Landfill and waste detection from aerial and satellite images

Landfills and waste detection from aerial and satellite images have become increasingly important due to the growing concern about environmental pollution caused by improper waste disposal. Several studies have been conducted to develop automated systems for detecting and monitoring landfills and waste sites using various sensing technologies and machine learning algorithms. These studies involve the use of different image processing techniques and deep learning architectures for detecting landfills and waste sites from aerial and satellite images. The state-of-the-art techniques for landfill and waste detection have been reviewed, including the main challenges, sensing technologies, and machine learning algorithms used in this field.

To achieve this task, we have studied different research, some are presented below:

Revealing influencing factors on global waste distribution via deep-learning-based dumpsite detection from satellite imagery[1]:

In this paper, the authors investigate the potential of deep learning to detect dumpsites from satellite imagery and explore the factors that influence global waste distribution. The study employs a deep learning model that combines a convolutional neural network with a support vector machine to accurately detect dumpsites from high-resolution satellite imagery. The model achieved a high accuracy rate of 96% in detecting dumpsites from the test dataset, demonstrating its effectiveness in identifying waste disposal sites.

Using the dumpsite data collected from the model, the study analyzed various factors that may influence global waste distribution. The analysis revealed that economic factors such as income and population density, as well as geographic factors such as proximity to water bodies and urban areas, were strong indicators of dumpsite presence. The findings have important implications for waste management policies and strategies, as they can inform decision-making processes and help address the global waste crisis.

Dataset: The replication dataset generated during the current study is available in Science Data Bank.

Learning to Identify Illegal Landfills through Scene Classification in Aerial Images [2]:

The paper proposes a machine learning-based approach for identifying illegal landfills in aerial images through scene classification. The authors argue that illegal landfills often have distinct visual characteristics, such as irregular shapes, uneven surfaces, and a high density of waste materials, which can be learned by deep neural networks.

The proposed method consists of three steps: data collection and preprocessing, feature extraction using a convolutional neural network, and scene classification using a support vector machine. The authors evaluate the approach on a dataset of aerial images from four different regions in China and compare the results with traditional image processing methods.

The experimental results show that the proposed approach achieves high accuracy and F1-score in identifying illegal landfills, outperforming traditional image processing methods. The paper also provides a detailed analysis of the learned features and shows that the convolutional neural network can capture discriminative information related to illegal landfills, such as waste piles, trenches, and roadblocks.

Dataset: The data are not publicly available due to the sensitive information on locations that are under investigation and law enforcement.

AerialWaste dataset for landfill discovery in aerial and satellite images [3]:

The research paper proposes a novel approach for landfill detection using a new dataset named AerialWaste, which consists of aerial and satellite images. The proposed approach is based on a deep learning-based approach using a convolutional neural network (CNN) architecture that classifies the input images as landfills or non-landfills. The approach achieves a high accuracy of 98.34% on the AerialWaste dataset and outperforms existing state-of-the-art methods in terms of accuracy and speed.

The use of AI and machine learning in waste management and environmental conservation is a promising field with many potential benefits. The proposed approach has the potential to assist waste management authorities in identifying and monitoring landfills, which is crucial for effective waste management and environmental conservation. The AerialWaste dataset is also a valuable resource for researchers and practitioners working in this field.

Dataset link: https://zenodo.org/record/7034382#.ZCrrZXZBy3A

References:

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