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Paper Authors

Ch.Kalyani , V Shalini , B.Ramya, K.Madhav, K Chandana, M Swathi

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Object Detection Using Raspberry Pi

Ch.Kalyani [1], V Shalini [2], B.Ramya[3], K.Madhav[4], K Chandana[5], M Swathi[6]

[1]Assistant Professor, Dept. of Electronics & Communicational Engineering,Balaji Institute Of Technology & Science, Warangal, Telangana , India.

E-Mail:kalyanichenigaram@gmail.com

[23456]UG Student,Dept. of Electronics & Communication,Balaji institute of Technology & Science,Warangal, Telangana, India.

Abstract- **Object detection is a major aspect in many fields. And there is much advancement in it after the introduction of deep learning. Our system has tried to use these advancements in simple way where it consists of raspberry pi camera, raspberry pi and other components. Software part includes python. The inbuilt packages in python IDLE make it convenient for object detection. Our own datasets can also be trained for recognizing. The recognition of object here is nothing but a box bounding the object. This can be visually viewed in a monitor. The main aspect of this object detection is to efficiently perform object detection on a low power device like raspberry pi.**
Keywords—Raspberry Pi, Raspberry Pi Camera, python IDLE.

I. INTRODUCTION

Computer vision is a field of computer science which enables machines not only to see but also to process and analyze digital images and videos. One big application area of computer vision is object detection, the capability of a computer to locate and identify objects in an image. With the recent advances in deep learning and convolutional neural networks (CNN), computers can from large image datasets learn to recognize and track objects seen in images [10] and videos with great accuracy [11]. This thesis studies the possibility of implementing an object detector on a single board computer, the Raspberry Pi B+, capable of maintaining real-time frame rate while keeping high precision [12]. The problem we face is the lack of computing power that is required in an object detecting system. Two popular object detecting methods have been selected and are evaluated by measuring detection accuracy, inference time and throughput [13].
We have sensors and diodes for obstacle detection. If we observe sensors like ultrasonic sensors are in wide use for any obstacle detection. Also we have Lidar sensor which is developing and it is finding application in geography. The LASER diode which also finds application in similar fields is used for obstacle detection. But all of them have one common disadvantage in them. They cannot be used to find a specified or the object we want to. As all of these sensors work on a similar principle that is measuring the distance from the object to identify them. They measure the distance from any object that is on the way and that is why we cannot use them for detecting the desired object. Also their efficiency reduces due to optical and spectral reflections [14]. So it is evident that no sensors can be used for object detection. But Deep learning solves this. We can make the machine learn to identify objects and that is what deep learning involves. It is easy to implement it with the open-source frameworks Tensor Flow and open CV [15].

Object detection and recognition applications are generally made using appearance-based or local feature-based approaches, depending on the purpose of use. The local feature-based approach is used when appearance-based approaches are not enough. In cases where illumination changes or objects are partially occluded by another object, local feature-based approaches are usually preferred. Local features can be expressed as specific regions containing information about objects. The feature vectors obtained from this approach are descriptors such as distances to the center, curvatures of curves and corners. Through these features, objects can be defined independently from the whole [16].

The drawbacks they are emerged from the existing methods are: There are many drawbacks with the existing system like the objects are not perfectly aligned in training, each image using multiple segmentation [17].

II. METHOD USED IN PROPOSED MODEL

Proposed system consists of Raspberry pi, camera module and the PC. Camera continuously captures the video and its input frames are sending to raspberry pi. On raspberry various operations are performed on the image. Image is preprocessed and blob detection algorithm is applied to detect objects and then bounding box algorithm is applied which detects the objects. Whole algorithm of the object detection is implemented on raspberry pi. Data from raspberry is send to PC end for display [9].

Steps in the proposed system for object detection:
1. Camera: Continuously record video.
2 .Read Image: Read frames of the image.
3. Bounding box to the object: It finds boundary pixel information to set bounding to the different objects for detecting.

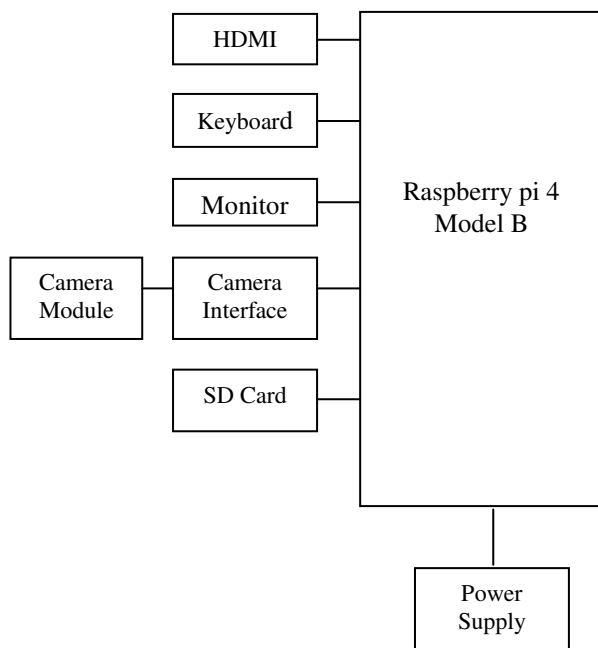
Fig1. Raspberry Pi4

II. MODEL ARCHITECTURE

Fig 2. Block Diagram

The block diagram of raspberry pi consists of HDMI, eyboard, Monitor, CameraModule,Camera Interfaces Card, Power Supply.

HDMI (High-Definition Multimedia Interface): HDMI is a proprietary audio/video interface for transmitting uncompressed video data and compressed or uncompressed digital audio data from an HDMI-compliant source device, such as a display controller, to a compatible computer monitor, video projector, digital television, or digital audio device.[3] HDMI is a digital replacement for analog video standards.

Camera Module: The camera module is a product used to take photos and videos from mobile devices, such as smartphones, automobile, and smart home appliances. In all areas, a high level of technology is needed that requires high resolution, miniaturization, slimming, low-power, and high stiffness. Raspberry Pi 4 Model B Power supply HDMI Keyboard Monitor Camera Interface SD Card Camera Module 29.

Camera Interface: The Camera Interface block or CAMIF is the hardware block that interfaces with different image sensor interfaces and provides a standard output that can be used for subsequent image processing.

SD Card: A Secure Digital (SD) card is a tiny flash memory card designed for high-capacity memory and various portable devices, such as car navigation systems, cellular phones, e-books, PDAs, smartphones, digital cameras, music players, digital video camcorders and personal computers.

Power Supply: A power supply is an electronic circuit that converts the voltage of an alternating current (AC) into a direct current (DC) voltage. It is basically consisting of the following elements: transformer, rectifier, filter and regulator circuits.
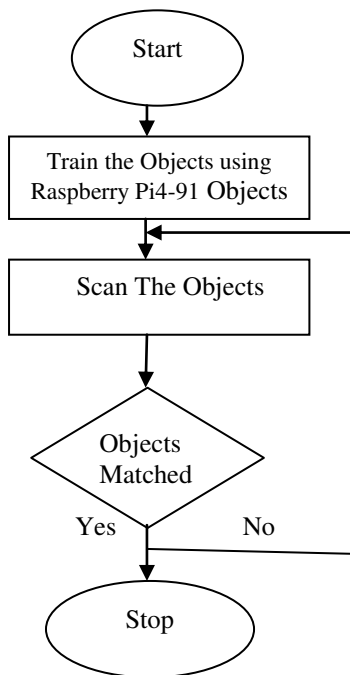
III. **MODEL IMPLEMENTATION**

Fig.3. Flowchart

V. RESULTS

The below Setup Fig.4. Consists of Raspberry pi 4,Camera to detect the objects,SD card in which the data is stored and a monitor to show the output.When the Raspberry pi is turned on, some operations are done in the background. When the code is executed in python whatever the objects we are going to detect will be detected by the camera and the name of the object will be displayed.
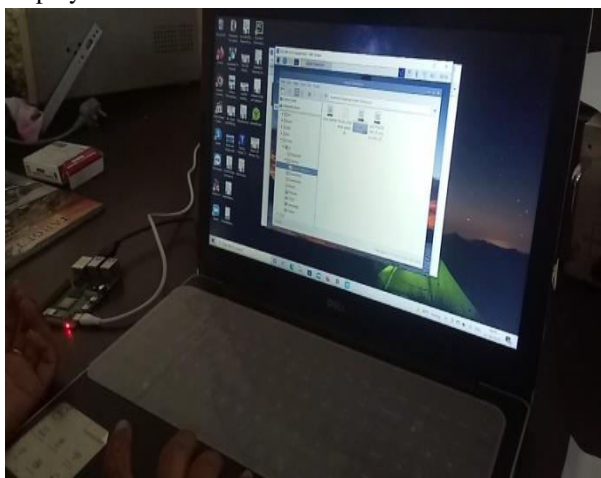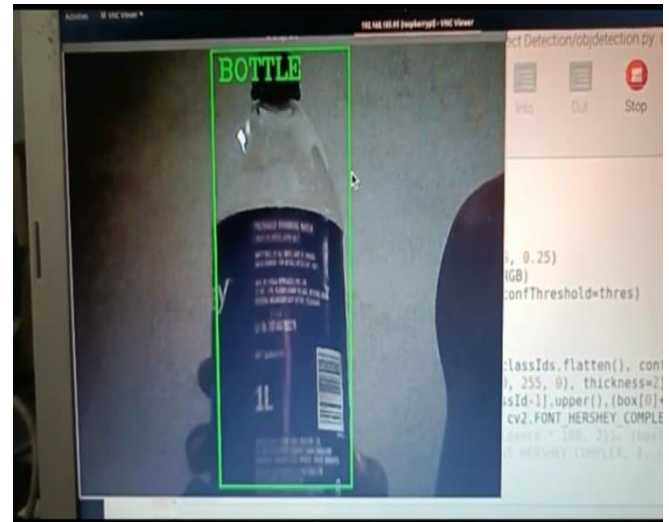

Fig.4.Setup

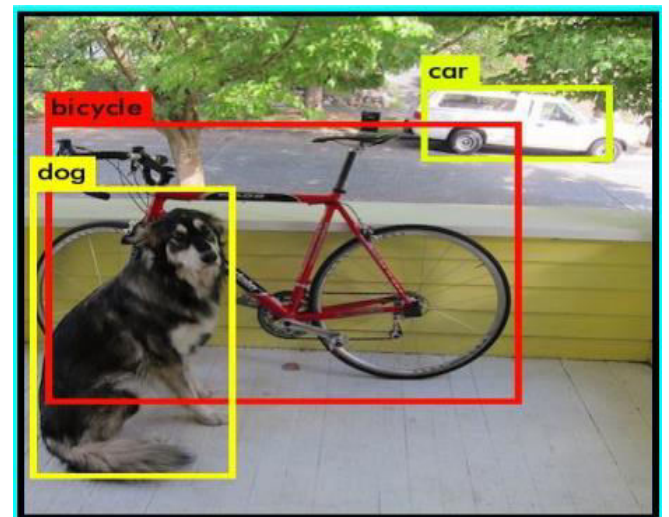Fig.5. Object Detected i.e, Bottle

Fig.6. Object Detection using Raspberry pi

VI.CONCLUSION

The object detecting system based on raspberry pi. Bounding box algorithm is implemented for detecting and tracking objects using Python. Results shows that method is suitable the detecting of objects and it can be used in various future applications.

VII. FUTURE SCOPE

The future of object detection technology is in the process of proving itself, and much like the original Industrial Revolution, it has the potential to free people from menial jobs that can be done more efficiently and effectively by machines.

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