Title: Machine Vision–Based Insect Recognition in Agriculture: A Comprehensive Review

Author names: Mohammad Monirul Islam, Morium Akter, Mohammad Shorif Uddin, Md. Ataur Rahman, Md. Tarek Habib

Abstract: The increasing harm that insect pests do to crops, along with the shortcomings of conventional pest control strategies, is what prompted this review. When dealing with pest outbreaks, manual, reactive methods are becoming less and less effective, particularly on the massive scale of contemporary agriculture. Machine vision, enabled by state-of-the-art computer technologies, presents an exciting opportunity for effective and preventive pest management. Highlighting the limitations of manual and reactive methods, the review advocates for a proactive, real-time approach. Real-time data interpretation is improved by integration with Internet of Things (IoT) devices. At the same time, a strong alternative is formed by elements such as picture capture, preprocessing, feature extraction, and classification algorithms. Real-world applications demonstrate the versatility of machine vision across diverse agricultural settings, presenting tangible benefits such as improved crop yields and reduced pesticide usage. This review explores how artificial intelligence (AI)-based machine vision is changing the face of agricultural pest identification. It highlights the change from reactive to proactive pest detection in real time. Reducing pesticide consumption and increasing crop yields are two of the many tangible advantages highlighted in the assessment, and it critically assesses performance, limitations, and future directions, contributing insights for researchers, policymakers, and practitioners pursuing sustainable and technologically advanced pest management in global agriculture.

Keywords: dataset ,deep learning ,image processing ,insect recognition , IoT in agriculture , machine vision , performance metrics ,pest detection

https://doi.org/10.1002/eng2.70729Digital Object Identifier (DOI)