AHMEDABAD UNIVERSITY

SCHOOL OF ENGINEERING AND APPLIED SCIENCE

Winter Semester 2024

CSE-541 Computer Vision

Team Number: 3

Members:

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Project 6: Explore oriented object detection (OOD) models. Create our own AU drone dataset for such a model and then test/validate trained models.

WEEKLY REPORT

(Week 4)

(26/02/2024 - 03/03/2024)

Tasks Completed:

- Paper Analysis
    - Thorough reading of both papers with a focus on:
        - Problem definition within the context of oriented object detection.
        - Core components of the proposed models
        - Datasets used and their characteristics.

PAPER 1: RBox-CNN: rotated bounding box based CNN for ship detection in remote sensing image

- Key Contribution: Introduces RBox-CNN, an end-to-end model tailored for oriented ship detection in remote sensing imagery. It leverages rotated bounding boxes for precise localization.
- Approach Summary:
    - Builds on Faster R-CNN: Adopts the two-stage Faster R-CNN architecture as its foundation.
    - Rotated Region Proposal Network (RRPN): Generates rotated bounding box proposals to encompass arbitrarily oriented objects.
    - Rotated RoI (RRoI) Pooling: Extracts features from these rotated proposals while preserving spatial orientation information.
    - Classification & Regression: Predicts object class and refines the rotated bounding box coordinates and orientation angle.
- Datasets: HRSC2016, ODAI
    - HRSC2016: A high-resolution ship detection dataset containing ships in maritime scenes with diverse sizes, orientations, and densities.

    - ODAI: Likely the Oriented Detection in Aerial Images (ODAI) dataset, offering another collection of aerial images with annotated oriented bounding boxes for objects.

PAPER 2: H2R Box-v2: Incorporating Symmetry for Boosting Horizontal Box Supervised Oriented Object Detection

- Key Contribution: Addresses the gap between methods trained on horizontal bounding boxes (HBox) and those requiring rotated bounding boxes (RBox), ultimately aiming to improve oriented object detection performance.
- Approach Summary:
    - Adopts FCOS Detector: Utilizes the single-stage FCOS detector as the base architecture.
    - Key Innovations:
        - Symmetry-based strategies to leverage HBox annotations for predicting oriented bounding boxes.
        - Potentially new loss functions or architectural components to facilitate the learning process from HBox data.
- Datasets: DOTA, HRSC2016, possibly FAIR1M
    - DOTA: Large-scale aerial image dataset with 15 object categories and oriented bounding box annotations.
    - HRSC2016: (Same as described earlier).
    - FAIR1M: Large-scale object detection dataset, likely containing oriented bounding box annotations.
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Next Steps:

- Code Search: Locate open-source implementations of RBox-CNN and H2RBox-v2 (MMRotate is a likely place to start).
- Dataset Compatibility: Assess how the AU drone dataset aligns with the datasets used in the papers. Identify potential preprocessing or annotation adjustments needed.
- Implementation Exploration (tentative): Begin outlining the steps to integrate or adapt elements from these papers for our model.