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Enhanced obstacle detection using bilateral vision-aided transformer neural network for visually impaired persons

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Abstract Obstacle detection remains vital in autonomous navigation and assistive technologies, especially for visually impaired individuals. This work introduces an enhanced obstacle detection framework based on a Bilateral Vision Transformer and Convolution Kernel Neural Network (BViT-CKNN). The system incorporates stereo vision data and applies a bilateral filter to reduce noise while preserving edge details. A Vision Transformer (ViT) model is then used for

global feature extraction, and a Convolution Kernel Neural Network (CKNN) captures fine-grained local features. Evaluated using the COCO dataset, the proposed BViT-CKNN achieves superior performance in precision (0.93), recall (0.91), F1-score (0.92), and Mean Absolute Error (MAE) reduction (3.16%) compared to existing methods.

Keywords

Author Keywords: Visually impaired; Obstacle detection; Bilateral filter vision transformer; Convolution Kernel Neural Network

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