

PREFACE

The way humans view and interpret the Earth's surface has changed dramatically as a result of the fast advancement of remote sensing technology. Among these developments, multispectral imaging and synthetic aperture radar (SAR) have become effective methods for extracting land cover. Our comprehension of the terrestrial environment is improved by complementing datasets provided by multispectral imaging, which has rich spectral information, and SAR, which can operate day and night and break through cloud cover. In order to enhance land cover extraction, this research explores the exciting field of combining dual polarised SAR data with comparative multispectral imagery.

In order to provide a more thorough knowledge of the observed events, the notion of data fusion in remote sensing entails merging information from numerous sources. Land surface structural and dielectric qualities can be better understood with the use of dual polarised SAR data, which records information in two separate polarisation systems. In contrast, multispectral photography gathers reflectance data over a number of wavelength bands, offering comprehensive details on the spectral properties of different kinds of land cover.

There are several polarisation setups for imaging radars. A single polarisation, usually in the same direction, is sent and received by a single-polarization system, often known as a "single-pol." This produces an imager that is either horizontal-horizontal (HH) or vertical-vertical (VV). (The broadcast direction is designated first, followed by the receive direction.) A dual-polarization system, sometimes known as "dual-pol," may produce either HH and HV or VH and VV pictures by transmitting in one polarisation and receiving in another. Because of the complimentary and distinct echoes, dual polarisation offers more information about surface characteristics.

The study is organised to give a thorough introduction to both SAR and multispectral remote sensing technologies, including their underlying ideas, methods for acquiring data, and inherent advantages and disadvantages. We then discuss the techniques and algorithms created for the combination of multispectral and dual polarised SAR data. Comparative studies are emphasised, showing how fused data may perform better than separate datasets in a range of land cover extraction settings.

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