OBSTACLE DETECTION USING AI

A PROJECT REPORT

Submitted by

BIYYAPU VAISHMITHA REDDY [211419104043]

DHANVARSHINI.R [211419104060]

DIVYA.N [211419104071]

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BONAFIDE CERTIFICATE

Certified that this project report **"OBSTACLE DETECTION USING AI"** is the bonafide work of **BIYYAPU VAISHMITHA REDDY [REGISTER NO: 211419104043], DHANVARSHINI.R [REGISTER NO: 211419104060], DIVYA.N [REGISTER NO: 211419104071]"** who carried out the project work under my supervision.

SIGNATURE	**SIGNATURE**
Dr.L.JABASHEELA,M.E.,Ph.D.,	**MRS.K.SANGEETHA,M.E.,**
HEAD OF THE DEPARTMENT	**ASST PROFESSOR**
DEPARTMENT OF CSE	DEPARTMENT OF CSE
PANIMALAR ENGINEERING COLLEGE	PANIMALAR ENGINEERING COLLEGE
NASARATHPETTAI.	NASARATHPETTAI.
POONAMALLEE,	POONAMALLEE,

Certified that the above candidate(s) was/ were examined in the Anna University ProjectViva-Voce Examination held on..........................

INTERNAL EXAMINER **EXTERNAL EXAMINER**

DECLARATION

We, **Biyyapu vaishmitha reddy (211419104043)**, **Dhanvarshini.R (2114104060)**, **Divya.N (211419104071)** hereby declare that this project reporttitled "**OBSTACLE DETECTION USING AI**" , under the guidance of Mrs.K.Sangeetha, M.E., is the original work done by us and we have not plagiarized or submitted to any other degree in any university by us.

BIYYAPU VAISHMITHA REDDY

DHANVARSHINI.R

DIVYA.N

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BIYYAPU VAISHMITHA REDDY

DHANVARSHINI R

DIVYA.N

ABSTRACT

People while driving face several problems in their life, one of these problems that is the most important one is detecting the obstacles when they are driving. Our research is on obstacle detection to reduce accidents on the road and other difficulties for drive lois people. To help people the visual world has to be transformed into the audio the world with the potential to inform them about obstacles. In this paper algorithm for real- time detection and tracking of obstacles is proposed by deep learning. Obstacle detection is one of the major applications in deep learning[1]. It can be done by many ways, like by using a pre-trained model using CNN(Convolution Neural Network), transfer learning or from the scratch by feeding n number of datasets to detect the obstacle with more number of epochs to increase the accuracy of the result. The model is trained with more images to recognize the obstacle. An obstacle such as Person, Animal, Vehicle monitoring, etc. It is used to above deep learning processing along with AI. individuals find it more challenging to move about independently because of their compromised challenges[2]. Moreover, people's capacity to navigate in a given setting, along with their ability to organize their daily activities while driving. Organizing any commonplace activity can be especially difficult for a man/woman if he/she has not learned to distinguish obstacles between different items.The more saddening fact is that there are tens of millions of persons worldwide who have to go through such experience and are dependent on others for their wellbeing and happiness. The encouraging news, however, is that the rapid advancement in technology hasseen the innovation of better systems for assisting the people , including the blind, such as the AI glasses, are being done which can provide intelligent navigation capabilities to the blind. This paper reviews the design of a smart cane, i.e., A smart stick for the blind, car camera any camera lens equipped with obstacle recognition using AI Technologies adds more virtual visibility in their journey[5]. Collision avoidance is an important feature in advanced driver-assistance systems, aimed at providing correct, timely and reliable warnings before an imminent collision (with objects, vehicles, pedestrians, etc.). The

obstacle recognition library is designed and implemented to address the design and evaluation of obstacle detection in a transportation cyber-physical system. The library is integrated into a co-simulation framework that is supported on the interaction between software and Matlab/Simulink. From the best of the authors' knowledge, two main contributions are reported in this paper. Firstly, the modelling and simulation of virtual on- chip light detection and ranging sensors in a cyber-physical system, for traffic scenarios, is presented[9]. The cyber-physical system is designed and implemented in. Secondly, three specific artificial intelligence-based methods for obstacle recognition libraries are also designed and applied using a sensory information database provided by. The computational library has three methods for obstacle detection: a multi-layer perceptron neural network, a self-organization map and a support vector machine. Finally, a comparison among these methods under different weather conditions is presented, with very promising results in terms of accuracy[10]. The best results are achieved using the multi-layer perceptron in sunny and foggy conditions, the support vector machine in rainy conditions and the self-organized map in snowy conditions.

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CHAPTER 1
INTRODUCTION

CHAPTER 1

1.1 OVERVIEW

Over the past few years we have witnessed the success of convolution neural network (CNN) for visual obstacle detection. To represent obstacles of various appearances, aspect ratios, and poses with limited convolutional features, many CNN- based detectors leverage anchor boxes as reference points for image localization. By assigning each obstacle to video at proper scales and aspect ratios, convolutional features are determined and two fundamental detection procedures, classification, and localization, are carried out. Obstacle-based detectors leverage spatial alignment, Intersection over Union (IoU) between object and obstacle, as the criterion for anchor assignment. Each assigned anchor independently supervises network learning for obstacle prediction, based upon the assumption that the anchors spatially aligned with obstacles are always appropriate for classification and localization. In what follows, however, we argue that such an assumption is implausible and that spatial alignment should not be the sole criterion for anchor assignment. On the one hand, for obstacles of acentric features, e.g., slender objects, the most representative features arenot close to their geometric centers. A spatially aligned anchor might correspond to less representative features, which deteriorate classification and localization performance. On the other hand, it is implausible to match obstacles with proper anchors/features using the IoU criterion when multiple obstacles come together. These issues arise from the pre-defining object for a specific obstacle which then independently supervises network learning for obstacle predictions.

1.2 PROBLEM DEFINITION

The lack of visual capabilities has limited these individuals from completely perceiving their immediate surroundings which has potential safety concerns and also lower their quality of life since they must rely on some sort of aid to get around. Currently, in order for visually impaired individuals to get around, they rely on walking guide dogs, and/or personal human aids for assistance. While these walking canes and guide dogs may allow the individual to get around independently, they each have a common drawback. These aids lack the intelligence to provide directions to unvisited locations andcannot completely warn individuals of obstruent objects in their vicinity. A human aid provides this intelligence but makes the visually impaired individual very dependent on the human aid. A good solution will be a device that is portable and is able to provide directions to new locations and alert the user of obstacles in their path when the user is walking. For the purpose of this project, we streamlined the problem defined above to assisting blind individuals with getting around outdoors. We believe a project like this will create the case for further investment in creating smarter electronic devices to assist visually impaired individuals with getting around. By smarter we mean that the device is able to provide directions to unvisited locations, while ensuring safe navigation. Additionally, the device is not intended to replace the use of walking canes or guide dogs. Design a portable device for visually impaired individuals that will provide direction to new locations and alert the user of obstacles in their path during outdoor navigation.

CHAPTER 2
LITERATUTE SURVEY

CHAPTER 2

There are a lot of devices and softwares which assist the people for navigation indoor and outdoor. An assistance system was developed in this research work which is based on ultrasonic sensors for obstacle detection. The ultrasonic sensors along with a vibration device and a buzzer are placed on multiple places in a wearable jacket. Sensors scan the environment of user and inform them through vibration and buzzer sound when the sensor detects any obstacle. Two things are prominently used in this paper i.e. Mobile camera and laser. The laser and the mobile is kept at static distance. The image is captured from the camera and along with it the laser is also observed. Using the static distance and the angle between the laser point and the camera the distance is measured. The machine acts by means of supplying speech instructions to the user through interface. A microphone captures the speech as input. The acquired input is diagnosed with the aid of the use of Google API. Also, it makes use of image processing as its primary approach to identify objects and signal boards. The video is captured by the Pi camera that is attached to the CSI port, which is then transformed into data frames for further processing. These frames are preprocessed for higher results. Now, Image processing algorithms for the item detection is carried out on these statistics frames and the object is identified. Audio commands from headsets are given to the user to inform him/her approximately the current position of the item. To make the life to be as a normal one for the blind peoples this may be very helpful project for them. By making this as a gadget or a device in their hand they can easily judge an object by their own by knowing the buzzer sound. The system uses ultrasonic sensor as a wide range of field to detect an object with its higher detection range.

Training-Set Distillation for Real-Time UAV Object Tracking

Author: Fan Li, Changhong Fu, Fuling Lin, Yiming Li , and Peng Lu

Year:2020

Correlation filter (CF) has recently exhibited promising performance in visual object tracking for unmanned aerial vehicle (UAV). Such online learning method heavily depends on the quality of the training-set, yet complicated aerial scenarios like occlusion or out of view can reduce its reliability. In this work, a novel time slot-based distillation approach is proposed to efficiently and effectively optimize the training-set's quality on the fly. A cooperative energy minimization function is established to score the historical samples adaptively. To accelerate the scoring process, frames with high confident tracking results are employed as the keyframes to divide the tracking process into multiple time slots. After the establishment of a new slot, the weighted fusion of the previous samples generates one key-sample, in order to reduce the number of samples to be scored. Besides, when the current time slot exceeds the maximum frame number, which can be scored, the sample with the lowest score will be discarded. Consequently, the training set can be efficiently and reliably distilled. Comprehensive tests on two well-known UAV benchmarks prove the effectiveness of our method with real-time speed on single

Wearable Navigation Assistance System for the Blind and Visually Impaired

Author: Ali Khan; Aftab Khan; Muhammad Waleed

Year: 2019

The blind people cannot get information of their surrounding environment for example they cannot see any obstacles and hazards in their path. They have no information of objects in their surroundings and direction which is essential for travelling. According to World Health Organization (WHO) report there are 285 million visually impaired people among which 39 million are totally blind. The estimated number of blind people in Pakistan is 1.14 million. Blind people mostly use a white cane or a guide dog for their assistance. However, these techniques are limited as they do not guarantee risk avoidance for the blind people. Many researchers are working on assistance of blind people and have developed several devices including infrared cane, ultrasonic sensors, voice assisted navigation cane and laser-based walker assistance to name a few. Nevertheless, all these schemes are marred by limitations and as such are not utilised in real life. An assistance system was developed in this research work which is based on ultrasonic sensors for obstacle detection. The ultrasonic sensors along with a vibration device and a buzzer are placed on multiple places in a wearable jacket. Sensors scan the environment of user and inform them through vibration and buzzer sound when the sensor detects any obstacle.

Blind Path Obstacle Detector using Smartphone Camera and Line Laser Emitter.

Authors: Rimon Saffoury , Peter Blank , Julian Sessner, Benjamin H. Groh Christine Martindale, Eva Dorschky, Joerg Franke and Bjoern M. Eskofier.

Year: 2018

Two things are prominently used in this paper i.e. Mobile camera and laser. The laser and the mobile is kept at static distance. The image is captured from the camera and along with it the laser is also observed. Using the static distance and angle between the laser point and the camera the distance is measured The method of information transfer to the user about obstacles was efficient and useful as almost all subjects did not collide with an obstacle. However, some of them knew immediately how to handle the appearing obstacle, whereas other first needed to rethink. Nonetheless, an acoustic signal as feedback may reduce the natural use of the visually impaired person' sense of hearing. Transmitting the environmental information, about obstacles, by other means should also be explored.

Visual Assistance for Blind using Image Processing

Author: S.Mahalakshmi1, Veena N2, Anisha Kumari3 1,2Assistant Professor, Dept. of ISE, BMSIT&M, Karnataka 3UG Student, Dept. of ISE, BMSIT&M, Karnataka

Year: 2020

The machine acts by means of supplying speech instructions to the use through interface. A microphone captures the speech as input. The acquired input is diagnosed with the aid ofthe use of Google API. Also, it makes use of image processing as its primary approach to identify objects and signal boards. The video is captured by the Pi camera that is attached to the CSI port, which is then transformed into data frames for further processing. These frames are preprocessed for higher results. Now, Image processing algorithms for the item detection is carried out on these statistics frames and the object is identified. Audio commands from headsets are given to the user to inform him/her approximately the current position of the item. This system gives them a sense of visualization as it also helps them visualize their nearby environment based on their voice commands. This system consists of a simple architecture which makes it complexity free and user-friendly.

Obstacle Detector for Blind Peoples

Author: M. Maragatharajan, G. Jegadeeshwaran, R. Askash, K. Aniruth, A. Sarath

Year: 2019

To make the life to be as a normal one for the blind peoples this may be very helpful project for them. By making this as a gadget or a device in their hand they can easily judge an object by their own by knowing the buzzer sound. The system uses ultrasonic sensor as a wide range of field to detect an object with its higher detection range. Based on this project we take survey in our institution. This project Arduino based obstacle detector for blind people is a new method to resolve their problems. A less complex portable, cost efficient, easy to manage are effective system with many more amazing properties and advantages are proposed to provide support for the blind. The system will be very easy to find the distance between the objects and the sensor. It can detect the objects in every directions the blind person. Without the help of others the blind person can move from one place to other and lead their regular lives independently.

Adaptive Discriminative Deep Correlation Filter for Visual Object Tracking

Author: Zhenjun Han, Pan Wang, Qixiang Ye

Year:2021

Correlation filter trackers building on deep convolution neural networks (CNNs) contributed efficient visual object trackers, but remain challenged with severe target appearance variations. The reason lies in that CNNs trained for image classification tasks are less discriminative to the dynamic variations of targets and backgrounds. In this paper, we propose an adaptive discriminative deep correlation filter (adaDDCF), which, by incorporating discriminative feature fine-tuning with adaptive appearance modeling, pursuits stable object tracking in complex backgrounds. In adaDDCF, a convolutional Fisher Discriminative Analysis (FDA) layer is implemented for positive and negative instance mining and scene-specific feature learning. A correlation layer is then embedded to learn the correlation response of consecutive frames for target appearance modeling. With an online learning procedure using forward-backward propagation, the FDA layer and the correlation layer are effectively coupled, leading to effective and discriminative fine-tuning for the proposed tracker, which consequently alleviates the target drifting problem. Extensive experiments on the challenging benchmarks OTB2013, OTB2015, and OTB50 demonstrate that the proposed adaDDCF tracker outperforms many state-of-the-art trackers.

Deep Learning for Generic Object Detection

Author: Li Liu, Wanli Ouyang, Xiaogang Wang, Paul Fieguth, Jie Chen, Xinwang Liu & Matti Pietikäinen

Year:2019

Object detection, one of the most fundamental and challenging problems in computer vision, seeks to locate object instances from a large number of predefined categories in natural images. Deep learning techniques have emerged as a powerful strategy for learning feature representations directly from data and have led to remarkable breakthroughs in the field of generic object detection. Given this period of rapid evolution, the goal of this paper is to provide a comprehensive survey of the recent achievements in this field brought about by deep learning techniques. More than 300 research contributions are included in this survey, covering many aspects of generic object detection: detection frameworks, object feature representation, object proposal generation, context modeling, training strategies, and evaluation metrics. We finish the survey by identifying promising directions for future research.

Manifold Siamese Network:A Novel VisualTracking ConvNet for Autonomous Vehicles

Author: Ming Gao; Lisheng Jin; Yuying Jiang; Baicang Guo

Year:2019

Visual tracking is a vital component of autonomous driving perception system. Siamese networks have achieved great success in both accuracy and speed for visual tracking tasks. These Siamese trackers share a similar framework in which each tracker consists of two network branches for exploring semantic information. However, the performance of Siamese trackers is limited by an insufficient semantic template and an unsatisfactory updating strategy. To tackle these problems, we propose a manifold Siamese network for visual tracking that can simultaneously utilize semantic and geometric information. A manifold sample pool is constructed to exploit the manifold structure of image object sequences. This sample pool is dynamically learned via a fast Gaussian mixture model (GMM). After obtaining a manifold sample template, we design a deep architecture based on a correlation filter (CF) network and append a novel manifold feature branch. The network remains fully convolutional and can train a template to discriminate exemplar image and arbitrarily size search image. Then, a triplet occlusion score function cooperates with an effective update method that is established to prevent model drift. Extensive experiments show that the proposed tracking algorithm performs favorably compared with the state-of-the-art methods on three standard benchmark datasets at a high framerate, which is very suitable for autonomous driving.

AutoTrack: Towards High-Performance Visual Tracking for UAV with Automatic Spatio-Temporal Regularization

Author: Yiming Li, Changhong Fu, Fangqiang Ding, Ziyuan Huang, Geng Lu

Year:2020

Most existing trackers based on discriminative correlation filters (DCF) try to introduce predefined regularization term to improve the learning of target objects, e.g., by suppressing background learning or by restricting change rate of correlation filters. However, predefined parameters introduce much effort in tuning them and they still fail to adapt to new situations that the designer did not think of. In this work, a novel approach is proposed to online automatically and adaptively learn spatio-temporal regularization term. Spatially local response map variation is introduced as spatial regularization to make DCF focus on the learning of trust-worthy parts of the object, and global response map variation determines the updating rate of the filter. Extensive experiments on four UAV benchmarks have proven the superiority of our method compared to the state-of-the-art CPU- and GPU-based trackers, with a speed of ~60 frames per second running on a single CPU.Our tracker is additionally proposed to be applied in UAV localization. Considerable tests in the indoor practical scenarios have proven the effectiveness and versatility of our localization method.

COMPARISON TABLE BASED ON LITERATURE SURVEY

YEAR & AUTHOR	TITLE	METHODOLOGY	MERITS	DEMERITS	FUTUR E SCOPE
2020&Fanli, Changhon, fulinglin, Yiming Li , and PengLu	Training-Set Distillation for Real-Time UAVObject Tracking	visual object tracking for unmanned aerial vehicle.	accelerate the scoring process, frames with high confiden tracking results	No much accuracy in determining.	Increase in accuracy
2019AliKhan; Aftab Khan; Muhammad Waleed	Wearable Navigation Assistance system for the Blind and Visually Impaired	Stereo vision, Image Processing Sonification procedure to support blind navigation sonification	provides high sensitive sensors	Size of hardware required is extensive and voluminous Musical stereo sound for the blind understanding of the scene in front	Increase in the size of the stereo

2018 & Rimon Saffoury ,Peter Blank,Julian Sessner, BenjaminH Groh*, Christine F. Martindale*, Eva Dorschky*, Joerg Franke**and Bjoern. Eskofier	Blind Pat Obstacle Detector using Smart phone one Camera and Line Laser Emitter.	acoustic signal as feedback May reduce the Natural use of the visually impaired person’ s sense of hearing.	High accuracy with fast object detection.	Distance between the camera and the laser must be constant. May not work efficiently on shiny surface as laser intensity may decrease	Consistency is important
2020& S. Mahalakshmi, VeenaN2, Anisha Kumari	Visual Assistance For Blind using Image Processing	sense of visualization as it also helps Them visualize Their nearby environment based on their voice commands	Voice feedback with high accuracy And high quality.	Environment cover is less in area.	Able to do in environment cover more area
2019& M. Maragatharajan, G. Jegadeesh waran, R. , K.Aniruth, A.Sarath	Obstacle Detector For Blind Peoples	Arduino based obstacle detector	High accuracy object detection.	The description of the object is not notified to the user.	Description of object required

2021& Zhenjun Han,Pan Wang, Qixiang Ye	Adaptive Discriminative Deep Correlation Filter for VisualObject Tracking	building on deep convolution neural network	correlation layer are effectively coupled,	discriminative fine-tuning for the proposed tracker	No scope of proposal
2019&Li Liu1, Wanli Ouyang, Xiaogang Wang, PaulFieguth, Jie Chen, Xinwang Liu,Matti Pietikäinen	Deep Learning for Generic Object Detection: A Survey	Deep learning techniques generic object detection: detection frameworks	redefined categories in natural image	context modeling training strategies	Difference between the similar objects detection
2019&Ming Gao;Lishen g Jin; YuyingJiang ; Baicang Guo	Manifold Siamese Network:A Novel VisualTracking ConvNet for Autonomous Vehicles	Gaussian mixture model (GMM).novel manifold feature branch	prevent model drift.	Three standard benchmark datasets at a high framerate	helps autonomous driving.
2020&Yimin gLi,Changhon g Fu, Fangqiang Ding, Ziyuan Huang, and GengLu	Auto Track:Towards High-Performance Visual Tracking for UAV with Automatic Spatio- Temporal Regularization	Existing Trackers based on Discriminative correlation	suppressin g backgroun d learning on by restricting change applied in UAV localization .	Still fail to adapt to new situations approach is proposed to online automatically and adaptively learn	updating rate of the filter is introduced as spatial regularization to make DCF focus on the learning

Table 2.1 Comparison table based on literature survey

CHAPTER 3
SYSTEM ANALYSIS

CHAPTER 3
SYSTEM ANALYSIS

3.1 EXISITING SYSTEM

Object detection

- Object detection is a computer vision technique that allows us to identify and locate objects in an image or video.
- With this kind of identification and localization, object detection can be used to count objects in a scene and determine and track their precise locations, all while accurately labeling them.

Device sensor

- It turns something about the physical world into data upon which a system can act.
- Traditionally, sensors have filled well defined, single-purpose roles: A thermostat, a pressure switch, a motion detector, an oxygen sensor, a knock detector, a smoke detector, a voltage arrestor.
- Measure one thing, and transmit a very simple message about that one thing.
- This thinking stems from several hundred years of physical engineering of devices and persists today in part because of the convenience of modular thinking in system design.

Braille system

- Braille is a reading and writing system for blind and vision impaired people, made up of raised dots that can be 'read' by touch.
- The most popular form of braille is Grade 2, which uses the alphabet as well as abbreviations and contractions.

Voiceover

- Using AI voice makers simplifies the process of creating voice overs.
- It gives you complete control over your process, allows you to directly convert your home recordings or scripts into voiceovers.
- AI text to speech is time ,cost- effective while retaining the quality of voice.

3.1.1 DISADVANTAGES OF EXISTING SYSTEM

- It doesn't give the description of the object detected
- It doesn't not give high accuracy
- It is difficult for the blind people to understand the environment.

3.2 PROPOSED SYSTEM

DEPTH ANALYSIS

It gives the description of the object, distance between the objects.

VOICE FEEDBACK

It converts the object which is detected text into its respective voice feedback andis sent to the person.

3.2.1 ADVANTAGES OF PROPOSED SYSTEM

- It alerts the user with the distance of the object and the person
- It gives a feedback about the object description

3.3 SOFTWARE REQUIREMENTS

OPERATING SYSTEM - Windows 8/11

SCRIPT - Python Tool

IDLE(Python)

3.4 HARDWARE REQUIREMENTS

PROCESSOR - I3, I5, I7, AMD Processor

RAM - 8 Gb , HARD DISK - Above 500 GB

CHAPTER 4
SYSTEM DESIGN

CHAPTER 4
SYSTEM DESIGN

4.1 BLOCK DIAGRAM

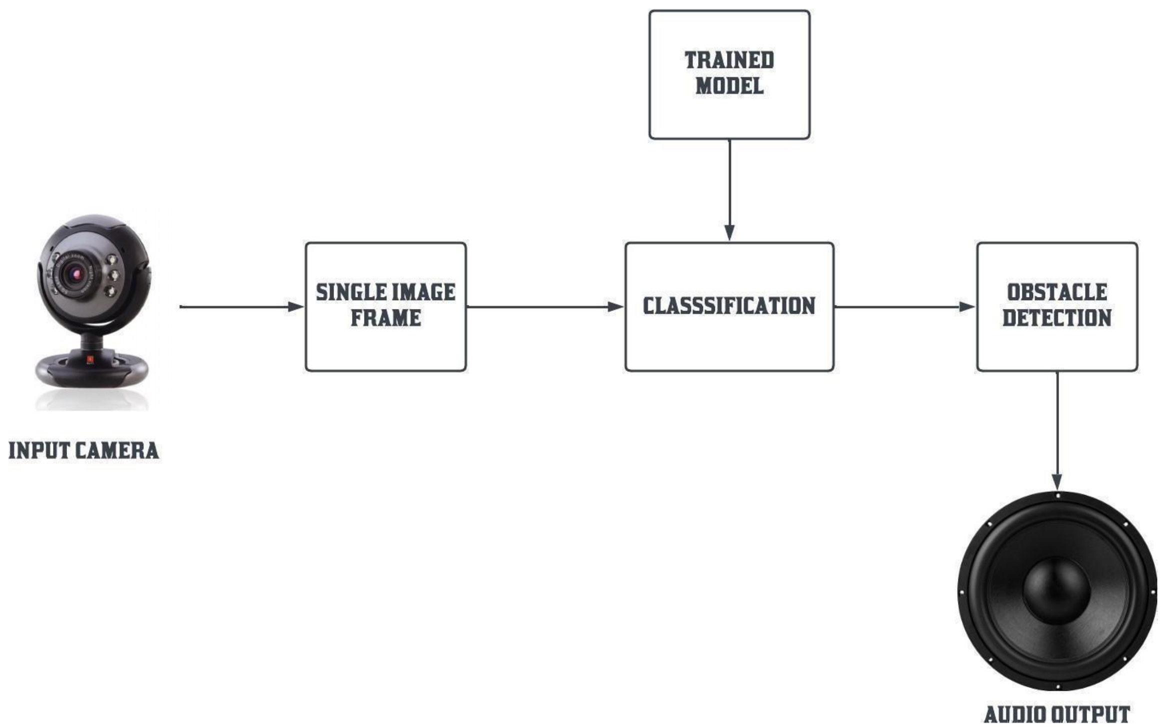

Fig.4.1. Block diagram

Description:

Block diagram, the input is taken from a camera and gets converted into single image frame. The image then gets classified by the trained model and the result is obtainedby voice feedback.

4.2 DATAFLOW DIAGRAM

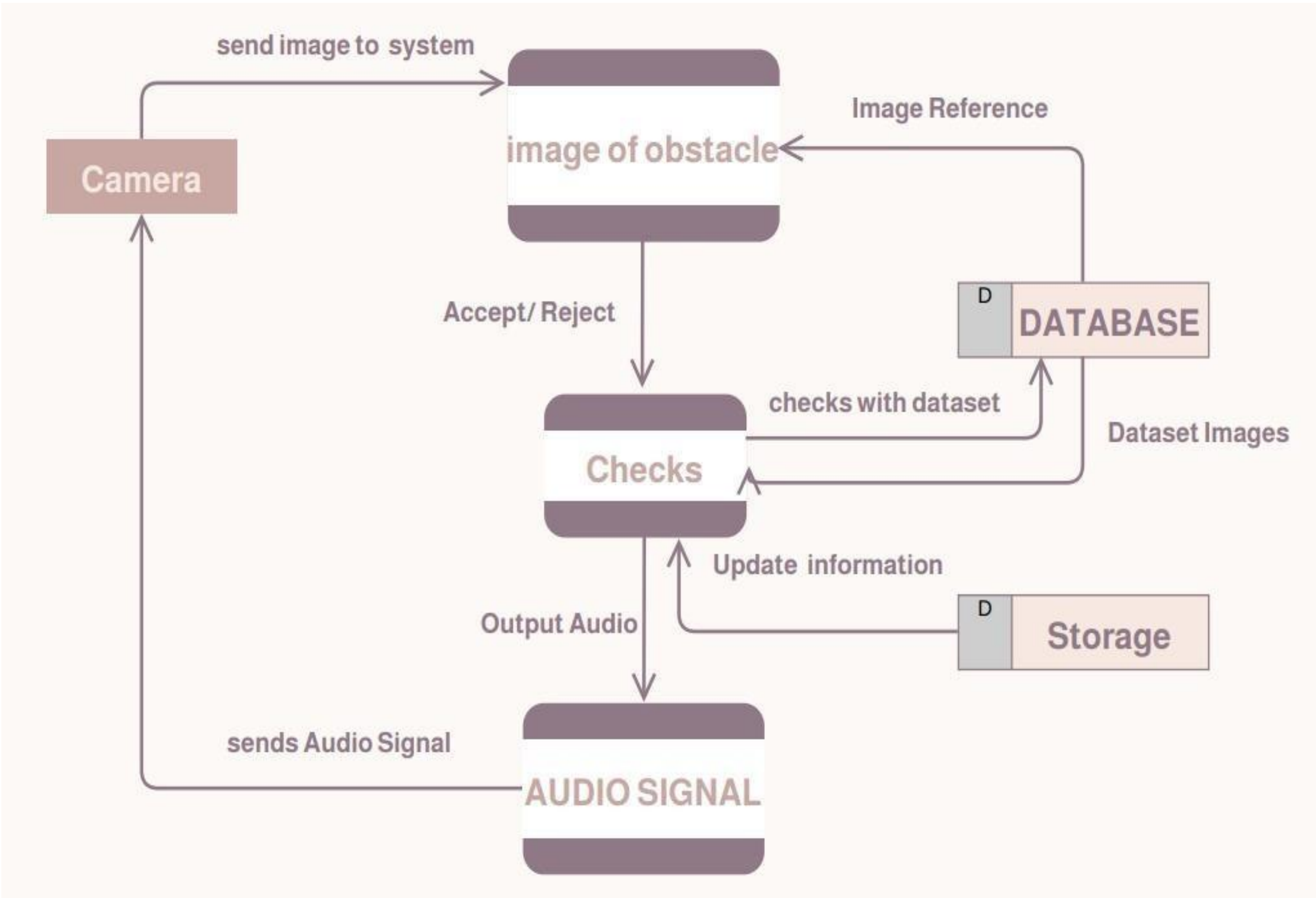

Fig.4.2. Data Flow diagram.

Description:

The detected images or the objects will go through a process where it is grouped according to its observation and the respected description of the image obtained converted into voice accordingly.

4.3 UML DIAGRAM

4.3.1 USECASE DIGRAM

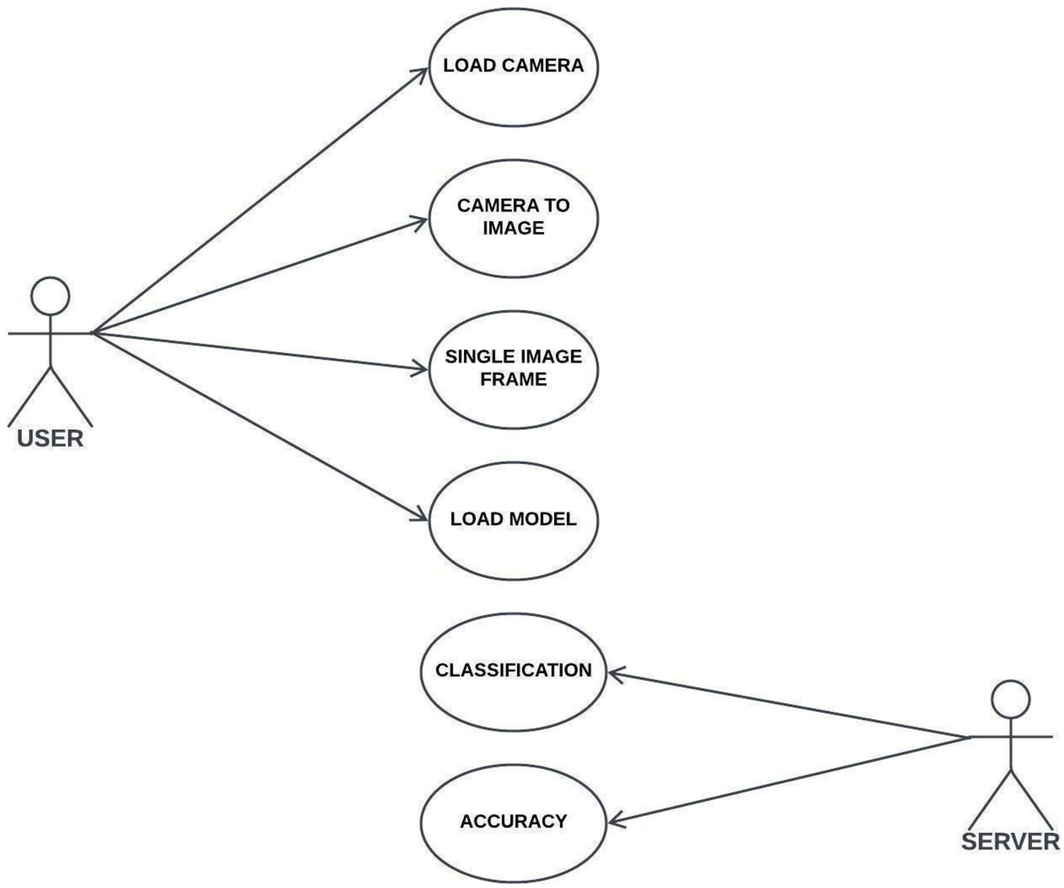

Fig.4.3.1. Usecase Diagram.

Description:

The use case diagram after detection of the object will go through test cases where its appropriate object will get mapped and its output is given by using voice detection.

4.3.2 ACTIVITY DIAGRAM

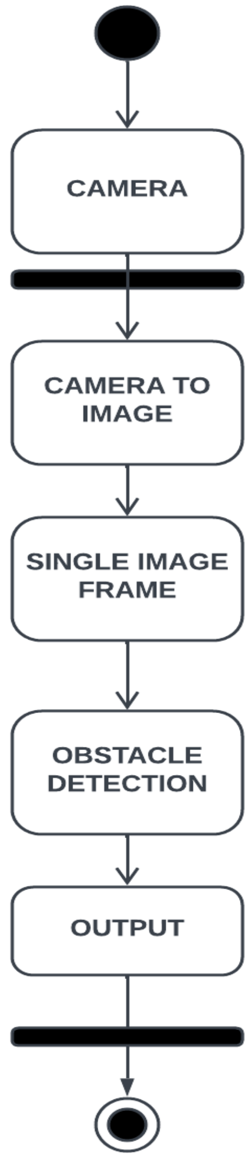

Fig.4.3.2. Class Diagram.

Description:

There is a connection between laptop and the camera and the process takes place on the laptop by using the software Open-CV the respected object is identified and is voice output is given.

4.3.3 STATE DIAGRAM:

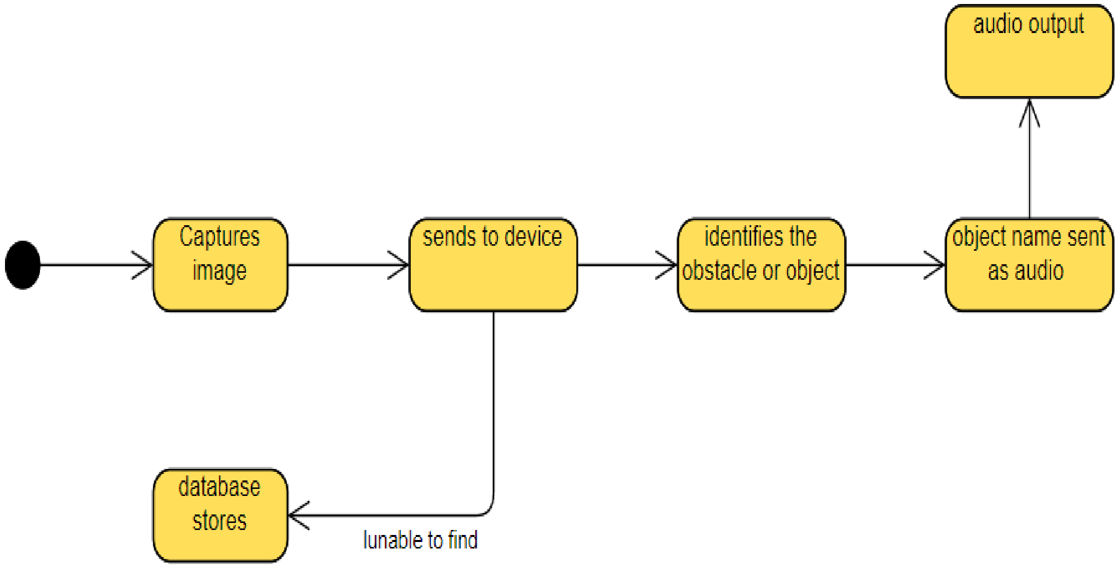

Fig.4.3.3

Description:

In the above diagram we have shown about and discuss about the state diagram of the project where the flow of the project is discussed in the diagram .states, transitions, events, and activities. You use state diagrams to illustrate the dynamic view of a system. They are especially important in modeling the behavior of an interface, class, or collaboration.

CHAPTER 5
SYSTEM ARCHITECTURE

CHAPTER 5

5. SYSTEM ARCHITECTURE

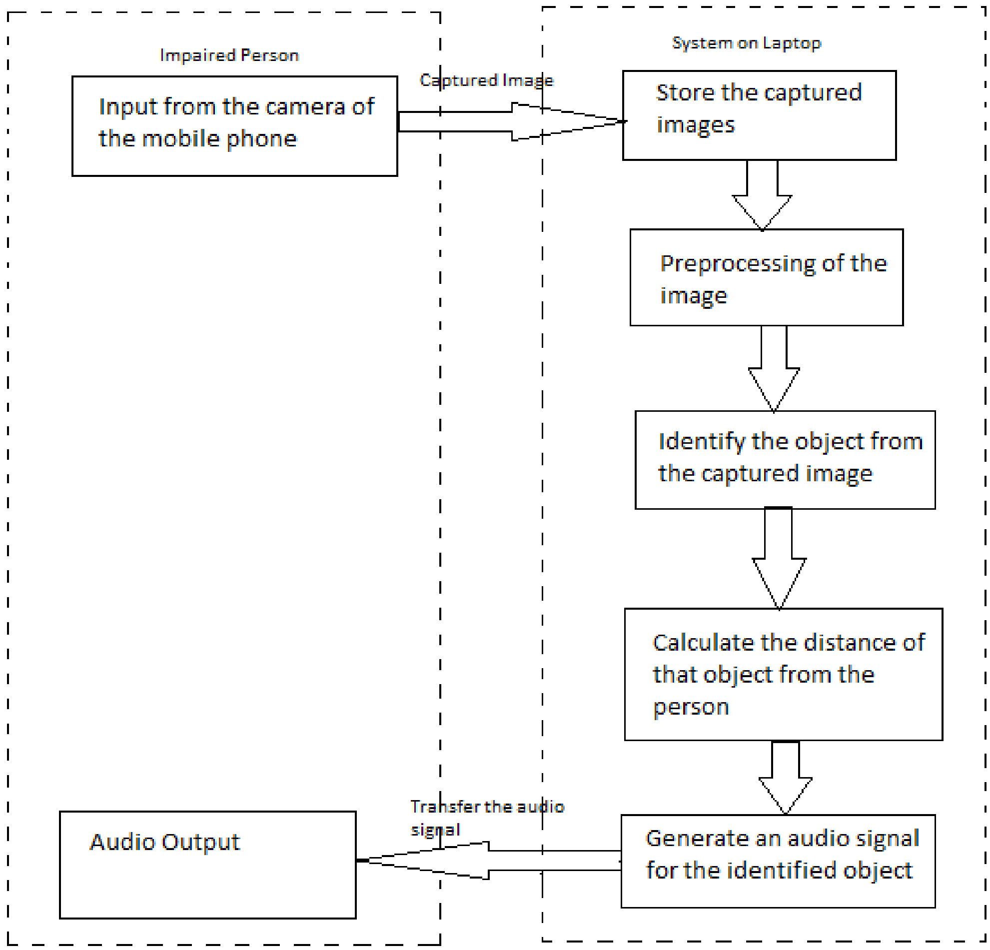

Fig.5. System Architecture.

DESCRIPTION:

In the above system architecture diagram according to that we setup cameras with software by which it captures and image and then stores the image in the database then preposses the image which is stored already identifies in that picture what is there in the database, now it calculates the distance between them along with the dataset related items generates required audio signal which can be easily understood transfer this audio as a signal

5.1 MODULE DESCRIPTION

The Modules involved are:

1. INPUT CAMERA

The input camera is uses an obstacle detection algorithm to analyze the input camera is identify obstacle within it. These algorithms use machine learning techniques like deep learning to recognize patterns and features in the obstacle. First we gather the camera to classify the obstacle detection. The camera are trained using the dnn_Detecti on model. The live camera is streaming the camera portal. The Collected data are clearly and neatly to find the exact accuracy to the solution. The streaming are categories on camera to image

2. IMAGE PREPROCESSING

An image classification task determines the category of a given input image in the clear dataset. It is a basic task in high –level image understanding and can be divided into binaryand multi classification tasks. An image is classified in the output layer following the requirements. Activation function of the output layer is the only difference between binaryand multi classification tasks. An image classification task for visual image analysis easilyidentified and then necessary actions can be taken to prevent visual tracking is an high performance in natural image classification, including dnn_Detection model can be used in JPG/PNG image classification.

3. FEATURE EXTRACTION

In machine learning, pattern recognition, and image processing, feature extraction starts from an initial set of measured data and builds derived values (features) intended to be informative and non-redundant, facilitating the subsequent learning and generalization steps, and in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction. When the input data to an algorithm is too large to be processed and it is suspected to be redundant, then it can be transformed into a reduced set of features (also named a feature vector). Determining a subset of the initial features is called feature selection. The selected features are expected to contain the relevant information from the input data, so that the desired task can be performed by using this reduced representation instead of the complete initial data.

4. OBSTACLE DETECTION

Obstacle Detection is a very prominent feature in the image since obstacle in detected. The visual obstacle needed to be found when its running. Since the obstacle is detected, edges can be used for the same. Canny edge detection is found to give very good results once the thresholds are tuned properly. Image can be filtered before edge detection to remove noise. Edge detection results in a cluster of number of lines. We need to extract the obstacle out of it. The Obstacle Detection can be detected something alarm detected automatic send message to User.

CHAPTER 6
SYSTEM IMPLEMENTATION

SYSTEM IMPLEMENTATION

```
import cv2 import math
import pyttsx3
# Threshold to detect object

thres = 0.45

# Minimum confidence threshold for object detection
confThreshold = 0.5
# Non-maximum suppression threshold

nmsThreshold = 0.2
# Width and height of the input image
width = 640
height = 480
# Focal length of the camera

focal_length =700
# Known width of the object to detect (in centimeters)
known_width = 10.0
engine=pyttsx3.init()
rate=engine.getProperty('rate')engine.setProperty('rate',rate-10)
classNames = []
classFile = "coco.names"
with open(classFile,"rt") as f:
```

```
classNames = f.read().rstrip("\n").split("\n")

configPath = "ssd_mobilenet_v3_large_coco_2020_01_14.pbtxt"
weightsPath = "frozen_inference_graph.pb"
net=cv2.dnn_DetectionModel(weightsPath,configPath)
net.setInputSize(320,320)
net.setInputScale(1.0/ 127.5)

net.setInputMean((127.5, 127.5,127.5))
net.setInputSwapRB(True)
def get_distance(known_width, focal_length, pixel_width):

"""Calculate the distance of an object from the camera using the known width of the object, the focal length of the camera, and the widthof theobject in pixels in the image.
"""

return (known_width * focal_length) /pixel_width
defgetObjects(img, draw=True, objects=[]):
try: classIds, confs, bbox = net.detect(img,confThreshold=confThreshold,
nmsThreshold=nmsThreshold)

if len(objects) == 0:

objects= classNames
objectInfo= []
if len(classIds) != 0:

for classId, confidence, box in zip(classIds.flatten(),confs.flatten(), bbox):


className = classNames[classId - 1]
if className in objects:
pixel_width= box[2] - box[0]
```

```
distance = get_distance(known_width, focal_length, pixel_width)
objectInfo.append([box, className, distance])

distance=distance*0.0254
if draw:
cv2.rectangle(img, box, color=(0, 255, 0), thickness=2)
cv2.putText(img, className.upper(), (box[0] + 10, box[1] + 30),
cv2.FONT_HERSHEY_COMPLEX, 0.7, (0, 255, 0), 2)
cv2.putText(img, str(round(confidence * 100, 2)), (box[0] + 200, box[1] + 30)
cv2.FONT_HERSHEY_COMPLEX, 0.7, (0, 255, 0), 2)
cv2.putText(img, f"Distance:{round(distance, 2)} m", (box[0] + 10, box[1]
+ 70)
cv2.FONT_HERSHEY_COMPLEX, 0.7, (0, 255, 0), 2)
engine.say(f"{className} Detected")
engine.runAndWait()
return img, objectInfo
except:
pass
_if name_== " main ":
cap=cv2.VideoCapture(0)
cap.set(3, width)
cap.set(4,height)
while True:
try: success,img = cap.read()
```

```
result, objectInfo = getObjects(img)
cv2.imshow("Obstacle Detection", img)
except: pass
if cv2.waitKey(1)== 27:
breakcv2.destroyAll
Windows()
```

CHAPTER 7
SYSTEM TESTING

CHAPTER 7

7.1 SYSTEM TESTING

At first, we are capturing real time images from the rear camera of the mobile handset of blind people and a connection is established between camera and system in laptop and then those images are sent from the camera to laptop.

This connection is done by a laptop software which is installed in the laptop of the person. All the real time images which get captured by the rear camera are first transferred to the in laptop where they are processed for some further conclusions.

The system in laptop will test it using its APIs and SSD ALGORITHM and it detects the confidence accuracy of the image which it is testing. We reached 98% accuracy for certain classes like books, cups, remote.

After testing the images we are generating an output on the laptop based system and its prediction is being translated into voice with voice modules and sent to the blind person with the help of wireless audio support tools.

7.2 UNIT TESTING:

A software development process in which the smallest testable parts of an application, called units, are individually and independently scrutinized for proper operation.

This connection is done by a laptop different sestions which is installed in the laptop of the person. All the real time images which get captured by the rear camera are first transferred to the in laptop where they are processed for some further conclusions.

The system in laptop will unit test it using its APIs and SSD ALGORITHM and it detects the confidence accuracy of the image which it is testing. We reached almost accuracy for certain classes like books, cups, remote.

After testing the images we are generating an output on the laptop based system and its prediction is being translated into voice with voice modules and sent to the blind person with the help of wireless audio support tools.

INTEGRATION TESTING:

checking individual components or units of a software project to expose defects and problems to verify that they work together as designed.The training dataset is relatively small compared to the complexity of the object detection model. Thus, the performance of the crack detection is improved marginally by employing various fine-tuning techniques in addition to the customization techniques introduced in Section 3.3. Particularly, too many false positive detections are not acceptable if human inspectors have to verify each false detection manually. On the other hand, elimination of false negatives is even more critical. This is because negligence of actually existing cracks can lead to the wrong assessment of the ship conditions on the system We have a small training dataset, i.e., initially around 1000 crack images. It is unlikely that using such small dataset to train RetinaNet which contains millions of trainable parameters could achieve the desired level of performance. Lack of sufficiently real data is a common issue for many DNN

7.3 TEST CASES

S.NO	TEST CASES	OUTPUT	EXPECTED OUTPUT	STATUS
1	Object detected– accuracy 45<=100	Detected object	Detected object with accuracy 60<=100	Pass
2	Distance of the person from the object	Distance is estimated	Warning if its close else safe to proceed	Pass
3	Voice feedback which is obtained from obstacle detection	Obstacle is converted to audio feedback	Audio feed back is obtained	Pass
4	Capture of Image in the camera	Software enables to click pictures automatic ally	stores image in the system	pass

5	open the website check the camera	camera should open	camera isopened	pass
6	couldn’t identify image then in the system what it takes place	stores the images gives audio as unidentified d image	Gives audio signal transmits as unidentified image.	pass
7	Captures distance between the object or obstacle	shows in the screen	measured accurate value is onscreen	pass
8	If there is more than one object or obstacle	shows both of them	show both with accurate distance values	pass

Table 7.2 Test cases

7.4 TEST CASE REPORT:

Training a deep CNN is computationally intensive and often executed using GPU(s). The training environment and configuration used in our work are described in Table 3. The RetinaNet model configuration were mostly set to default values such as the backbone network, initial weights, anchor sizes and strides, image maximum/minimum side, etc. However, the anchor ratios and scales were set to optimal values which were obtained from running the anchor optimization algorithm [36] on our crack image dataset (The dataset used for finding the optimal value of anchor ratios and scales was a subset of the training dataset described in . The reason is that the training dataset has been continuouslyupdated until nowbut the optimal anchor settings have not been updated accordingly.). The number of training epochs was not very large as overfitting occurred in the early phase of training and continuously training longer will not improve the model performance anyway. The batch size is related to the computational resource limitation and can not be set to a too big value. The steps per epoch is calculated based on the number of training images and batch size. we take care of all the required number of assessments that are needed for the system.

CHAPTER 8
RESULT AND DISCUSSION

CHAPTER 8

8.1 RESULT AND DISCUSSION

Driving with too short of a safety distance between the vehicles is a common problem inroad traffic, which often results in traffic accidents as a consequence. The number of vehicles is increasing day by day and because different road conditions, accidents can occur between vehicles, human as well as animals, so object detection is very important. The main goal of this project is to develop object detection for accident avoidance and improving the Road Safety with Use of Raspberry Pi. A user-friendly visualization approach of the detected images is provided in this paper. The main purpose of the system is to implement the real-time objects detection system on a Raspberry Pi to avoid accidents and improving road safety. In which the system performs reprocessing using the mean subtracted difference extension (MSDE) and then segmentation is performed. Classification is done using proposed advanced classifier. The system can classify objects such as animals, people, cars, etc. After the object is detected the system will notify the user to slow down the car via voice message. The result analysis shows that proposed system is more precise and consumes less time than existing CNN and YOLO object detection methods.

CHAPTER 9 CONCLUSION AND FUTURE ENHANCEMENT

CHAPTER 9

9.1 CONCLUSION AND FUTURE ENHANCEMENTS

Several technologies have been created find obstacles which will be helpful for visually impaired persons and self-driving cars(navigation). One such attempt is that we would wish to make an Integrated Machine Learning System that allows the blind victims to identify and classify real-time objects generating voice feedback and distance. Which also produces warnings whether they are very close or far away from the thing. For visually blind folks, this technology gives voice direction. This technique has been introduced specifically to assist blind individuals. The precision, on the other hand, can be improved. Furthermore, the current system is based on theAndroid operating system; it can be altered to work with any device that is convenient. In future GPRS is installed for better outdoor navigation of the user.

CHAPTER 10
APPENDICES

CHAPTER 10

APPENDICES

10.1 CODING

obstacle_detection_voice.py - E:\Obstacle Detection\obstacle_detection_voice.py (3.10.6)

File Edit Format Run Options Window Help

```
import cv2
import math
import pyttsx3
# Threshold to detect objectSs
thres = 0.45

# Minimum confidence threshold for object detection
confThreshold = 0.5

# Non-maximum suppression threshold
nmsThreshold = 0.2

# Width and height of the input image
width = 640
height = 480

# Focal length of the camera
focal_length = 700

# Known width of the object to detect (in centimeters)
known_width = 10.0

engine=pyttsx3.init()
rate=engine.getProperty('rate')
engine.setProperty('rate',rate-10)
classNames = []
classFile = "coco.names"
with open(classFile,"rt") as f:
    classNames = f.read().rstrip("\n").split("\n")

configPath = "ssd_mobilenet_v3_large_coco_2020_01_14.pbtxt"
weightsPath = "frozen_inference_graph.pb"

net = cv2.dnn_DetectionModel(weightsPath,configPath)
net.setInputSize(320,320)
net.setInputScale(1.0/ 127.5)
net.setInputMean((127.5, 127.5, 127.5))
net.setInputSwapRB(True)

def get_distance(known_width, focal_length, pixel_width):
    """
    Calculate the distance of an object from the camera using the known width
    of the object, the focal length of the camera, and the width of the object
    in pixels in the image.
```

Fig.10.1.Code of the project

10.2. SCREENSHOTS

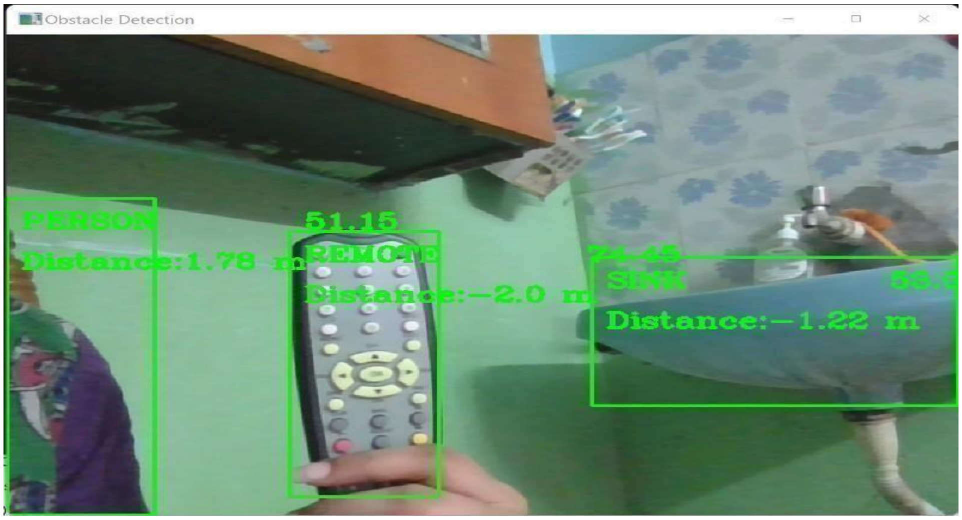

Fig.10.2.Object (Person,Remote,Sink) is detected.

Fig.10.3.Keyboard is detected.

10.3. DATASETS

COCODATA SET

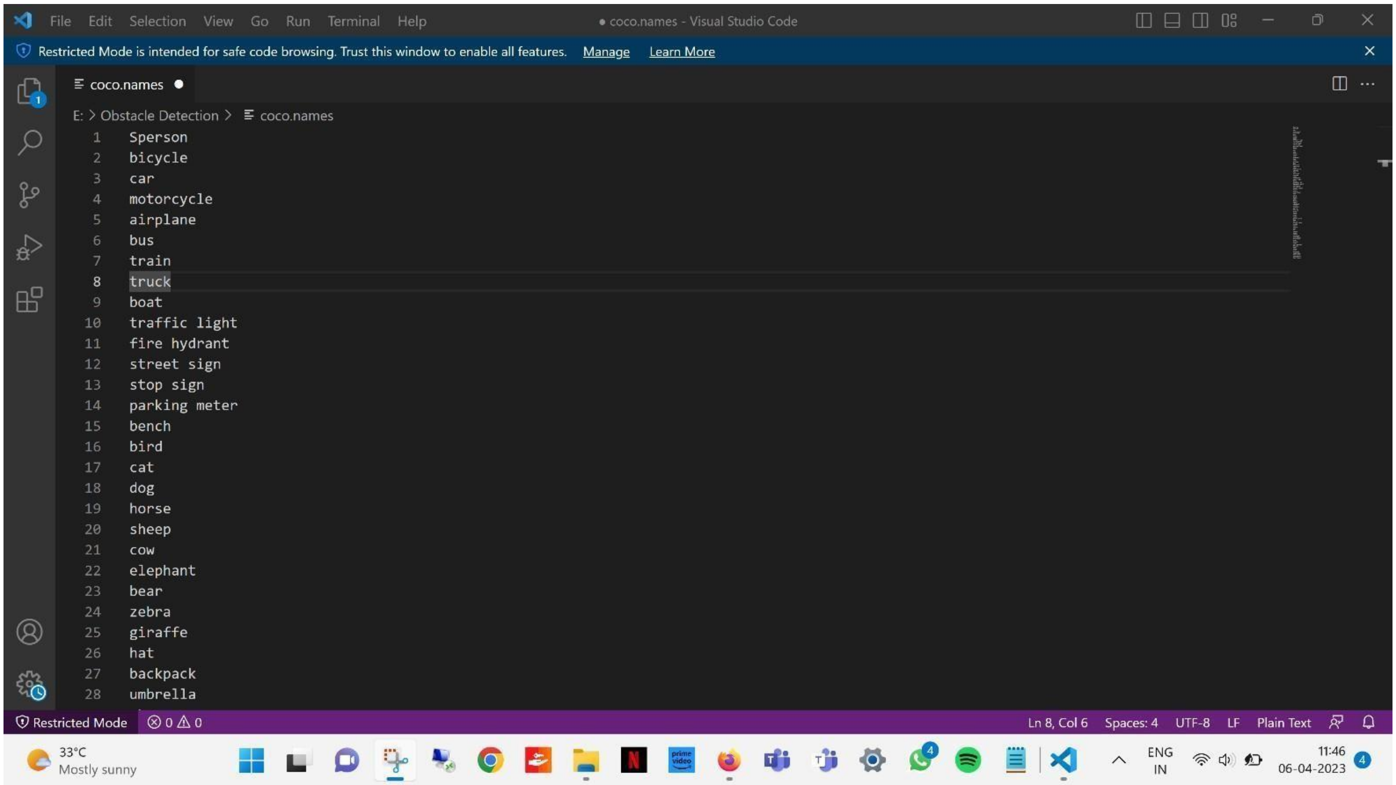

Fig.10.3 Datasets

CHAPTER 11 REFERENCES

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