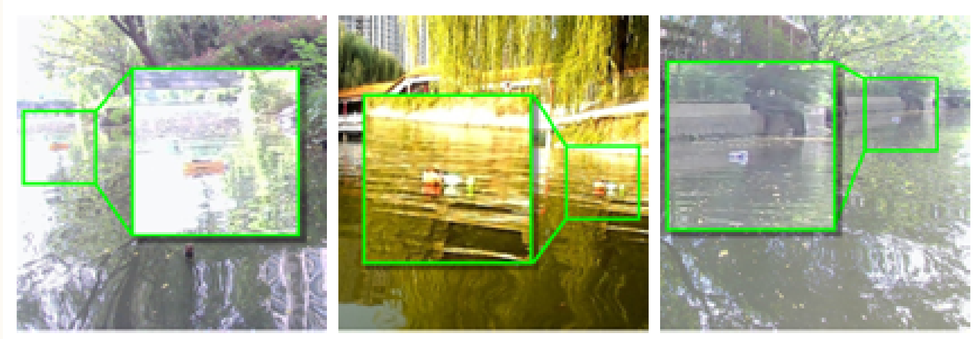
ARTIFICIAL INTELLIGENCE FRAMEWORK TO ACCURATELY PERFORM SMALL OBJECT DETECTION ON THE WATER SURFACE

CONTEXT AND MOTIVATION

- With the expansion of USVs' application scenes from the typical marine areas to inland waters, new challenges arise for the object detection task especially small object detection on water surfaces.
- Perception system of USVs and safe autonomous navigation like avoiding buoys and reefs depends on this.
- There has been a new garnered attention towards autonomous activities on water surfaces such as oceanographic research, transportation, water quality monitoring, etc.
- Applications/missions that are very much needed can also be implemented such as floating waste cleaning.

BACKGROUND

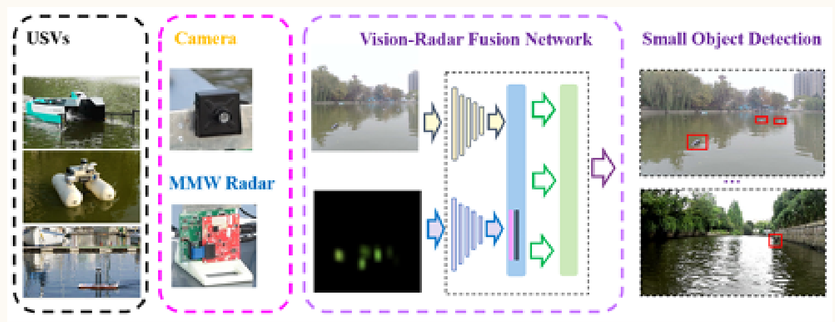
- There has been a few main challenges for vision-based small objects detection on water surfaces like light reflection on the water surface, surrounding scene reflection interference and short detection range [1].



- Also object detection based on other sensors like MMW radar show weakness in non-metallic targets and have lack of semantic information compared to RGB images.

STATE OF THE ART

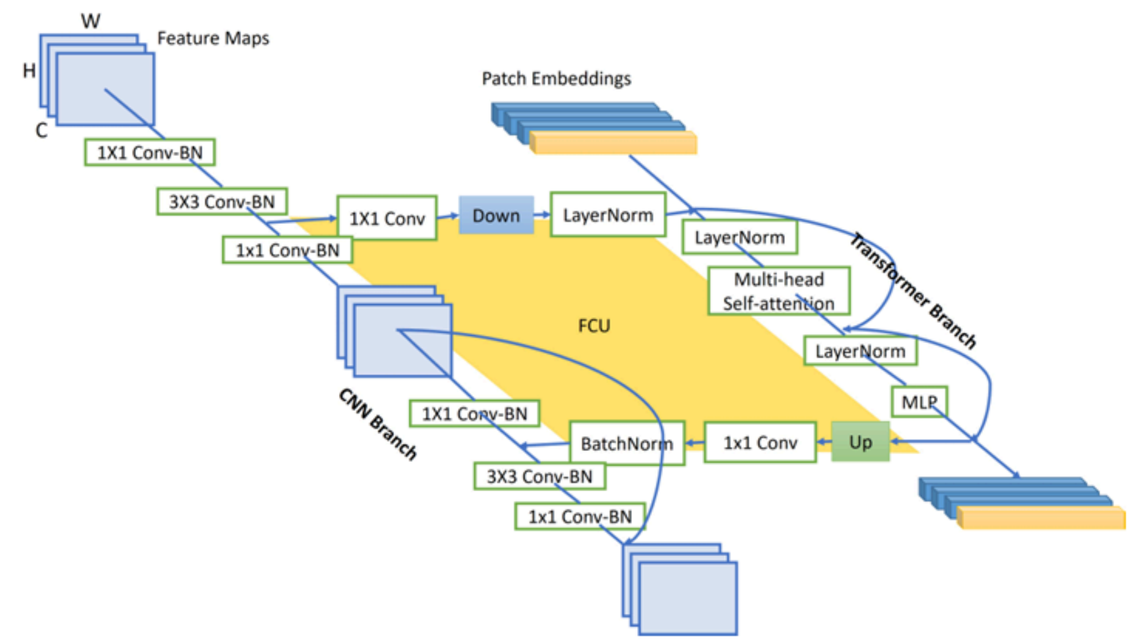
- The authors of [2] talk about a novel method Radar-Image spatiotemporal fusion network (RISFNet).
- It utilizes multi-frame radar data and deep-level multi-scale fusion with RGB images. Achieves state-of-the-art performance in small object detection for USVs.



- Paper [3], compares different methods for integration of transformers for small object detection based on vision as well as other sensors.

PROPOSAL

- Implement a Transformer block after obtaining the features from the model to enhance precision.
- Add sensors like Lidar to support research on object detection using fusions of various modalities and to further improve the accuracy and robustness of the small object detection system.
- Implement model to work effectively on different lighting condition (one of the main problems) [4].
- Extend the water surface small object dataset [2].



REFRENCES

[1] Alexey Bochkovskiy, Chien-Yao Wang, and HongYuan Mark Liao. Yolov4: Optimal speed and accuracy of object detection. arXiv preprint arXiv:2004.10934, 2020.
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