a trip, one doesn't know what will be on the coming road, particularly during Bad Weather Conditions (BWC). In such a situation, driving can be dangerous due to bad visibility, which can lead to an accident. It was also noticed that in BWC, multiple vehicle collisions can occur. Currently, the road signs are stationary. But the road signs can be digitized. We can consider some cases when there are some road diversions due to heavy traffic or due to accidents. In that case, we can change the road signs consequently if they're digitized. This design proposes a system which has Digital Boards on which the signs can be dynamically changed. This design uses an Arduino Uno, TFT Display and an Arduino based SD Card Reader for performing. When the roads are slippery, consequently the speed can be reduced. These smart connected sign boards get the speed limitations from openweather API and update automatically. Traffic and Construction data are collected from google map API and correspondingly warnings and diversions are displayed.*

Keywords: Digital Sign Board, Dynamic, Arduino, Speed Limits, Warnings, APIs.

1. INTRODUCTION:-
1.1. DOMAIN OVERVIEW

A static traffic sign board system is a type of traffic control system that uses physical signs to convey information to drivers, pedestrians, and other road users. These signs are typically made of metal, plastic, or other durable materials, and are mounted on poles or other structures along the roadside.

Static traffic sign boards are used to provide important information about traffic conditions, construction, detours, and other issues that may impact the flow of traffic. They can be found in a variety of settings, including freeways, highways, intersections, and other locations where traffic information may be relevant.

Some common types of static traffic sign boards include:

Regulatory signs: These signs are used to convey information about the rules of the road, such as speed limits, traffic signals, and other regulations that drivers must follow.

Warning signs: These signs are used to alert drivers to potential hazards or dangers ahead, such as curves, construction, or animals crossing the road.

Guide signs: These signs are used to provide information about the location and direction of specific destinations, such as airports, hospitals, or exits.

Static traffic sign boards are an important tool for improving road safety and helping drivers navigate through busy or unfamiliar areas. They can help to reduce the risk of accidents and improve the efficiency of the

transportation system by providing timely and relevant information to road users.

Digital traffic sign boards are electronic displays that are used to convey information to drivers, pedestrians, and other road users. These signs are typically installed on or near roadways, and are used to provide important information about traffic conditions, construction, detours, and other issues that may impact the flow of traffic.

Digital traffic sign boards can be found in a variety of settings, including freeways, highways, intersections, and other locations where traffic information may be relevant. These signs can be used to display text, images, or videos, and can be updated in real-time using a computer or other device.

Digital traffic sign boards are an important tool for improving road safety and helping drivers navigate through busy or unfamiliar areas. They can help to reduce the risk of accidents and improve the efficiency of the transportation system by providing timely and relevant information to road users.

1.2. ROAD RULES AND SAFETY

Road rules and road safety measures are designed to help ensure the safety of everyone who uses the roads, including drivers, pedestrians, and bicyclists. These rules and measures are put in place to prevent accidents, injuries, and fatalities on the roads.

Here are some examples of common road rules and road safety measures:

1. Obeying traffic signals and signs: This includes stopping at red lights and stop signs, yielding to pedestrians at crosswalks, and following speed limits.
2. Wearing a seatbelt: Wearing a seatbelt can help protect you in the event of a crash.
3. Using turn signals: Turn signals let other drivers know what you plan to do, helping to prevent accidents.
4. Avoiding distractions: Distractions such as texting while driving, eating, or using a GPS can take your attention off the road and increase the risk of an accident.
5. Sharing the road: It's important to be aware of other road users, such as pedestrians, bicyclists, and motorcyclists, and to give them the space they need to safely use the road.
6. Maintaining your vehicle: Proper maintenance of your vehicle, including checking the brakes, tires, and lights, can help prevent accidents.

By following these road rules and road safety measures, you can help make the roads safer for everyone.

2. EXISTING TECHNIQUE: -

This existing technique proposes a system in which uses drawings and paintings to display the traffic signs. Also, in some places digital boards are used where it also shows a static sign. It will not be dynamic. The main problem in this is that most of people will not notice the sign which leads to major accidents. Also, some of the signs are not known and recognizable by most of the people.

3. SYSTEM HARDWARE:-

3.1. Arduino UNO

The Arduino Uno is a microcontroller board based on the ATmega328 microcontroller. It was released in 2010 and has become one of the most popular and widely used Arduino boards.

The Arduino Uno has 14 digital input/output pins, 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It can be powered via the USB connection or an external power supply.

The Arduino Uno is programmed using the Arduino Integrated Development Environment (IDE), which is based on the Processing programming language. The Arduino IDE allows users to write and upload code to the board using a variety of programming languages, including C++ and Python.

The Arduino Uno is a versatile platform that can be used to control a wide variety of electronic devices, including LEDs, motors, and sensors. It is commonly used in DIY electronics projects and is a popular choice for beginners due to its low cost and ease of use. The Arduino Uno is also compatible with a large number of third-party hardware and software libraries, making it a great platform for building a variety of projects.
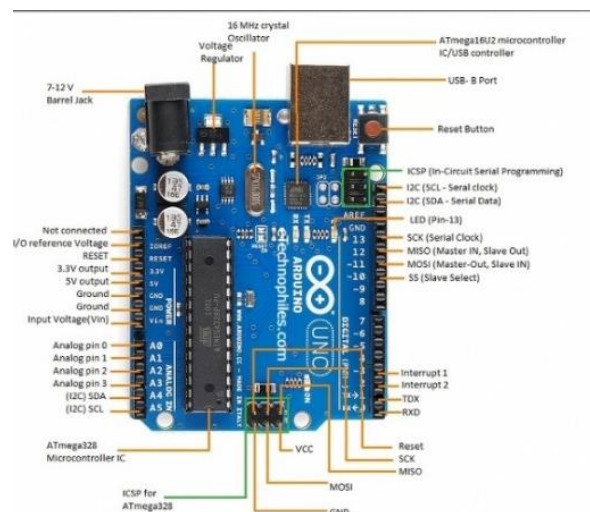

Fig.1 Arduino UNO Pin Diagram

3.2. TFT Display

A TFT (Thin Film Transistor) display is a type of LCD (Liquid Crystal Display) that uses thin-film transistor technology to improve image quality and increase the response time of the display. TFT displays are commonly used in a variety of electronic devices, including smartphones, tablets, laptops, and TVs.

TFT displays work by using a matrix of thin-film transistors (TFTs) to control the flow of electric current through the display. Each pixel on the display is controlled by a single TFT, which allows for precise control of the pixel's brightness and color. This results in high image quality and fast response times, making TFT displays suitable for displaying fast-moving video and other dynamic content.

TFT displays are available in a range of sizes and resolutions, and can be used in both monochrome and color configurations. They are also available in different orientations, including portrait and landscape. TFT displays can be connected to a microcontroller, such as an Arduino, using a variety of interfaces, including SPI (Serial Peripheral Interface), I2C (Inter-Integrated Circuit), and parallel.
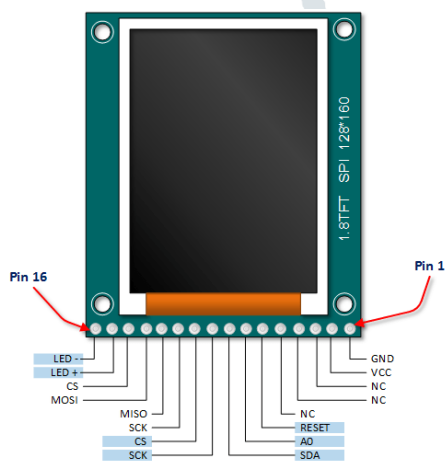

Fig.2 TFT Display Pin Diagram

3.3. SD CARD READER

An SD card reader is a device that allows a microcontroller, such as an Arduino, to read and write data to and from an SD card (Secure Digital card). SD cards are small, portable storage devices that are commonly used in a variety of electronic devices, including cameras, smartphones, and tablets.

There are several types of SD card readers available for use with an Arduino, including USB-based readers and stand-alone readers that connect to the Arduino's SPI (Serial Peripheral Interface) or I2C (Inter-Integrated Circuit) bus.

To use an SD card reader with an Arduino, you will need to install a library that provides the necessary functions to access the SD card. The Arduino SD library is a popular choice for this purpose, and it is included with the Arduino IDE.

Using an SD card reader with an Arduino allows you to store and retrieve large amounts of data from the SD card, which can be useful for applications such as data logging, storing large files, and providing additional storage for your Arduino projects.

Fig.3 SD Card Reader

4. WORKING OF PROPOSED METHOD:-

Instead of the static system, this system uses a Digital Sign Board. There are some cases when there are some road diversions due to heavy traffic or due to accidents. These Digital Sign Boards function dynamically.

The dynamic features of the Digital Traffic Sign Board are:

Speed Limitations: These smart connected sign boards get the speed limitations from weather API and update automatically. Accordingly, the speed limit will be increased or decreased.

Displaying real-time traffic information: Digital traffic sign boards can be used to show drivers the current traffic conditions on a particular roadway. This can include information about delays, accidents, construction, or other events that may impact the flow of traffic.

Providing construction updates: Digital traffic sign boards can be used to inform drivers about construction or roadwork that may impact their route. This can include information about detours, lane closures, and other changes to the roadway.

5. RESULT:-

The results can be displayed in the TFT Display which is considered as the digital board.
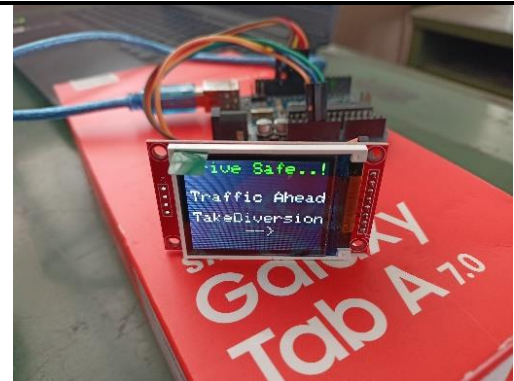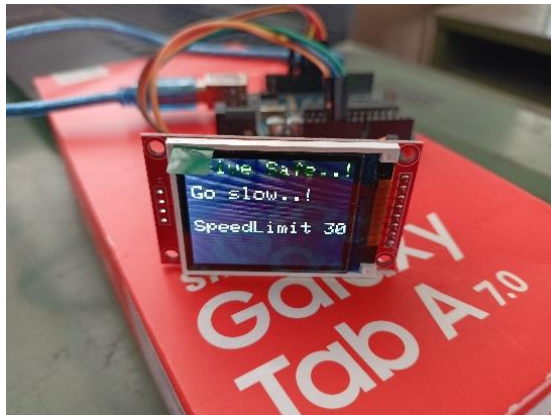
Fig.4 Normal Sign with speed limit
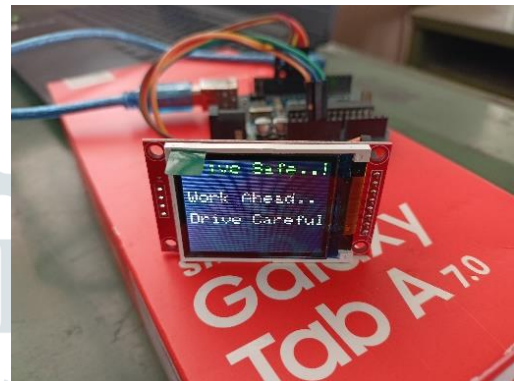

Fig.5 Speed Limitation based on weather

Fig.6 Decrease of speed limit based on weather

Fig.9 Traffic Warning

Fig.10 Diversion for Traffic

Fig.11 Construction Warning

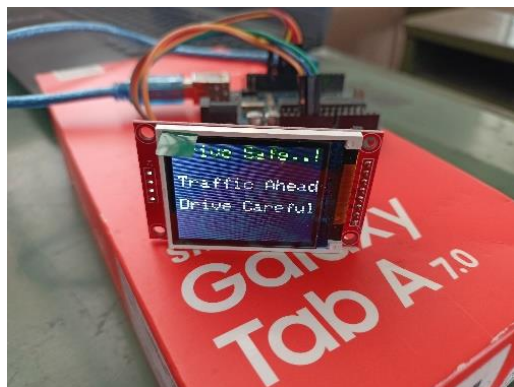Fig.12 Service Warnings

6. CONCLUSION:-

By using this method, accidents can be reduced in a larger amount. This project is a digital and dynamic version of the current static system. Additionally, it uses API to collect weather data and control the speed limits. Also, APIs are integrated for traffic, construction monitoring for providing diversion in some cases.

7. Future Work:-

In future, we planned to implement a speed cam in order to detect any speed violations. According to this, if there are any speed violations detected, the camera will take a snap of the driver or sometimes the number plate of the car. The data captured will be uploaded to a cloud platform or a webpage. The cloud platform or the webpage will access will be given to the respected authorities who will continuously monitor it. A database consisting of all

user data will be available. The snap taken previously will be matched with the existing database. When a match is found, the details of the person such as Name, License ID, Car number plate details, address etc. are uploaded to the cloud or webpage. In the webpage, there will be option called "Notify". On pressing, it will send a notification to the person with a fine amount. In case, if the person violates more than 3-5 times in a month, their license will be cancelled. In addition, violations such as No Parking Violations, One-way Traffic Violations can also be monitored.

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