Ahmedabad University

Report 1

CSE541 Computer Vision Section-1

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Problem Statement:

Small object detection in aerial imagery is a complex and critical task, especially in scenarios like monitoring road traffic in urban environments. Despite the availability of various deep learning-based models, accurately detecting small objects remains a challenge due to factors such as scale, resolution, and occlusion.

Literature survey:

Paper 1:

Title: Vehicle Detection From UAV Imagery With Deep Learning: A Review

Author: Abdelmalek Bouguettay

Publish year: 2022

Main finding: types of deep learning architectures, such as convolutional neural networks etc and then investigate different vehicle detection methods

Limitation: Vehicle detection studies have a very limited dataset which is a major setback to this field.

Paper 2:

Title: Feature-Fused SSD: Fast Detection for Small Objects

Author: Guimei Cao, Xuemei Xie

Publish year: 2017

Main finding: Real time detection with the speed of 43 FPS of element-sum module and 40 FPS of concatenation module with higher accuracy.

Limitation: slower than SSD original model(50 FPS) because of the extra feature fusion layers.

Paper 3:

Title: Small Object Detection for Drone Image Based on Advanced YOLOv7

Author: Haoran Chen; Jingyu Wang; Jingwei Li; Yu Qiu; Dengyin Zhang

Publish year: 2023

Main finding:

With the increasing popularity of consumer drones, deep learning models for object detection on drone images have become a standard solution. The accuracy of detection is low in this scene

due to obstacles like drones moving too quickly or too high or being blocked by trees or buildings. This paper addresses the aforementioned problems by choosing to enhance the real-time object detector YOLOv7 and by designing the backbone network of the model with a large convolution kernel architecture that increases the effective receptive field of convolution.Concurrently, to address the issue of the model's low precision in the drone scene, a BiFPN-like struct is created for the YOLOv7 and utilized to process feature maps of different sizes. This paper employs techniques like depth-wise convolutions and struct reparameterization to support the large kernel backbone architecture, improving the model's inference performance.

Approach:

- Various Deep Learning Models/Approaches to study: QueryDet, HoughNet, SyNet
- Using multiscale feature learning. Extract the multi-level features from SSD model.

Dataset:

- Training Set: Visdrone 2019 detection
- AU drone dataset

References:

***Small Object Detection for Drone Image Based on Advanced YOLOv7*. (2023, July 24). IEEE Conference Publication | IEEE Xplore.**

https://ieeexplore.ieee.org/document/10239784