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ARTIFICIAL INTELLIGENCE BASED ACCIDENT PREVENTION SYSTEM

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Abstract – *The report describes the creation of a complex system aimed at tracking head gestures and preventing accidents by using machine learning, graphical programming, and hardware components. By employing a webcam, the system detects head movements and analyzes them using a trained machine learning model. It then triggers responses through hardware devices controlled by an ESP8266 microcontroller. The report begins by introducing Teachable Machine and PictoBlox, highlighting their roles in creating machine learning models without coding. It then explains the stages of the machine learning process, from defining objectives to deploying models. Additionally, it reviews existing AI-based accident prevention systems, discusses hardware integration, and explores the functions of specific components such as the ESP8266, buzzer, and vibrator motor. Detailed explanations of hardware components, interfacing with PictoBlox, and example programs are provided, along with step-by-step instructions for block programming in PictoBlox, including machine learning integration. Finally, the report concludes with abstract, program, and output sections summarizing the project's goals, methodologies, and achievements, demonstrating the effective use of machine learning, graphical programming, and hardware integration to enhance safety proactively.*

***Key Words*: Accident Prevention, Artificial intelligence, Machine Learning, ESP8266, Teachable Machine, Safety, Buzzer, Vibrator Motor, Pictoblox, Block Program.**

1.INTRODUCTION

Teachable Machine is an online tool designed for individuals to train their own machine learning classification models without any coding knowledge. Users can utilize their webcam, images, or sound to train models. It employs transfer learning, a machine learning technique, to identify patterns and trends within the provided data and swiftly generate a classification model. Through transfer learning, users can incorporate their own data and refine a model based on a pre-existing base model that has been trained on a vast dataset within a specific domain. For instance, the base model (mobilenet) used for image recognition in Teachable Machine was initially trained to recognize 1000 classes (such as dogs, phones, beds, trombones, etc.). The inherent features utilized by mobilenet to recognize these classes can also be applied to identify new classes defined by the user. This intricate process is concealed from users, who can benefit from requiring less data and training time to develop effective and accurate models. PictoBlox, on the other hand, is a graphical programming software modeled after the latest version of Scratch, designed to make coding an enjoyable and straightforward experience. Featuring a user-friendly interface and drag-and-drop functionality, it serves as an ideal platform for beginners venturing into the realm of programming.

2. LITERATURE REVIEW

Numerous approaches have been explored in prior studies to tackle distracted driving incidents, incorporating both technological advancements and behavioral interventions aimed at reducing driver distractions and enhancing road safety.

- **Cognitive Distraction Assessment**: Previous research has examined various methods for assessing cognitive distraction among drivers, including eye tracking, cognitive workload assessments, and reaction time tests. By monitoring these factors, researchers can identify periods of heightened distraction and develop targeted interventions to mitigate their impact.

- **Behavioral Interventions**: Researchers have also explored behavioral interventions to address distracted driving behaviors. These interventions encompass educational campaigns, enforcement of distracted driving laws, and the implementation of incentive-based programs to promote safe driving practices. By focusing on driver attitudes and behaviors, these interventions aim to cultivate a culture of distraction-free driving.

- **Technological Solutions**: Technological advancements have led to the development of innovative solutions to combat distracted driving. These solutions include smartphone applications that disable certain functions while driving, in-vehicle systems that offer real-time feedback on driver behavior, and vehicle-to-infrastructure communication systems that alert drivers to potential hazards. By harnessing technology, these solutions strive to mitigate the impact of distractions on driving performance.

- **Public Policy Initiatives**: Governments and regulatory bodies have implemented various public policy initiatives to address distracted driving. These initiatives may involve enacting laws to prohibit specific behaviors, such as texting while driving, imposing fines and penalties for offenders, and allocating resources to support enforcement efforts. By establishing legal frameworks and raising awareness of the risks associated with distracted driving, these initiatives seek to influence societal norms and behaviors.

- **Collaborative Efforts**: Recognizing the multifaceted nature of distracted driving, collaborative efforts involving diverse stakeholders, including government agencies, industry partners, and advocacy groups, have emerged. These collaborations aim to pool resources, share best practices, and coordinate efforts to comprehensively address distracted driving. By fostering collaboration and cooperation, these initiatives seek to amplify the impact of individual interventions and drive meaningful change.

3. WORKING PRINCIPLE

- The safety system incorporates a microcontroller, webcam, vibrator motor, and buzzer to enhance road safety measures.
- The webcam continuously captures real-time images of the driver's eyes, utilizing AI-powered computer vision for immediate analysis. These video feeds are processed through the microcontroller's Bluetooth module.
- Upon detecting signs of drowsiness or distraction, the buzzer issues an instant alert to the driver. If there's no response within ten seconds, the vibrator motor, installed on the steering wheel, provides tactile feedback.
- This integrated configuration constitutes a closed-loop system, merging auditory and tactile signals to promptly intervene and mitigate accidents stemming from driver fatigue or inattention.
- Through seamless integration of cutting-edge technologies, the system actively improves road safety standards.

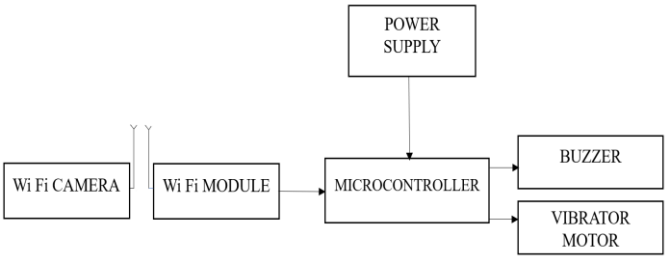

Fig – 1 : Block Diagram

4. HARDWARE AND SOFTWARE

4.1 ESP8266

The ESP8266 stands out as a budget-friendly Wi-Fi microchip featuring built-in TCP/IP networking software and microcontroller capabilities. It originates from Espressif Systems in Shanghai, China. Initially introduced to the English-speaking maker community through the ESP-01 module by third-party manufacturer Ai-Thinker in August 2014, it quickly gained popularity. This compact module enables microcontrollers to establish connections with Wi-Fi networks and execute basic TCP/IP operations using Hayes-style commands. Despite the initial scarcity of English documentation on the chip and its commands, its exceptionally low price and minimal external component requirements attracted a wave of hackers eager to explore its potential. This interest led to efforts to decipher the Chinese documentation and delve into the module, chip, and associated software. An evolution of this technology, the ESP8285, shares similar features but boasts built-in 1 MiB flash memory, enabling the development of single-chip devices capable of Wi-Fi connectivity. Subsequently, the ESP32 family of devices has succeeded these microcontroller chips, offering expanded capabilities and functionalities.

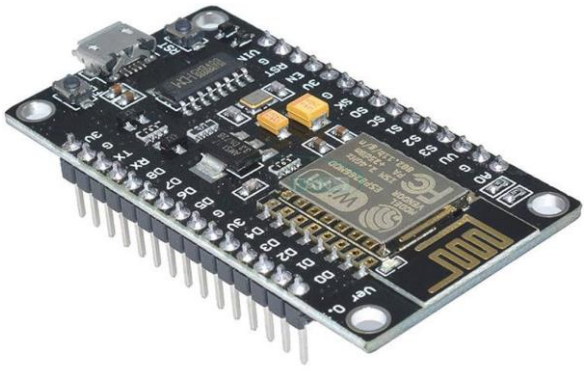

Fig – 2 : ESP8266

4.2 BUZZER

Audio signaling devices, such as beepers or buzzers, come in electromechanical, piezoelectric, or mechanical variations. Their primary purpose is to convert audio signals into audible sound. Typically powered by DC voltage, they find application in timers, alarm systems, printers, computers, and various other devices. Depending on their design, they can produce a range of sounds, including alarms, music, bells, and sirens.

Fig – 3 : Buzzer

4.3 VIBRATOR MOTOR

A vibrator is a mechanical device designed to create vibrations, usually accomplished by an electric motor with an unbalanced mass attached to its drive shaft. Vibrators come in various types, and they are often integrated as components within larger products like smartphones, pagers, or video game controllers featuring a "rumble" feature. In devices such as smartphones and pagers, the vibrating alert is generated by a compact component embedded within the device itself.

Fig – 4 : Vibrator Motor

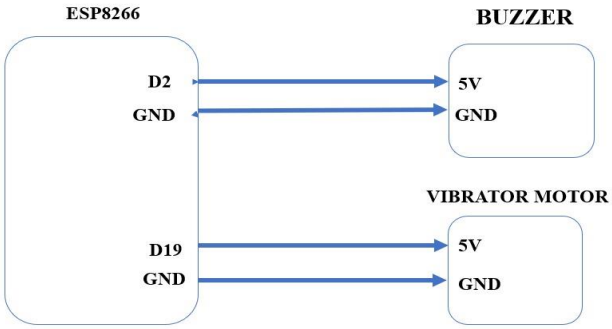

Fig – 5 : Connection Diagram

4.4 PICTOBLOX SOFTWARE

PictoBlox, a Scratch 3.0-based graphical programming software, serves as an excellent introduction to programming for beginners. Its intuitive interface and drag-and-drop functionality eliminate the need to memorize syntax and rules, which can often intimidate children new to programming. With PictoBlox, users can focus solely on problem-solving and developing essential skills like logical reasoning.

This software empowers users to create interactive games, animations, and even program robots, fostering creativity and critical thinking. In this paper, we explore how PictoBlox can be utilized in the context of artificial intelligence to nurture computational thinking and problem-solving abilities among primary school students.

Fig – 6 : Block Program

5. TEACHABLE MACHINES

Teachable Machine is a web-based tool designed by Google to simplify the creation of custom machine learning classification models, catering to users without specialized technical skills. With machine learning, these models can analyze data without the need for explicit programming. The platform aims to democratize machine learning by enabling students, teachers, designers, and enthusiasts to develop and utilize their own models. Its intuitive interface has led to widespread adoption, allowing individuals to explore and comprehend machine learning concepts more effectively. Users have leveraged Teachable Machine to develop educational materials, tutorials, and projects covering various topics, including AI ethics. Esteemed institutions like Stanford University, NYU's Interactive Telecommunications Program, and the MIT Media Lab have embraced this tool for creative experimentation and learning.

5.1 TEACHING MODEL

Quickly and effortlessly create machine learning models for your websites, applications, and beyond—no expertise or coding skills needed.

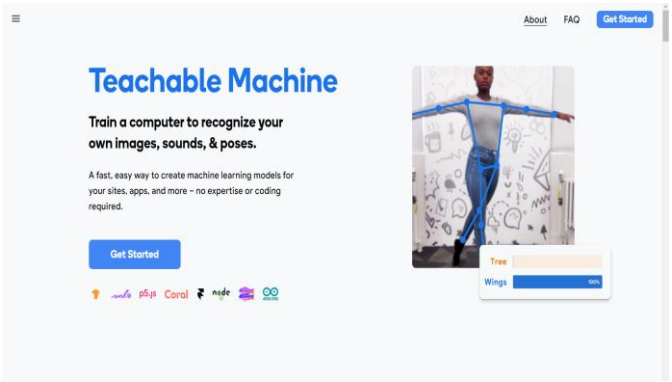

Fig – 7 : Start Teaching

- Click the "Get Started" button.

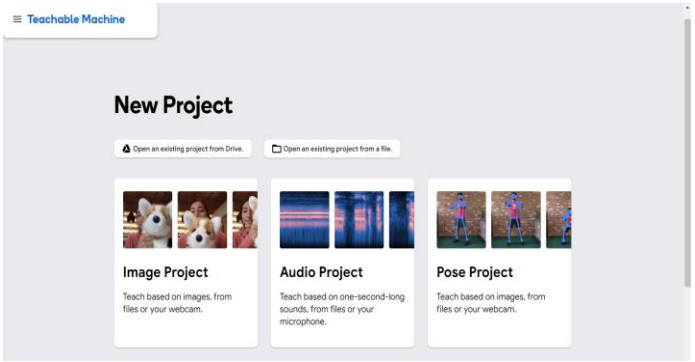

Fig – 8 : New Project Page

- Navigate to the "New Project" page and select "Image Project."

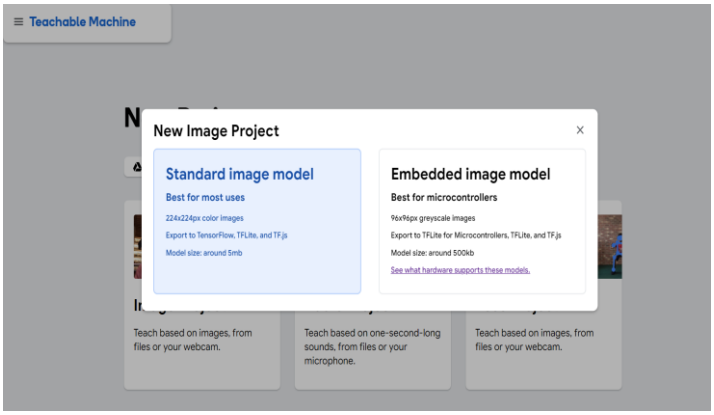

Fig – 9 : Standard Image Model

- Choose any desired model from the options available.

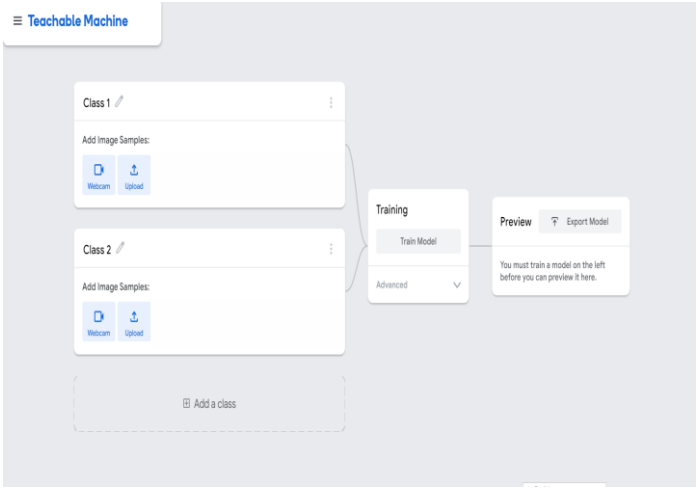

Fig – 10 : Training Window

- Utilize the webcam to create sample classes.

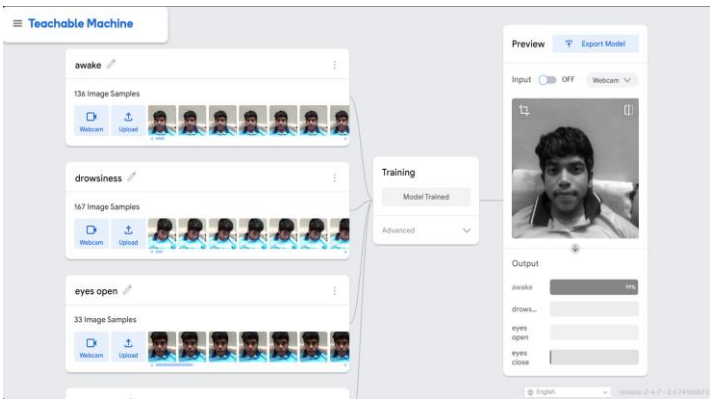

Fig – 11 : Training Sample Window

- Train the sample model and select the "Export Model" button.

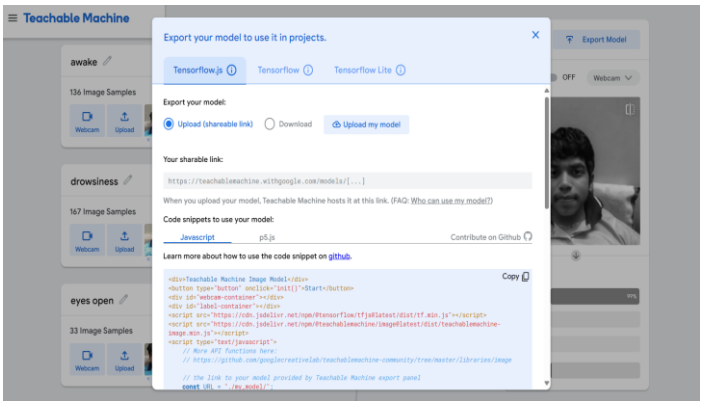

Fig – 12 : Export Model Window

- After exporting, a page will appear prompting you to upload the model. Click the "Upload my Model" button.

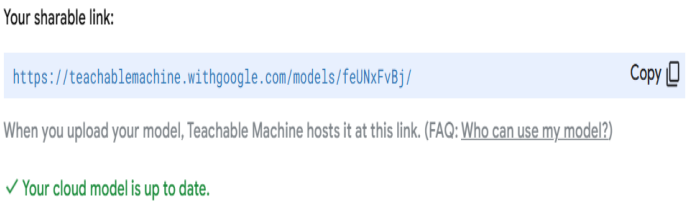

Fig – 13 : Link

- Once uploaded, a sharable link will be generated. Copy this link.

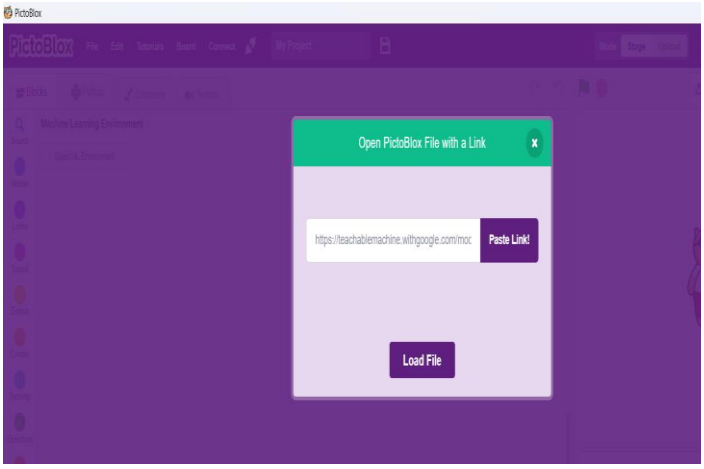

Fig – 14 : Paste Link

- Paste the copied link into the Pictoblox Software and click "Load File." The respective machine learning codes will then be generated.

Fig – 15 : Output

6. CONCLUSION

The combination of PictoBlox and Teachable Machines presents a robust and accessible solution with myriad applications, spanning computer vision projects to assistive technologies. PictoBlox's intuitive visual programming interface empowers users of all levels to effortlessly design and deploy eye detection systems.

On the other hand, Teachable Machines offer the capability to train and fine-tune machine learning models specifically for eye detection. This flexibility enables customization of detection models, catering to unique scenarios and user requirements.

When integrated, PictoBlox and Teachable Machines create a versatile platform for eye detection, fostering innovation in healthcare, accessibility, and security sectors. With a detailed explanation of the process and utilization of these tools, developers, educators, and enthusiasts alike are equipped to create precise and effective eye detection systems.

As technology progresses, the synergy between PictoBlox and Teachable Machines is poised to drive further advancements in eye detection applications, making them more advanced and accessible than ever before.

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