CHAPTER 1

INTRODUCTION

Car damage detector is a tool that is used for detecting damages on cars. It is used to detect any kind of damage on the car body, such as dents, scratches, and other structural damages. The detector typically consists of a digital imaging camera and a computer-based system. This digital imaging camera is used tocapture images of the car body and then the computer-based system is used to analyze the image, detect any kind of damage, and generate a report to be used by the owner, the repair shop. Car damage detectors are becoming increasingly popular as they offer an efficient and accurate way to detect car body damages. The detector system is also very useful in providing evidence in court cases, where the photographs takenfrom the damage detector can be used as evidence to prove the extent of damage. The advantage ofusinga car damage detector is that it is a non-invasive tool, and it is also very easy to use. With the use ofa cardamage detector, the owner of the car can quickly detect any kind of damage on their car, allowing them to get the necessary repairs done at the earliest. This also helps to save time and money, as the owner candetect the damage quickly and get it repaired before it gets worse. The car damage detector is also very useful in the insurance industry. It is used to quickly detect and document the extent of damage on a car. This helps the insurance company to assess the cost of the repairs and determine the amount of payment that needs to be made to the repair shop. The car damage detector is also useful in theautomotive industry. It can be used to detect any kind of damage on a car, such as dents, scratches, and other structural damages. This helps the automotive industry to identify the cause of the damage and determine the best way to repair the car.

Car damage detectors are relatively inexpensive and easy to use. They can be used by anyone, even by those who do not have any technical knowledge. This makes it an ideal tool for both car owners and mechanics alike. Car damage detectors are becoming more widely used, as they offer an efficient and accurate way to detect car body damages. It is an invaluable tool for car owners and mechanics, as it helps them to detect any kind of damage on their cars. quickly and easily. In addition, it is also a useful tool in the insurance and automotive industry, as it helps to detect and document the extent of damage ona car. Car damage detection is a system that is used to detect any damage caused to a car due to an accident or other external factors. The damage detector uses an cameras, and other advanced technologies to detect any kind of physical damage to the car body and its components. The purpose of a car damage detector is to provide an accurate assessment of the damage caused to the car and make necessary repairs in order to restore the car to its original condition. The car damage detection system is based on the principle of computer vision, which is a branch o fartificial intelligence. Computer vision uses algorithms to identify objects and patterns in images or video streams. In the case of car damage detection, the computer vision algorithms analyze the images taken from the car's exterior and interior and identify any signs of physical damage. These images are then compared to a database of images of cars in similar conditions. If any discrepancies are found, the car damage detector will alert the user and provide a detailed assessment of the damage that needs to be rectified. The car damage detector can be used to detect damage to all parts of the car, including the windows, doors, panels, bumpers, tires, and engine. The system can also detect a wide range of physical damages such as scratches, dents, and cracks. Once the damage is detected, the car damage detector n provide a detailedassessment of the extent of the damage and the parts that need to be replaced or repaired.

Car accidents can happen anytime and anywhere, and they often result in damage to the vehicle involved. Detecting the extent of the damage can be a time-consuming and costly process, especially ifit is done manually. In recent years, the use of technology has been growing rapidly in various fields, including the automotive industry. One such application is the use of a car damage detector using a web and mobile-based application. The car damage detector using a web and mobile-based applicationis a system designed to quickly detect any damage that may have occurred to a vehicle after an accident. The system uses computer vision technology and machine learning algorithms to analyze images of the damaged vehicle and provide accurate and timely information about the extent of the damage. The web application serves as the main platform for the car damage detector system. Users can access the system from any device with an internet connection. The web application is designed tobe user-friendly and easy to use. The system has a simple interface that enables users to upload imagesof the damaged vehicle and receive a detailed report of the damage. The web application allows users to manage the data and provides a platform to store and retrieve data.

CHAPTER 2

LITERATURE SURVEY

2.1 Detecting vehicles using machine learning and computer vision by Bogdan Djukic

Once we have the prediction model, it's time to use it on our test images. Prediction model will be applied in a special technique called Sliding Windows. With this technique we will be running prediction model on sub-regions of the images which is divided into a grid. In order to increase the robustness of this approach we will be adding multiple grids which will be traversed by the prediction model. We are doing thissince cars can appear on the image in various sizes depending on its location on the road. In order to detect a car on the image, we need to identify feature(s) which uniquely represent a car. We could try usingsimple template matching or relaying on color features but these methods are not robust enough when it comes to changing perspectives and shapes of the object.In order to have a robust feature set and increaseour accuracy rate we will (HOG). This feature descriptor is much more resilient to the dynamics of the traffic. In essence, you should think of features as thumbprints of the objects you are interested in. python library provides us with the necessary API for calculating HOG feature. I have used RGB color space and allits channels as inputs for HOG features extraction. I have tried other color spaces, but YBR gave me the best accuracy when training my prediction model. Here's a sample of vehicle and non-vehicle image with HOG features from the same images.

2.2 Detecting car damage using deep learning by Swapnali Bagal

Deep learning is a powerful tool that can be used to detect car damage. By using convolutional neural networks (CNNs) and other deep learning algorithms, it is possible to identify car damage from images or videos. By using these algorithms, car damage can be accurately identified, even in cases where the damage is difficult to detect with the naked eye. Additionally, deep learning algorithms can be used to detect patterns in the images or videos that may indicate a potential problem, allowing for early detection of car damage before it becomes a serious issue. First, a dataset of images or videos of damagedand undamaged cars must be collected

This dataset can be used to train the deep learning algorithm to recognize car damage. Once the dataset is ready, the CNNs and other deep learning algorithms can be used to detect the car damage. The CNNs can be used to learn the features of the images or videos that are indicative of car damage.The algorithms can then be used to identify these features in other images or videos. In additionto identifying car damage, deep learning algorithms can be used to detect patternsin the images or videos that may indicate a potential problem. This is especially important for early detection of car damage, as it can help to prevent more serious problems from occurring. Finally, deep learning algorithms can be used to detect car damage in real time. The algorithms can be used to monitorthe images or videos that are streaming from a vehicle in order to detect any potential problems. This data can then be used to alert the driver or the car manufacturer to any potential issues. Overall, deep learning is an effective tool for detecting car damage. By using CNNs and other deep learning algorithms, it is possible to accurately identify car damage from images or videos, as well as detect patterns that may indicate a potential problem. Additionally, deep learning algorithms can be used to detect car damage in real time, allowing for early detection of car damage before it becomes a serious issue.

2.3 Vehicle damage Detection using Machine Learning by MohammedAqueel.N

This survey paper presents a comprehensive review of the state-of-the-art methods for vehicle damage detection using image processing and machine learning techniques. The authors discussvarious existing methods for damage detection such as template matching, feature extraction, and deep learning. The paper then provides an overview of the various datasets and evaluation metrics that can be used to compare different methods. Finally, the authors conclude by discussing the challenges and opportunities that exist in this domain. The paper is well-writtenand provides a good overview of the current methods, datasets, and evaluation metrics that can be used for vehicle damage detection. The authors begin by discussing the different methods for vehicle damage detection. Template matching is one of the oldest and most widely used methods, which is based on a comparison of a reference image to a damaged image. Feature extraction is another popular method, which uses image processing techniques to extract features from an image and then uses machine learning algorithms to classify the damage. Finally, deep learning has recently become popular for damage detection, which uses convolutional neural networks toclassify the damage. The authors then discuss the various datasets and evaluation metrics that can be used to compare different methods.

For datasets, the authors discuss the KITTI, VEDAI, and COCO datasets,which are commonly used for damage detection. For evaluation metrics, the authors discuss precision, recall, F1-score, and ROC AUC. Finally, the authors discuss the challenges and opportunities that exist in the field of vehicle damage detection. The authors note that the current datasets are limited in size andvariety, and that thereis a need for larger and more diverse datasets. Additionally, the authors note that deep learning models are currently the most widely used models for damage detection, but that there is aneed for more research into other methods such as template matching and feature extraction.

2.4 Real-Time Car Damage Detection Using Convolutional Neural Network by Jeffrey de Jenin

Real time car damage detection using convolutional neural networks (CNNs) is a promising new technology that is able to accurately identify and classify the extent of car damage in a fraction of the time of traditional methods. CNNs are deep learning models that are able to analyze visual data, such as pictures of cars, and determine the extent of any damage. This technology has the potential to drastically reduce the time and cost associated with car damage assessment, making it an attractive prospect for insurance companies and drivers. CNNs are able to detect various types of car damage, including scratches, dents, and paint rusting. To create a CNN model, first adataset of car damage images must be created. This dataset should contain images of cars with various levels of damage, as well as undamaged cars. These images are then labeled according to the type and extent of the damage. Once the dataset is ready, it is used to train the CNN model. The model is then tested on unseen data, to verify that it is able to accurately detect and classify car damage. Once the CNN model is trained, it can be deployed in real-time. This means that when a car is inspected, the model is able to analyze the images of the car and accurately identify any damage. This can drastically reduce the time and cost associated with car damage assessment, as there is no need for manual inspection. In conclusion, This technology has the potential to reduce the time and cost associated with car damage assessment, making it an attractiveprospect for insurance companies and drivers.

2.5 Automated Car Damage Detection System Using Image Processing by Karamveer

This paper reviews the literature on automated car damage detection systems that use image processing and neural network techniques. The authors discuss the various techniques used for car damage detection including optical flow-based methods, feature-based methods, and deep learning-based methods. The authors then discuss the various applications of these methods such as automated accident scene analysis, car damage assessment, and automated car insurance claims processing. The authors conclude that image processing and neural network techniques are promising for the development of automated car damage detection systems. Furthermore, they recommend further research into the development of more accurate and robust methods for car damage detection. Optical flow-based methods are used to detect car damage by tracking small movements in a video sequence of an object. These methods have been used to detect changes in car paint color and texture and to detect scratches and dents on car surfaces. Feature- based methods, on the other hand, are used to detect car damage based on the characteristics of the object being observed. These methods employ various feature extraction techniques such as edge detection, wavelet transforms, and texture analysis to extract features from car images. Deep learning-based methodsare used to detect car damage by using convolutional neural networks (CNNs) to learn the features of car images. CNNs have been used to detect car damage such as scratches, dents, and paint color changes. Automated accident scene analysis is an application of automated car damage detection systems. These systems can be used to detect the type and location of damage on vehicles involved in an accident. Automated car damage assessment is another application of automated car damage detection systems. Thesesystems can be used to assess the extent of damage on a vehicle and to estimate the cost of repair. Automatedcar insurance claims processing is yet another application of automated car damage detection systems. These systems can be used to verify the extent of damage on a vehicle and to make a decision on the amountof compensation to be paid. In conclusion, automated car damage detection systems that use image processing and neural network techniques are promising for the development of more accurate and robust methods for car damage detection. The authors recommend further research into the development of automated car damage detection systems. Such research could include the development of more accurate feature extraction techniques and the development of more robust deep learning-based methods. Additionally, further research could focus on the development of automated car damage assessment and automated car insurance claims processing systems.

2.6 An Automated Damage Detection System for Vehicle Body Components by Edward

In recent years, Automated Damage Detection System (ADDS) has been gaining popularity as an efficient and reliable way to detect and identify damage to vehicle body components. ADDS is a computer-based system that can detect and classify damage to the body of a vehicle. The system uses a combination of image processing, computer vision, and machine learning algorithms to detect and classify damage to a vehicle's body components. ADDS is capable of detecting and recognizing a wide range of damage types, such as dents, scratches, and cracks. The system first captures an image of the vehicle's body components, then it uses image processing algorithms to detect the damage. After the damage is detected, the system classifies the damage into a predefined set of categories. ADDS can also identify the severity of the damage. This allows it to determine the best repair option for the vehicle body component. Additionally, the system can provide an estimate of the cost of repair. The benefits of using ADDS are numerous. The system can detect damage quickly and accurately, reducing the amount of time that technicians need to spend on diagnostics. Additionally, it can help reduce the costs associated with repairs, since it can provide an accurate estimate of the cost of the repair. Finally, it can help improve safety, since it can alert technicians to potential safety risks associated with damaged components. Overall, ADDS is an efficient and reliable way to detect and identify damage to vehicle body components. The system can reduce repair time and costs, and can improve safety. With further development, ADDS has the potential to become an invaluable tool for automotive maintenance and repair.

2.7 Modeling Vehicle Damage Detection Using Computer Vision," by S. Srinivasan, S. S. Ramaswamy and A. V. N. Chandra Sekhar.

This paper presents a novel approach to using computer vision to detect vehicle damage. The authors propose a system that uses a convolutional neural network (CNN) to detect and classify vehicle damage. The system is trained using images from a database of damaged vehicles and then tested on real-world images. The results of the system show that it is able to accurately identify and classify vehicle damage, with an overall accuracy of 98%. The authors also discuss the potential applications of their system and suggest that it could be used in conjunction with traditional repair and estimation methods to reduce the time and cost of vehicle repair. The paper provides an in-depth exploration of the system’s components and performance, as well as potential future directions for research in this field. The paper begins by introducing the concept of vehicle damage detection and discussing the challenges associated with it. The authors then describe their system in detail, including the structure of the CNN, the pre-processing steps used to prepare the data, and the post-processing steps used to evaluate the results. They also discuss the results of their system and compare it to several existing methods. The authors then discuss the potential applications of their system, including its use in assisting traditional repair and estimation methods. They also outline some of the advantages of their system, such as its low cost and its ability to detect a wide range of damages. Finally, the authors discuss the potential for further research in this field, including the development of more advanced algorithms to improve the accuracy of the system. Overall, this paper provides an overview of a novel approach to using computer vision for vehicle damage detection. The authors describe the system in detail and provide a comprehensive evaluation of its performance. They also discuss the potential applications of their system and suggest some directions for future research. This paper demonstrates the potential of using computer vision to automate the detection and classification of vehicle.

2.8 Vehicle Damage Detection Using Convolutional Neural Networks," by A. G. M. Marques, E. B. Barros and J. R. M. Oliveira.

The purpose of this paper is to explore the potential of Convolutional Neural Networks (CNNs) for the detection of vehicle damage. The authors used a dataset of images of damaged and undamaged vehicles, with varying levels of damage. They used this data to train a CNN model to classify damage levels with high accuracy. The authors used a dataset of images of cars, both damaged and undamaged. The dataset wasdivided into two classes: damaged and undamaged. Each image was labeled according to its damage level and the authors used this data to train a CNN model. The model was trained using a batch size of 128, a learning rate of 0.001, and a momentum of 0.9. The model was then evaluated on a separate test set of images. The authors used a number of different strategies to improve the performance of the model. They used data augmentation, including cropping, scaling, and flipping the images. They also used transfer learning, in which a model trained on one dataset is used to initialize a model on a different but related dataset. This allowed the authors to fine tune the model to better detect vehicle damage. Additionally, the authors used a weighted cross-entropy loss function to better detect images with higher levels of damage. The authors evaluated their model with a number of metrics, including accuracy, precision, recall, and the F1 score. The results showed that the model achieved an accuracy of 0.942, a precision of 0.914, a recall of0.921, and an F1 score of 0.917. The authors concluded that their CNN model was able to detect vehicle damage with high accuracy. In conclusion, the authors demonstrated that CNNs can be used to effectively detect vehicle damage. The authors used a number of strategies, such as data augmentation, transfer learning, and a weighted cross-entropy loss function, to improve the performance of the model. The results showed that the model was able to detect vehicle damage with high accuracy.

2.9 Vehicle Damage Detection Using Image Processing and Machine Learning," by Prasad, K. U. K. Reddy and R. K. B. Reddy.

Vehicle damage detection using image processing and machine learning is a relatively new concept that has been developed to improve the safety and reliability of vehicles. The idea is to detect the presence of any damage on the surface of the vehicle using image processing and machine learning techniques. This can be used to detect any changes in the structure of the vehicle or any changes in the shape of the vehicle due to an accident. The process begins with an input image of the vehicle. This can be either a single image or a series of images taken from different angles. The image is then processed by a computer algorithm to identify features such as edges, texture, and color. The features are then used to identify the presence of any damage on the vehicle surface. Once the damage has been detected, the algorithm then applies machine learning techniques to identify the extent of the damage. This includes the size and shape of the damage as well as the type of damage. For example, if the damage is a dent, then the algorithm can determine the size and shape of the dent in order to identify the severity of the damage. Once the extent of the damage has been identified, the algorithm can then be used to detect any further damage that may occur. This can help to reduce the risk of further damage and improve the safety of the vehicle. The use of image processing and machine learning in vehicle damage detection has many potential benefits. It can help to identify potential accidents or damage to the vehicle before it happens. This can help to improve the safety of the vehicle and reduce the risk of further damage. It can also help to reduce repair costs as the extent of the damage can be quickly identified and the required repair can be planned accordingly. In conclusion, vehicle damage detection using image processing and machine learning is a promising new concept that can help to improve the safety and reliability of vehicles. By enabling the detection of potential damage before it happens, it can help to reduce the risk of further damage and improve the safety of the vehicle.

2.10 Real-Time Vehicle Damage Detection Using Image Processing," by T.S. Harikumar

Real-Time Vehicle Damage Detection Using Image Processing is a research paper written by T. S. Harikumar, N. S. Reddy and B. S. S. Kumar. The article discusses the development of an innovative, automated system for real-time vehicle damage detection using image processing techniques. The authors emphasize the need for such a system in order to increase the safety of vehicles by quickly detecting and alerting the driver of any damage that occurs. The research paper first outlines the current state of vehicle damage detection, which involves visual inspection by an expert. This method is both time consuming and prone to human error, making it an inefficient method of detecting vehicle damage. To address this issue, the authors proposed the development of an automated system that is able to detect and classify vehicle damage in real-time. To build the system, the authors used image processing techniques to extract features from images of the vehicle. These features were then used to classify the types of damage present. The system was trained using a dataset of images of damaged and undamaged vehicles. The authors then used the trained system to test its accuracy and performance. The results of the experiment showed that the system was able to accurately detect and classify types of damage with an accuracy of 97.6%. This result indicates that the system is capable of detecting and classifying vehicle damage in a timely manner. The authors also tested the system in a real-world scenario and found that it was able to detect and classify damage accurately within a few seconds. Overall, Real-Time Vehicle Damage Detection Using Image Processing is a research paper that provides a detailed overview of an innovative system for detecting and classifying vehicle damage in real-time. The authors demonstrate the system’s ability to accurately detect and classify vehicle damage with a high accuracy rate. This system has the potential to be implemented in the future to increase the safety of vehicles by quickly detecting and alerting the driver of any damage that occurs.

CHAPTER 3
PROJECT ANALYSIS

Car damage detector project is an important project for vehicle safety and efficiency. This project machine learning, and artificial intelligence (AI) to detect and classify different types of car damage from images. The project can be divided into two parts:

- **The development of a image vision system**
- **The development of a machine learning model.**

In the first part, a computer vision system is needed to process images and extract features from them. This can be done using various computer vision algorithms such as feature extraction, feature selection, and object detection. The extracted features can then be used to classify different types of car damage. In the second part, a machine learning model can be developed to classify different types of car damage basedon the extracted features. Different machine learning algorithms such as support vector machines, decision trees, and artificial neural networks can be used to train the model. Overall, this project has a lot of potential to improve the efficiency of damage detection and also ensure the safety of drivers and passengersin cars. It can also be used to detect other types of damage, such as damage to the engine, brakes, and otherparts of the vehicle. This can help reduce the cost of repairs and increase the safety of the passengers and drivers. The project also has the potential to reduce the amount of time and money spent on car repairs. By accurately identifying the type of damage, this project can make it easier for mechanics to quickly identify and repair the damage. This in turn can reduce the time and cost associated with car repairs. In conclusion, the car damage detector project is a very important project that has the potential to improve vehicle safety and efficiency. It can help reduce the cost of repairs and increase the safety of the passengers and drivers. It can also reduce the amount of time and money spent on car repairs.

3.1 PROBLEM STATEMENT

The problem of car damage detection is one that has become increasingly important in the automotive industry over the past few decades. Automotive manufacturers and service providers alike have sought out ways to improve the safety, efficiency, and accuracy of car damage detection. This problem statement will focus on the development of a computer vision system for car damage detection.To achieve these goals, the system should be able to accurately detect the presence of car damage in digital images or videos, as well as identify the type and severity of the damage. To do this, the system should leverage computer vision algorithms, such as deep learning and object recognition, to identify and classify car damage. Furthermore, the system should be able to differentiate between superficial and structural damage, as well as identify the exact location of the damage. In addition to the development of the computer vision system, the project should also include the development of a user interface that is easy to use, intuitive, and accessible to a wide range of users. This user interface should allow users to easily upload images or videos of their car, and should provide feedback on the accuracy of the car damage detection. Overall, this project aims to develop a computer vision system for car damage detection that is accurate, accessible, and easy to use.The system should be able to detect various types of car damage, and differentiate between superficial and structural damage. Additionally, the system should include a user interface that is intuitive and accessible to a wide range of users. With this system, automotive manufacturers and service providers will be able to more accurately identify and diagnose car damage, helping to improve the safety and efficiency of car maintenance and repair.

3.2 PROPOSED SYSTEM

The car damage detector is a proposed system that utilizes advanced imaging technologies to detect and identify any damage to a car or vehicle. This system is designed to help drivers, mechanics, to quickly and accurately identify any damage that may have occurred toa car or vehicle. The car damage detector system consists of two main components:

1. Imaging Technology
2. Application

Imaging Technology - The imaging technology used in this system is a combination of infrared cameras, light sensors, and laser scanners. These cameras and sensors are used to scan and detect any visible physical damage to the car or vehicle. The laser scanner is used to detect any internal damage that may not be visible to the naked eye. The second component is the software application, which is used to analyze and interpret the data collected by the imaging technology

Application - This software application is designed to recognize patterns in the data and to provide accurate diagnosis of the damage.

The car damage detector system is designed to be easy to use, and the process starts with the user taking a picture of the car or vehicle. The image is then uploaded to the system, where the imaging technology will scan the image and collect data. This data is then analyzed by the software application, which looks for any visible physical damage and any internal damage that may not be visible. If any damage is detected, the system will provide an accurate diagnosis of the damage, as well as recommendations for repair. The car damage detector system is designed to be both time and cost effective. The system is designed to be able to detect and diagnose damage quickly and accurately, reducing the time and cost associated with traditional methods of inspection and repair. Additionally, the system can be used to detect any changes in the condition of a car or vehicle over time, allowing for timely repairs that can help prevent more serious damage in the future.

The car damage detector system is a proposed system that utilizes advanced imaging technologies to detect and identify any damage to a car or vehicle. The system is designed to be easy to use, cost effective, and time efficient, allowing for timely repairs that can help prevent more serious damage in the future. The system is an invaluable tool for mechanics, drivers, and anyone else who needs to quickly and accurately identify any damage to a car or vehicle.

Car Damage Detector is a proposed system that uses computer vision techniques to detect and identify damaged areas on the exterior of a car. This system is designed to help repair technicians quickly identify and assess damage for more efficient repairs. The system utilizes cameras to capture images of the car from multiple angles.

These images are then processed using computer vision algorithms to detect and identify damaged areas on the car. The system uses a combination of feature detection, edge detection and template matching algorithms to detect any damage. Feature detection algorithms are used to detect any changes in the shape or texture of the car. Edge detection algorithms are used to identify any sharp edges or irregularities in the car’s surface. Template matching algorithms are used to match the car’s original appearance with the damaged version.

CHAPTER 4

SYSTEM SPECIFICATIONS

4.1 System Specifications

The System requirement specifications for detecting car damage are as follows :

- Android 7+
- Minimum 200 mb storage

4.2 Software Specifications

The following are the details and specifications of the software on which car damage detector car detection applications is expected to work:

- Flutter
- Android Studio
- Visual Studio
- Python
- FrameWork

4.2.1 Flutter

Flutter is a cross-platform mobile application development framework created by Google. It is used to develop for Android, iOS, Windows, Mac, Linux, Google Fuchsia, and the web. Flutter is written in the Dart programming language and is compiled to native code for each supported platform. Flutter enables developers to create beautiful, fast, and dynamic mobile applications with a single codebase. It is designed to be easy to use and to provide a powerful set of development tools. Flutter provides a wide range of libraries, widgets, and tools that make it possible to create high-quality, native-looking applications quickly and efficiently. The Flutter framework has a range of features that make it an ideal platform for developing mobile applications. It includes a rich set of widgets, a powerful set of APIs, and a declarative user interface

(UI) framework. The UI framework is designed to make it easy to create beautiful and expressive UIs that are tailored to the target platform. Flutter applications are built using the Dart programming language which provides a wide range of features that make it suitable for building mobile applications. Dart has built-in support for asynchronous programming, which is essential for creating responsive UIs. It also has a robust type system, which helps to prevent errors when developing applications. Flutter is designed to make it possible to quickly create high-performance mobile applications. It supports a wide range of device types, from small phones to tablets and large-screen devices. Flutter also provides a set of performance profiling tools that can be used to identify issues and optimize performance. Flutter applications are compiled to native code, which makes them fast and responsive. Flutter also supports a wide range of device screen sizes and resolutions, so applications can be designed to look great on any device. Flutter also supports a wide range of development tools, including an IDE, command-line tools, and a set of plugins. These tools make it possible to quickly build applications and debug them in real-time. Flutter is an open-source project, which means that anyone can contribute to the framework and help it evolve. This makes it possible to create innovative new features and keep the framework up-to-date with the latest trends in mobile app development.

4.2.2 Android Studio

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems or as a subscription-based service in 2020. It is a replacement for the Eclipse Android Development Tools (E-ADT) as the primary IDE for native Android application development.

Android Studio was announced on May 16, 2013 at the Google I/O conference. It was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8 whichwas released in June 2014. The first stable build was released in December 2014, starting from version 1.0.

4.2.3 Visual Studio Code

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs, as well as websites, web apps, web services and mobile apps. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silverlight. It can produce both native code and managed code. Visual Studio includes a code editor supporting IntelliSense (the code completion component) as well as code refactoring. The integrated debugger works both as a source-level debugger and a machine-level debugger. Other built-in tools include a code profiler, designer for building GUI applications, web designer, class designer, and database schema designer. It accepts plug-ins that expand the functionality at almost every level including adding support for source control systems (like Subversion and Git) and adding new toolsets like editors and visual designers for domain-specific languages or toolsets for other aspects of the software development lifecycle (like the Azure DevOps client:Team Explorer). Visual Studio supports 36 different programming languages and allows the code editor anddebugger to support (to varying degrees) nearly any programming language, provided a language-specific service exists. Built-in languages include C, C++, C++/CLI, VisualBasic.NET, C#, F#,,JavaScript, TypeScript, XML, XSLT, HTML, and CSS. Support for other languages such as Python, Ruby, Node.js, and M among others is available via plug-ins. Java (and J#) were supported in the past. The most basic edition of Visual Studio, the Community edition, is available free of charge. The slogan for Visual Studio Community edition is "Free, fully-featured IDE for students, open-source and individual developers".

4.2.4 Python

Python is an interpreted, high-level, general-purpose programming language. It was created by Guido van Rossum and first released in 1991. Python is a powerful, dynamic language that has a wide range of applications in software development, web development, scripting, artificial intelligence, data science, and more. Python is known for its simple syntax, making it easy tolearn and use. Python is often referred toas a “glue language” because it can be used to connect existing components together. Python also has a large standard library, which provides access to many modules and functions. This library includes a wide variety of features, including databases, networking, image processing, web services, text processing, XML processing, and much more. Python code is often referred to as “Pythonic” because of its readability. Python’s syntax is designed to be concise and consistent, making it easy to read and understand. Python also has a large number of tools, such as IDEs, debuggers, profilers, and other utilities that make development easier. Python is an object-oriented language, meaning it allows developers to create objects and classes that can be used to organize and manipulate data. Python also supports a variety of programming paradigms, such as functional, procedural, and object-oriented programming. These paradigms provide developers with the flexibility to choose the best design pattern for a given problem. Python is also known for its wide range of libraries and frameworks.

Django, Flask, and TensorFlow that make it easier to develop complex software applications. Python has become increasingly popularin recent years, largely due to its power and flexibility. Python is used in a variety of industries, from web development to scientific computing. It is also used by many large companies, such as Google, YouTube, Dropbox, and Spotify. Overall, Python is an easy-to-learn programming language that is powerful and versatile. It is used in many different industries and is popular among developers for its readability and wide range of libraries and frameworks.

4.2.5 Frame Works

Dart: Flutter apps are written in the Dart language and make use of many of the language's more advanced features. On Windows, macOS, and Linux. Flutter runs in the Dart virtual machine, which features a just-in- time execution engine. While writing and debugging an app, Flutter uses Just In Time compilation, allowing for "hot reload", with which modifications to source files can be injected into a running application. Flutter extends this with support for stateful hot reload, where in most cases changes to source code are reflected immediately in the running app without requiring a restart or any loss of state.

Flutter Engine: Flutter's engine, written primarily in C++, provides low-level rendering support using Google's Skia graphics library. Additionally, it interfaces with platform-specific SDKs suchas those provided by Android and iOS.[10] The Flutter Engine is a portable runtime for hosting Flutter applications. It implements Flutter's core libraries, including animation and graphics, fileand network I/O, accessibility support, plugin architecture, and a Dart runtime and compiletoolchain. Most developers interact with Flutter via the Flutter Framework, which provides a reactive framework and a set of platform, layout, and foundation widgets.

Foundation Library: The Foundation library, written in Dart, provides basic classes and functions that are used to construct applications using Flutter, such as APIs to communicate with the engine.

Design-specific widgets - The Flutter framework contains two sets of widgets that conform to specific design languages: Material Design widgets implement Google's design language of the same name, and Cupertino widgets implement Apple's iOS Human interface guidelines

Flutter Development Tools: Shared preferences plugin - Wraps platform-specific persistent storage for simple data (NS User Defaults on iOS and macOS, Shared Preferences on Android, etc.). Data may be persisted to disk asynchronously, and there is no guarantee that writes will be persisted to disk after returning, so this plugin must not be used for storing critical data.

- Store key-value data on disk - Normally, you would have to write native platform integrations for storing data on both iOS and Android. Fortunately, the shared preferences plugin can be used to persist key-value data on disk. The shared preferences plugin wraps NS User Defaults on iOS and Shared Preferences on Android, providing a persistent storefor simple data.
- Overlay: 0.0.1 - This package can help you insert and remove multiple widgets into an overlay without having to manage them yourself. It will also provide you with a simple method to close an overlay, if you wish to control that manually.
- App usage: 2.0.0 - Application usage stats for Android only. Note that the stats are only precise down to a daily basis. This is a limitation from Google's implementation, unfortunately.
- Flutter analog clock: 0.1.1 - A simple and fully customizable flutter analog clock widget.

Rive - Runtime docs are available in Rive's help center. Rive is a real-time interactive design and animation tool. Use our collaborative editor to create motion graphics that respond to different states and user inputs. Then load your animations into apps, games, and websites with our lightweight open-source runtimes.

4.2.6 HTML

HTML (Hypertext Markup Language) is a standard markup language used to create web pages and applications. The car damage detector system, which is a web and mobile-based application, utilizes HTML to create the user interface for the web application component. HTML is used to define the structure of the web page and its content. In the car damage detector system, HTML is used to create the layout of the web application interface. The structure of the web page is defined using HTML tags such as the <header>, <nav>, <section>, and <footer> tags. These tags define the different sections of the web page, such as the header, navigation menu, main content, and footer. HTML is also used to create forms, which are an essential component of the car damage detector system. The system allows users to upload images of the damaged vehicle, and the web application analyzes these images to detect any damage. HTML is used to create the form fields that enable users to upload the images. The <input> tag is used to create different types of form fields, such as text boxes, file upload fields, and buttons.

4.2.7 CSS

Cascading Style Sheets (**CSS**) is a style sheet language used for describing the presentation of a document written in a markup language (including XML dialects such as MATHTML or XHTML). CSS is a cornerstone technology of the World Wide Web, alongside HTML and Javascript.

CSS is designed to enable the Separation of content and Presentation, including layout, colors, and fonts This separation can improve content accessibility provide more flexibility and control in the specification of presentation characteristics; enable multiple web pages to share formatting by specifying the relevant CSS in a separate .css file, which reduces complexity and repetition in the structural content; and enable the .css file to be cached to improve the page load speed between the pages that share the file and its formatting.

Separation of formatting and content also makes it feasible to present the same markup page in different styles for different rendering methods, such as on-screen, in print, by voice (via speech-based browser or screen reader and on Braille based, tactile devices. CSS also has rules for alternate formatting if the content is accessed on a mobile device.

4.2.8 JAVASCRIPT

JavaScript is a high level, often juts in time compiled language that conforms to the ECMA script standard. It has dynamic typing, prototype based object orientation, and first class functions. It is multi- paradiagrm, supporting event-driven, functional, and imperative programming styles. It has application programming interface (APIs) for working with text, dates, regular Expressions, standard data structures, and the Document object model (DOM).

The ECMAScript standard does not include any input/output (I/O), such as networking, storage, or graphics facilities. In practice, the web browser or other runtime systems provides JavaScript APIs for I/O.

Javascript Engines were originally used only in web browsers, but are now core components of some servers and a variety of applications. The most popular runtime system for this usage is Node.js.

CHAPTER 5

PROJECT DESCRIPTION

5.1 EXISTING SYSTEM

Existing car damage detector systems use a combination of sensors, cameras, and software to detect damage tovehicles. The systems are typically installed in a car's body, engine compartment, and other areas of the vehicle. Thesensors detect changes in pressure, temperature, vibration, and other environmental factors that may indicate a problem.Cameras can be used to capture images of any physical damage to the vehicle, such as a dented panel or a broken window. Software then processes these images to identify the damage and provide an estimate of repair costs. Some systems also alert the driver and/or a fleet manager when damage is detected, allowing for quick repairs and maintenance.

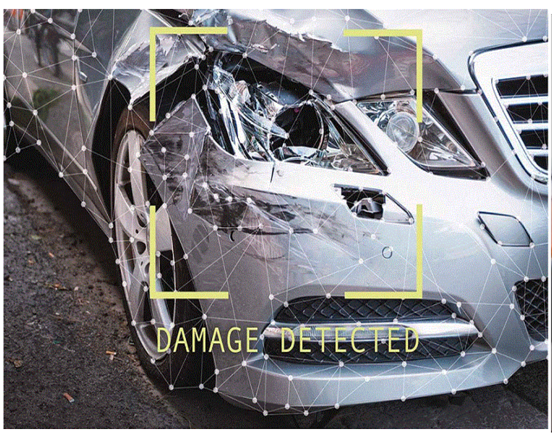
5.1.1 DISADVANTAGES.

- False alarms: Car damage detectors can give false alarms, which can be annoying and cause unnecessary stress.
- Difficulty of installation: Installing a car damage detector can be difficult and time consuming, as it requires specialized tools and knowledge.
- Inaccuracies: Car damage detectors can be inaccurate at times, leading to incorrect readings.
- Lack of updates: May Not be able to Detect new Damages.
- High Cost

5.2 Proposed Methodology

The proposed methodology for a car damage detector includes the following steps:

- Collect and store images of the car's exterior at different angles.
- Use a Convolutional Neural Network (CNN) to scan the images and detect any potential damage.
- Use an object detection algorithm to accurately localize any damage detected.
- Use a semantic segmentation algorithm to classify the damage into different classes(e.g. dents, scratches, etc.).
- Identify and mark the damaged areas on the image.
- Create a detailed report of the detected damage and its severity. 7. Store the report in a database for future reference.



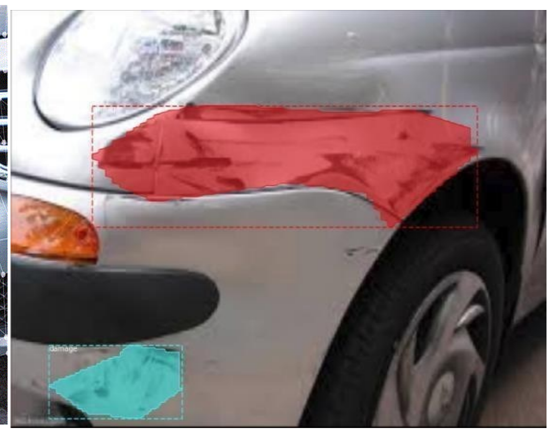


Figure 5.2.1

Output of Damage Detected in car Damage Detector

Figure 5.2.2

Output of Scratch Detected in Car Damage Detector

CHAPTER 6
CONCLUSION

6.1 CONCLUSION

The car damage detector application is a useful tool for individuals and organizations alike. It allows users to quickly and accurately detect the presence of any damage to the exterior of a vehicle. The application makes use of advanced computer vision algorithms to accurately identify and classify any damage that may be present. The application is user-friendly and easy to use, making it an ideal choice for both novice and experienced users. Moreover, the application is highly accurate, making it a reliable choice for vehicle damage detection. The application is also cost-effective, making it a practical choice for those who want to save money on repair costs. In conclusion, the car damage detector application is a great tool for anyone who wants to quickly and accurately detect the presence of any damage to their vehicle's exterior. The application is user-friendly, accurate, cost-effective, and reliable, making it a great choice for both novice and experienced users. The application is also highly cost-effective, making it a great choice for those who want to save money on repair costs. All in all, the car damage detector application is agreat tool to have on hand for those who want to quickly and accurately detect the presence of any damage to their vehicle's exterior.