Roof Capture and Classification for Building Characterization from High-Resolution Images

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Key words: Cadastre; Digital cadastre; Low cost technology; Valuation; cadastre; roof; machine learning; Segmentation

SUMMARY

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This study presents a methodology from a project developed by the Agustín Codazzi Geographic Institute (IGAC) within the framework of the multipurpose cadastre, serving as input for the valuation of constructions. The methodological approach focuses on the identification and classification of materials used in urban building roofs in Colombia, using very high-resolution orthoimages. Additionally, it details a database of different types of construction roofs.

The methodology commences with the segmentation of orthoimages from urban areas in the municipalities of San Andrés, Carmen de Bolívar, and Quimbaya (Colombia). The SAM (Segmentation Anything Model) was employed to identify various structures in the image, including the roofs. Subsequently, non-relevant objects were removed by size, using unsupervised segmentation algorithms to eliminate objects not related to the roofs of interest.

Each roof polygon resulting from the segmentation was labeled by experts according to the construction materials within categories: zinc (new, oxidized), asbestos (red, traditional), mud, imitation mud, shingle (red, blue, and green), natural fibers, and others. The sets of labels corresponding to each urban area were used to train Machine Learning models, specifically Random Forest. The obtained results regarding the models' effectiveness in classifying roof materials allowed for accuracy levels above 70%, and the recall was over 70% except for the oxidized zinc category, which exhibited way higher variability with values around 50%.

These results are promising, opening opportunities for decision-making using machine learning techniques in urban settings, specifically in obtaining the physical characteristics of buildings for

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property valuation purposes.

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