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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. © This is a U.S.

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Author keywords

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

Indexed keywords

Engineering controlled terms

Assistive technology; Convolution; Copyrights; Human rehabilitation equipment; Neural networks; Nonlinear filtering; Stereo image processing; Stereo vision; Vision aids

Engineering uncontrolled terms

Autonomous navigation; Bilateral filter vision transformer; Bilateral filters; Convolution kernel; Convolution kernel neural network; Navigation technology; Neural-networks; Obstacles detection; Visually impaired; Visually impaired persons

Engineering main heading

Obstacle detectors

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