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DEEP LEARNING BASED VEHICLE DAMAGE ASSESSMENT SYSTEM

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ABSTRACT- ***A Deep learning-based vehicle damage assessment system is an intelligent solution that automates the process of detecting and evaluating vehicle damage from images. The system uses advanced deep learning techniques, particularly convoluational neural Networks (CNNs) and object detection models such as YOLO or Mask R-CNN, to identify damaged areas including dents, scratches, cracks, and broken parts. After analyzing the uploaded vehicle images, the system classifies the type and severity of damage and generates an assessment report. This reduce the need for manual inspection, minimize human error, and speeds yup the insurance claim and repair estimation process. The proposed system provides accurate, reliable, and cost-effectiv e damage assessment, making it beneficial for insurance companies, vehicle owners, and automobiles service centers. By leveraging artificial intelligence and computer vivion, system improves efficiency cocsistent evaluations, and enhances customer satisfaction in the vehicle inspection process.***

KEYWORDS*: Deep learning, Vehicle Damage Assessment, computer vivion, convolutional Neural Networks (CNN), Object Detection, Damage Classification, insurance Claim Automation, Artificial Intelligence (AI).*

INTRODUCTION

With the rapid increase in the number of vehicles and road accidents, the need for quick and accurate vehicle damage assessment has become more important than ever. Traditional methods of inspecton vehicle damage are time-consuming, costly, and dependent on manual evaluation, which can lead to errors and inconsistencies. Recent advancements in artificial intelligence(AI), Deep Learning-Based Vehicle Damage Assessment System uses

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models such as Convoluational Neural Networks(CNNs) and object detection algorithms to detect, classify, and broken parts, providing fast and reliable results that assist in insurance claim processing, repair cost estimation, and vehicle maintenance.

LITERATURE SURVEY

Recent research has shown that deep learning techniques have signification improved the accuracy and efficiency of vehicle damage assessment. Traditional image processing methods relied on handcrafted complex damage patterns. With the introduction of Convoluational Neural Networks(CNNs), automated damage detection models such as YOLO, Faster R-CNN, and Mask R-CNN to identify and localize damage region in real time. Several studies have demonstrated that these models can accurately detect scratches, dents, cracks, and broken parts while reducing the need for manual inseption. Furthermore, transfer learning using pre-trained models has enhanced performance even with limited datasets, making deep learning-based systems more practical for insurance companies, automobiles service centers, and vehicle owners.

RELATED WORK

Several researchers have proposed deep learning-based approaches for automatic vehicle damage detection and assessment. Earlier studies used traditional image processing techniques such as edge detection and feature extaction, but these methods were less accurate under varying lighting conditions and complex backgrounds. Recent works have employed deep learning models, including convolutional Neural Network (CNNs), YOLO, Faster R-CNN, and Mask R-CNN, to detect and classify vehicle damage such as dents, scratches, cracks, and broken parts with high accuracy.

EXISTING SYSTEM

The existing vehicle damage assessment system primarily relies on manual inspection by insurance surveyors or automobile experts. They visually examine the damaged vehicle, identify the affected parts, and estimate the repair cost based on their experience. The process is time-consuming, labor-intensive, and may produce inconsistent result due to human error and subjective judgment. Some exixting automated systems use traditional image processing techniques for damage detection, but their accuracy is limited under varying lighting coditions, different vehicle

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models, and complex backgrounds.

PROPOSED SYSTEM

The proposed Deep Learning-Based vehicle Damage Assessment System uses advanced deep learning and computer vision techniques to automatically detect and assess vehicle damage from images.

The system accepts an image of a damaged vehicle, prepocesses it, and uses a trained deep learning models such as a convolutional Neural Network(CNN) or YOLO to identify damaged regions classify damage, including dents, scratches, cracks, and broken parts. It alsoestimates the damage and generates an assessment report cost estimation and insurance claim processing.

SYSTEM ARCHITECTURE

The proposed Deep Learning-Based Vehicle Damage Assessment System consists of several modules that work together to detect and assess vehicle damage. Initially, the user uploads an image of the damaged vehicle through the application. The image is then preprocessed by resizing, noise removel, and normalization to improve image quality. The preprocessed image is passed to a deep learning model(such as CNN or YOLO), which detects the damage, including dents, scratches, craks, or broken parts. The System then evaluates the severity of the detected damage and generates a detailed damage assessment report. Finally, the results are displayed to the user which can be used for insurance claim processing repair cost estimation and vehicle maintenance.

METHODLOGY DESCRIPTION

The proposed Deep Learning-Based Vehicle Damage Assessment System follows a systematic process to detect and evaluate vehicle damage from images. First, a dataset containing images of damaged and undamaged vehicle is collected and preprocessed by resizing, normalization, and noise removal to improve image quality. The prepocessed images are the used to train a deep learning model, such as a Convoluational Neural Network(CNN) or YOLO, to recognize different types of vehicle damage.

RESULTS AND DISCUSSION

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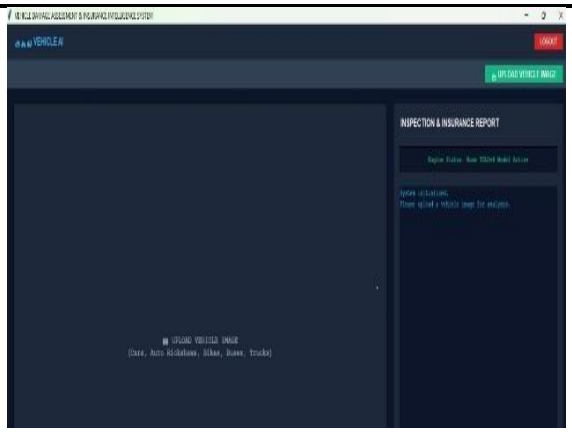

Fig 1: Home page

This page is the Home page of the Vehicle Damage Assessment & insurance Intelligence System. It is the main interface where user upload vehicle images,perform AI-based damge detection, and generate inspection and insurance report.

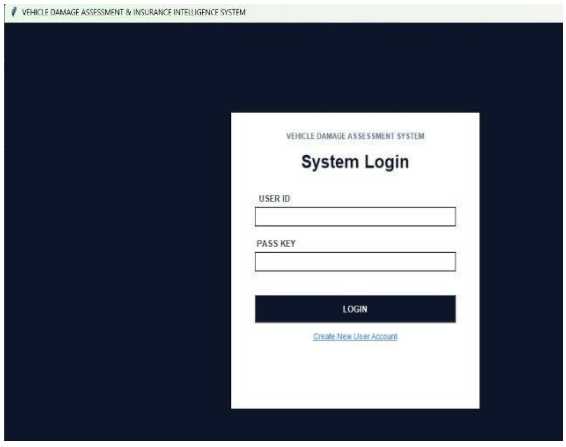

Fig 2: Login page

User can login with previous account creating mails and passwords. Here user can login only after account creating.

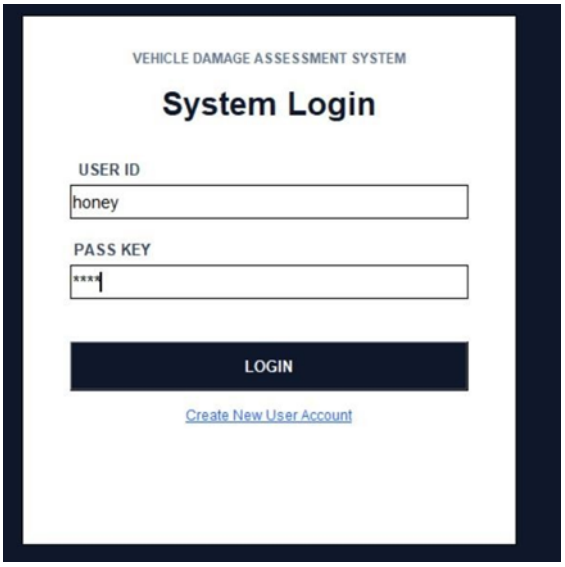

Fig 3: System login page

This page is the system login page of the Vehicle Damage Assessment System. It allows registered users to log into the applications using the credentials created during the registration process.

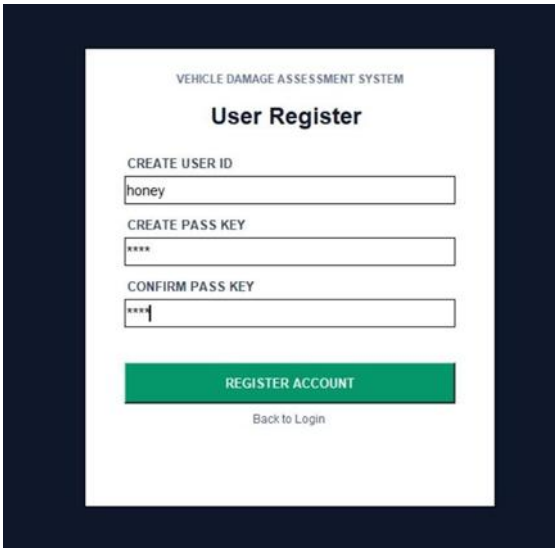

Fig 4: User Registration page

This page is the user registration page of the vehicle damage assessment system of the process very useful for

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this. It enables new users to create an account before accessing the system.

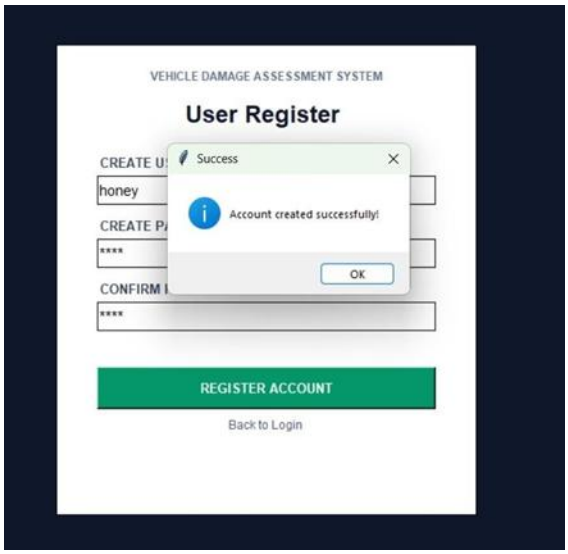

Fig 5: Registration Success page

The page displays a registration success confirmation after a new account has been created successfully in the vehicle damage assessment in the vehicle damage assessment system.it confirms that the registration [process has been completed and the users creadentials have been stored successfully.

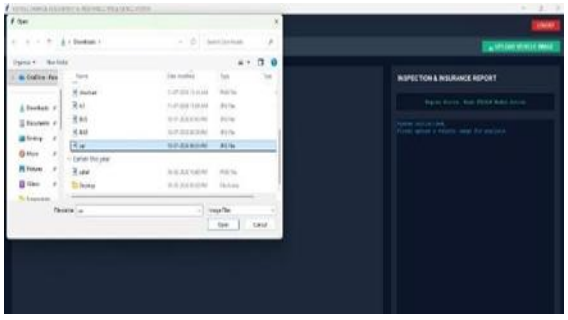

Fig 6: Image Upload page

This page displays the image File Selection Window of the vehicle Damage Assesment& insurancebsystem. It appears after the user clicks the upload Vehicle Image button on the dashboard and allows the user to browse and select a vehicle image from the local computer for AI-based analysis.

Fig 7: Vehicle Damage Analysis Page

This page shows the Vehicle Damage Analyis and insurance Report generated by the Vehicle Damage Assessment & Insurance Intelligence System after a vehicle image has been uploaded.The system uses the YOLOv8 deep learning model to naalyis the uploaded image, identify the damaged part, estimate repair costs, and provide insurance-related information.

CONCLUSION

The Deep Learning-Based Vehicle Damage Assessment System provides an efficient and intelligent solution for automatically detecting and evaluating vehicle damage from images. By utilizing deep learning and computer vision

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techniques, the system accurately identifies damaged areas, classifies the type of damage, and assesses its severity with minimal human intervention. Compared to traditional manual inspection methods, it reduces processing time, improves accuracy, minimizes human error, and supports faster insurance claim processing and repair estimation.

FUTURE SCOPE

The Deep Learning-Based Vehicle Damage Assessment System can be further enhanced by improving its accuracy with larger and more diverse datasets covering different vehicles models and damage types. Furture version can integrate real-time damage detection using mobile applications, allowing users to assess vehicle damage instantly by capturing images with a smartphone. The system can also be connected with insurance claim management platforms to automate claim verification and settlement.

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