

(Doctorat : D4)
RESUME DE THESE¹

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Titre de la thèse	Pedestrian Detection and Distance Estimation using Stereo Vision in Advanced Driver Assistance Systems
Discipline/ Spécialité	Sciences de l'ingénieur/Génie électromécanique
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Résumé : (150 mots)

Pedestrian detection and distance estimation are critical tasks for Advanced Driver Assistance Systems (ADAS), directly affecting road safety. Despite advances in deep learning and computer vision, reliable deployment remains challenging under adverse conditions and embedded constraints. This thesis develops a cost-effective and computationally efficient framework for real-time pedestrian detection and stereo vision-based distance estimation. The first contribution focuses on the design of a Raspberry Pi-based system employing the small variant of the You Only Look Once model (YOLOv5s), enhanced through data augmentation to improve robustness under challenging visual conditions. The second contribution introduces a novel object-level stereo distance estimation method that extracts representative keypoints within pedestrian regions, reducing background interference and improving temporal consistency. The third contribution proposes a novel attention module, termed Weighted Fusion Efficient Channel Attention (WF-ECA), which is integrated into YOLOv5s to enhance detection of small, occluded, blurred, and poorly illuminated pedestrians. Collectively, these contributions enable reliable pedestrian detection and distance estimation for embedded ADAS.

Mots clés : Pedestrian detection, Distance estimation, Stereo vision, Advanced Driver Assistance Systems (ADAS), Raspberry Pi, You Only Look Once (YOLO), Object-level stereo distance estimation, Weighted Fusion Efficient Channel Attention (WF-ECA).

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