SSM INSTITUTE OF ENGINEERING AND TECHNOLOGY

Intelligent Speed Limit Recognition and Engine Control System for Enhanced Road Safety

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OBJECTIVE

The proposed system uses a Python-based speed limit detection system and an Arduino-based motor speed regulation system to regulate a motor's speed based on the speed limit of the area. This system aims to improve road safety by reducing the number of accidents caused by speeding.

ABSTRACT

In recent years, road accidents caused by speeding have become a major concern for road safety authorities. To address this issue, we propose a system that combines a Python-based speed limit detection system and an Arduino-based motor speed regulation system. The aim of the proposed system is to regulate the speed of a motor based on the speed limit of the area in which the motor is being used. The speed limit detection system uses machine learning algorithms to detect and classify the speed limit signs, while the motor speed regulation system uses a Arduino controller to regulate the speed of the motor based on the speed limit. The proposed system provides a cost-effective solution for speed limit regulation in areas where speed limits frequently change. The system can be easily implemented on different types of motors and can be extended to include other features, such as automatic braking systems and collision detection systems. The proposed system has the potential to improve road safety and reduce the number of accidents caused by speeding.

INTRODUCTION

- A proper management of a traffic-sign inventory is an important task in ensuring safety and efficiency of the traffic flow.
- Most often this task is performed manually.
- Traffic signs are captured using a vehicle-mounted camera and a manual localization and recognition is performed off-line by a human operator to check for consistency with the existing database.
- However, such manual work can be extremely time-consuming when applied to thousands of kilometers of roads.

INTRODUCTION

- Automating this task would significantly reduce the amount of manual work and improve the safety through a quicker detection of damaged or missing traffic signs
- Computer vision is increasingly used in the field of intelligent transport , and traffic sign recognition is a very important part of this.
- These systems are typically based on detecting a region of interest (ROI), in which the traffic sign is located, using characteristics such as color and geometric form.
- In computer vision, the ROI defines the borders of an object under consideration and is commonly used in many application areas, such as medical imaging.

LITERATURE SURVEY

s.No	Title	Author	Journal,Year	Method
1	Real-time traffic-sign recognition using tree classifiers	Fatin Zaklouta et al	IEEE Transactions on Intelligent Transportation Systems ,2012	Evaluate the performance of k-d trees, random forests, and support vector machines (SVMs) for traffic-sign classification using different-sized histogram-of-oriented-gradient (HOG) descriptors and distance transforms (DTs).
2	Traffic sign detection and recognition using features combination and random forests	A. Ellahyani et al	Int. J. Adv. Comput. Sci. Appl,2016	Distance to border feature and Random Forests classifier to detect circular, triangular and rectangular shapes on the segmented images.
3	An efficient method for traffic sign recognition based on extreme learning machine	Z. Huang et al	IEEE Trans. Cybern,2017	This proposed method consists of two modules: (1) extraction of histogram of oriented gradient variant (HOGv) feature and (2) a single classifier trained by extreme learning machine (ELM) algorithm.

LITERATURE SURVEY

s.No	Title	Author	Journal,Year	Method
4	A novel traffic sign detection method via color segmentation and robust shape matching	H. Li et al	Neurocomputing, ,2015	Propose a new traffic sign detection method by integrating color invariants based image segmentation and pyramid histogram of oriented gradients (PHOG) features based shape matching.
5	Supervised low-rank matrix recovery for traffic sign recognition in image sequences	Deli Pei et al	IEEE Signal Processing Letters, 2013	Present a supervised low-rank matrix recovery model to leverage these correlations for classification tasks by introducing a supervised penalty term to the classic low-rank matrix recovery model.
6	Traffic sign detection based on convolutional neural networks	Y. W et al	IEEE Conf. Intell. Transp. Syst,2017	Propose an approach for traffic sign detection based on Convolutional Neural Networks (CNN)

EXISTING SYSTEM

- Histogram of oriented gradients (HOG)
- Scale invariant feature transform (SIFT)
- Local binary patterns (LBP) or integral channel features.
- Machine learning methods -SVM, Random forests, Artificial neural networks , Extreme learning machine (ELM)
- Advanced Driver Assistance Systems (ADAS)

DRAWBACKS OF EXISTING SYSTEM

- Existing speed limit detection and motor speed regulation systems suffer from several drawbacks, which can limit their effectiveness in regulating motor speeds and ensuring road safety. Some of the drawbacks are:
- **Limited accuracy:** Existing speed limit detection systems can suffer from limited accuracy, especially in adverse weather conditions or in low light situations. This can result in incorrect speed limit detection, which can lead to inaccurate motor speed regulation.
- **High cost:** Some existing speed limit detection and motor speed regulation systems can be costly to implement, which can make them inaccessible to low-income communities or regions with limited resources.
- **Limited flexibility:** Some existing systems can be inflexible, meaning that they may not be able to adapt to changes in speed limits or road conditions. This can result in the system being ineffective in certain situations.
- **Complex installation:** Some existing systems can be complex to install and maintain, which can make them difficult to implement in certain regions or for certain types of motors.
- **Limited features:** Some existing systems may only provide speed limit detection and motor speed regulation, without offering additional features such as automatic braking systems or collision detection systems.
- Addressing these drawbacks can lead to the development of more effective and accessible speed limit detection and motor speed regulation systems that can help improve road safety and reduce the number of accidents caused by speeding.

PROPOSED SYSTEM

- The proposed system is a combination of a Python-based speed limit detection system and an Arduino-based motor speed regulation system. The aim of this system is to regulate the speed of a motor based on the speed limit of the area in which the motor is being used. The system consists of two main parts :

  - Speed Limit Detection System &
  - Motor Speed Regulation System

- Proposed detection and recognition utilizing an approach based on the ensemble Neural Network detector.
- The system provides an efficient deep network for learning a large number of categories with efficient and fast detection

PROPOSED DIAGRAM

OVERALL PROCESS

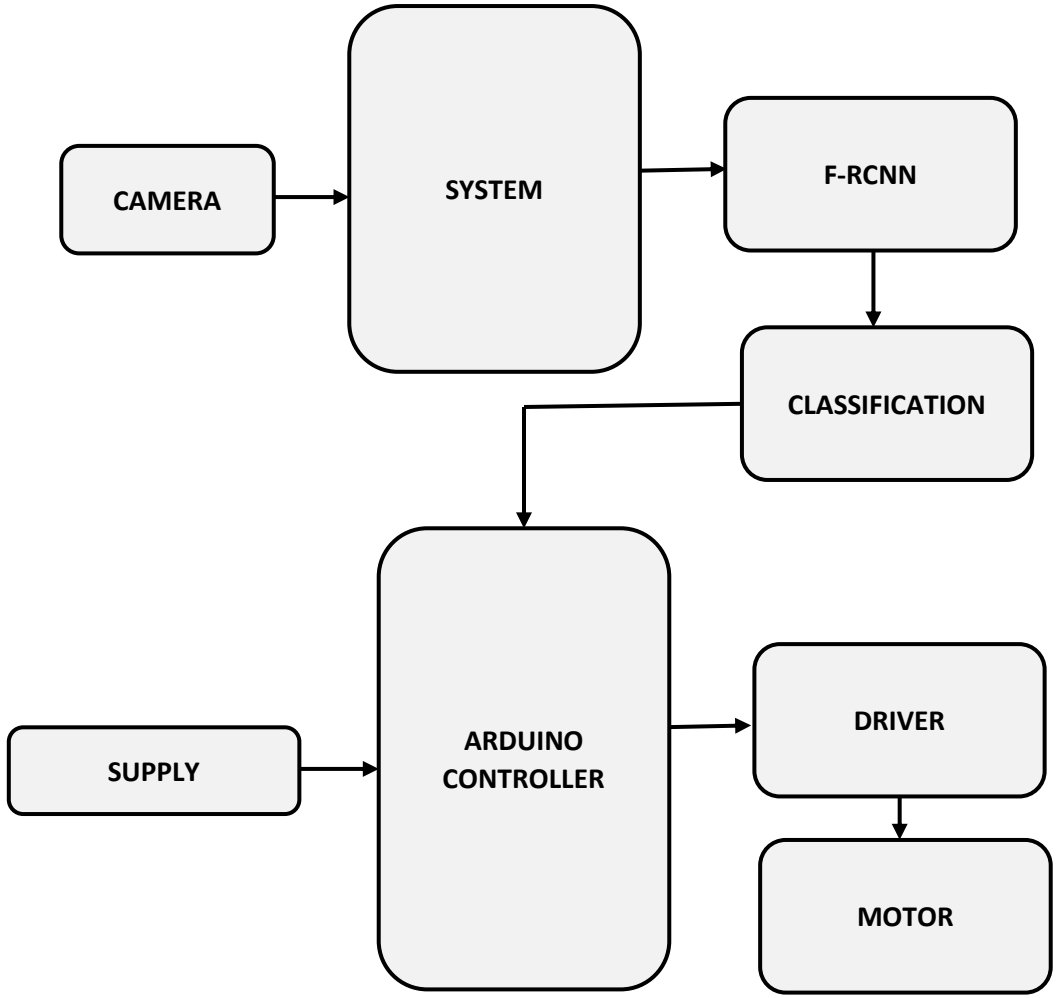
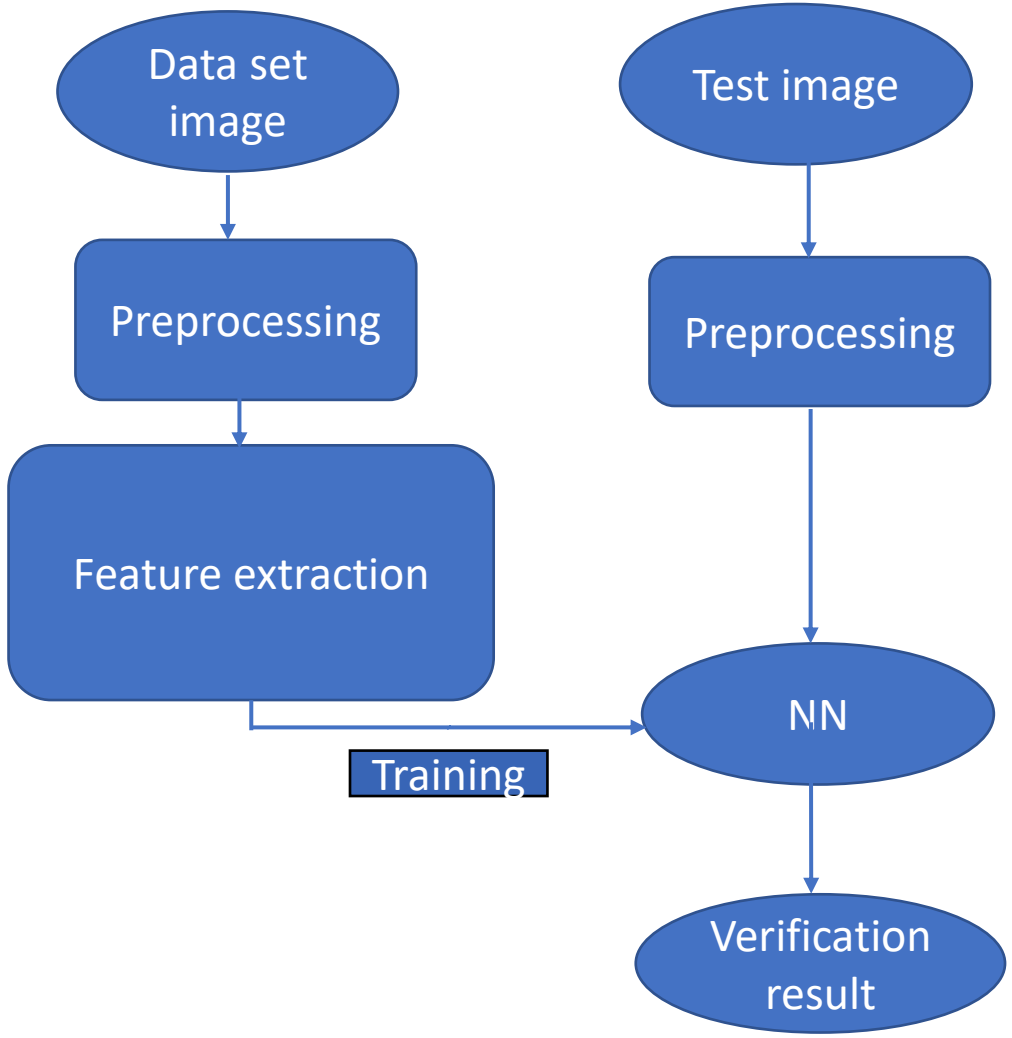


IMAGE PROCESSING



WORKING

- The working of the proposed system of Python-based speed limit detection and Arduino-based motor speed regulation can be described in the following steps:

- **Image capture:** The system uses a camera to capture images of the road ahead.

- **Image processing:** The captured images are processed using computer vision techniques to detect and classify speed limit signs. This is done using machine learning algorithms that have been trained on a dataset of speed limit signs.

- **Speed limit detection:** Once the speed limit signs are detected and classified, the system determines the speed limit of the area in which the motor is being used.

- **Motor speed regulation:** The system uses a Arduino controller to regulate the speed of the motor based on the detected speed limit. The PID controller calculates the error between the desired speed and the current speed of the motor and adjusts the motor speed accordingly.

WORKING

- **Motor control:** The adjusted motor speed is sent to the Arduino microcontroller, which controls the motor speed.

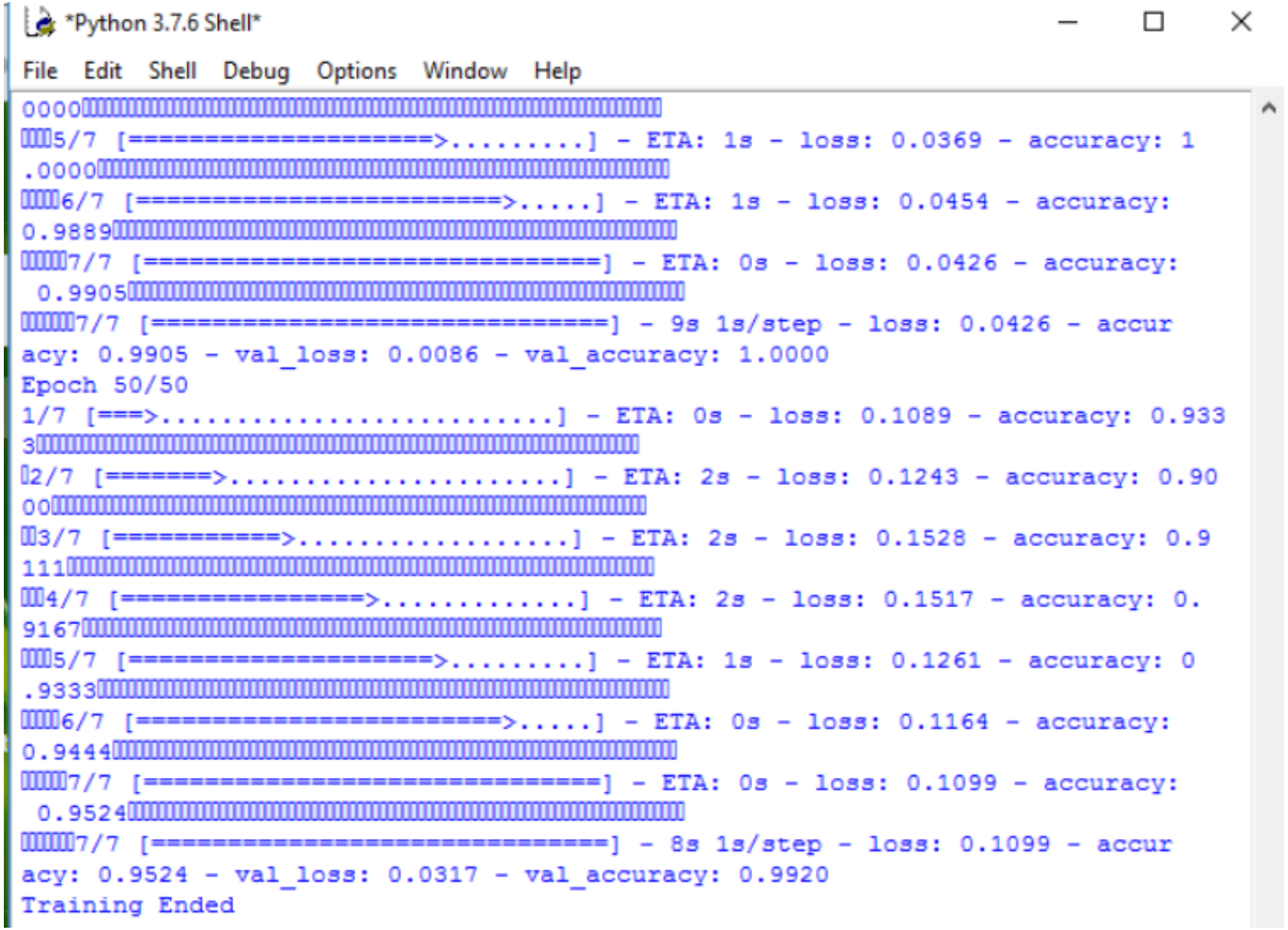
- **Feedback loop:** The system continuously monitors the speed of the motor and adjusts it based on changes in the speed limit. This ensures that the motor speed is always within the speed limit of the area in which it is being used.

- Overall, the system uses a combination of image processing, machine learning, and PID control techniques to accurately detect speed limit signs and regulate motor speed based on the detected speed limit. The system provides a cost-effective and flexible solution for speed limit regulation that can improve road safety and reduce the number of accidents caused by speeding.

LAYER DESIGNING IN PYTHON

```
        return out

    if(a==4):
        out = "THE Predicted Traffic Sign for the given image is U Turn"
        return out


#Training model
model = Sequential()    ## creating a blank model
model.add(Conv2D(32,kernel_size=(3,3),activation='relu',input_shape=(224,224
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Conv2D(64,(3,3),activation='relu'))
model.add(MaxPooling2D(pool_size=(2,2)))
model.add(Dropout(0.25))     ### reduce the overfitting

model.add(Flatten())     ### input layer
model.add(Dense(256,activation='relu'))     ## hidden layer of ann
model.add(Dropout(0.5))
model.add(Dense(5,activation='softmax'))    ## output layer

model.compile(loss='categorical_crossentropy',optimizer='adam',metrics=['acc

model.summary()
```

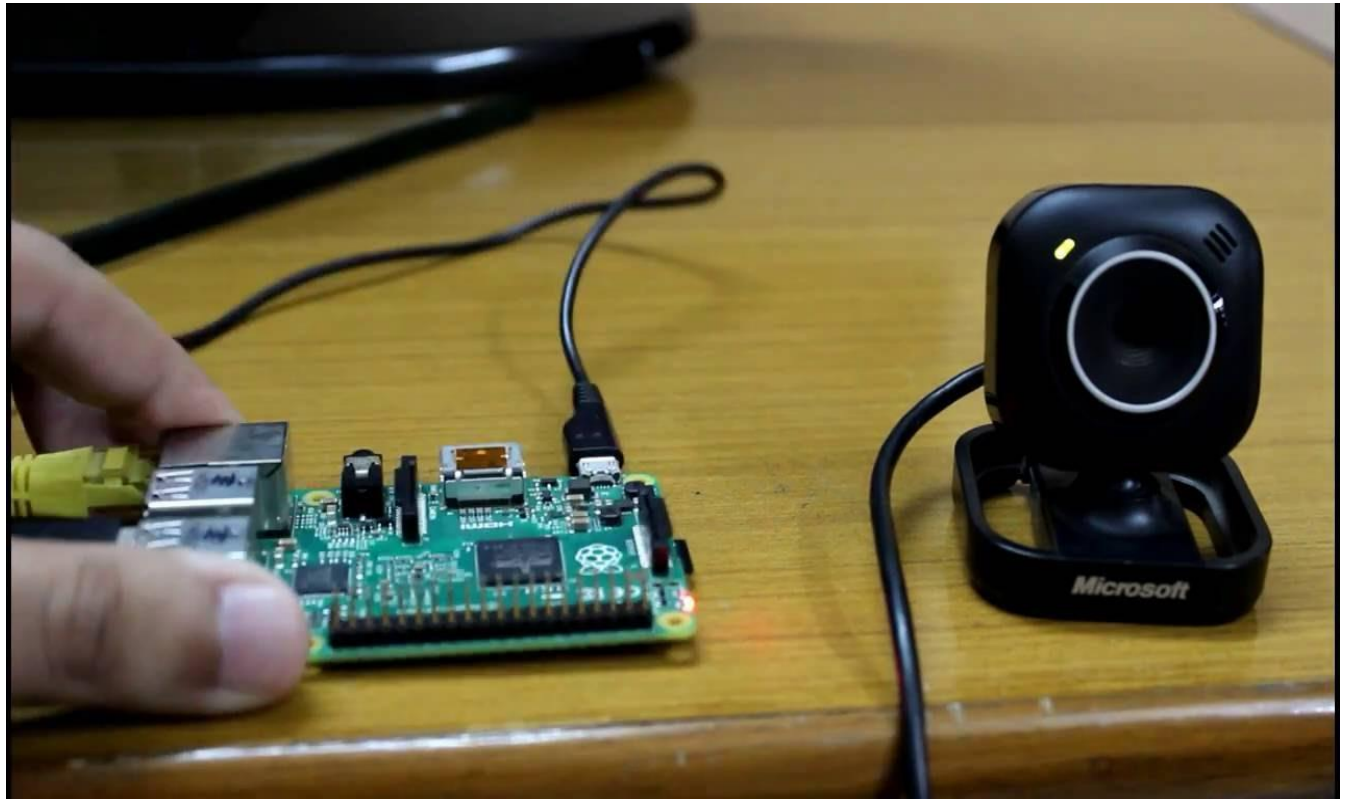
TRAINING


Python 3.7.6 Shell
File Edit Shell Debug Options Window Help
0000
5/7 [====================>.....] - ETA: 1s - loss: 0.0369 - accuracy: 1
.0000
6/7 [=========================>.....] - ETA: 1s - loss: 0.0454 - accuracy:
0.9889
7/7 [==============================] - ETA: 0s - loss: 0.0426 - accuracy:
0.9905
7/7 [==============================] - 9s 1s/step - loss: 0.0426 - accur
acy: 0.9905 - val_loss: 0.0086 - val_accuracy: 1.0000
Epoch 50/50
1/7 [===>.....] - ETA: 0s - loss: 0.1089 - accuracy: 0.933
3
2/7 [=======>.....] - ETA: 2s - loss: 0.1243 - accuracy: 0.90
00
3/7 [==========>.....] - ETA: 2s - loss: 0.1528 - accuracy: 0.9
111
4/7 [===============>.....] - ETA: 2s - loss: 0.1517 - accuracy: 0.
9167
5/7 [====================>.....] - ETA: 1s - loss: 0.1261 - accuracy: 0
.9333
6/7 [=========================>.....] - ETA: 0s - loss: 0.1164 - accuracy:
0.9444
7/7 [==============================] - ETA: 0s - loss: 0.1099 - accuracy:
0.9524
7/7 [==============================] - 8s 1s/step - loss: 0.1099 - accur
acy: 0.9524 - val_loss: 0.0317 - val_accuracy: 0.9920
Training Ended

SOFTWARE REQUIREMENTS

- Python IDLE 3.7
- Arduino IDE

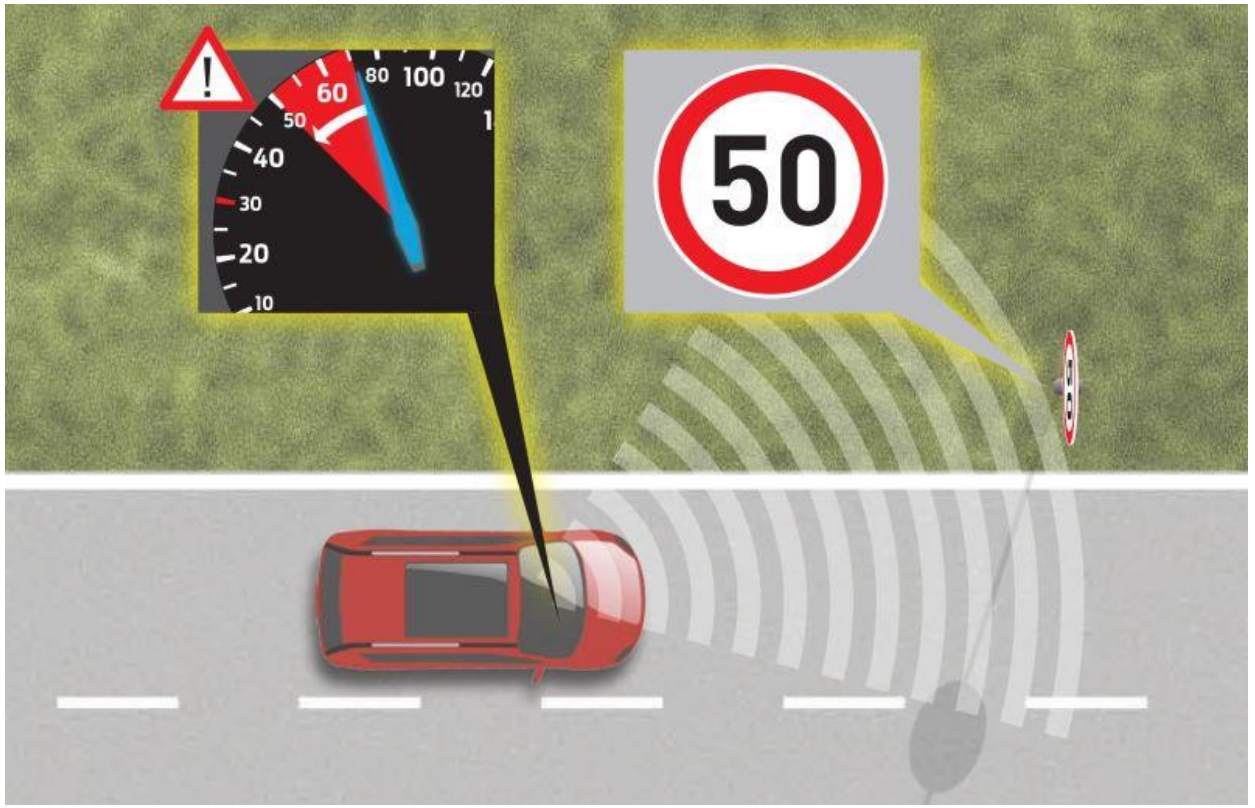
HARDWARE REQUIREMENTS



- Car Dash Camera
- Micro Controller
- Motor Controller
- Display Unit
- Power Supply

ADVANTAGES

- ✓ Enhanced road safety
- ✓ Real-time speed regulation
- ✓ Higher accuracy
- ✓ Integration with existing systems
- ✓ Cost-effective
- ✓ Less training needed



CONCLUSION

In conclusion, the proposed system provides a simple and effective solution for speed limit regulation in areas where speed limits frequently change. The system can help reduce the number of accidents caused by speeding and improve road safety. The proposed system is a cost-effective solution that can be easily implemented on different types of motors.

REFERENCE

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