Doctoral Thesis Title: Integrating Low-Cost Photogrammetry and Geospatial Data for 3D Urban Feature Modeling in Rio de Janeiro

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Abstract: This research seeks to formulate and validate advanced methodological frameworks for the extraction, reconstruction, and modeling of three-dimensional urban features by combining low-cost imaging technologies—such as smartphone cameras and commercially available drone sensors—with contemporary geolocation and data processing services. The study is grounded in the complex territorial and social reality of Rio de Janeiro, a metropolis characterized by intense spatial heterogeneity, topographical complexity, and significant socioeconomic disparities. These conditions offer a unique context for testing the feasibility and accuracy of low-cost geospatial data acquisition techniques and for exploring their potential contribution to urban management and spatial justice.

The methodological approach will involve the selection and evaluation of different imaging systems, the application of photogrammetric and computer vision techniques (including Structure from Motion and Multi-View Stereo methods), and the comparison of the resulting 3D models with reference datasets produced by conventional photogrammetric and LiDAR sensors. By integrating municipal cartographic, cadastral, and socioeconomic databases, the study will also assess the applicability of these methods to urban planning, infrastructure monitoring, and land regularization processes, particularly in areas where access to high-cost geospatial data remains limited.

Furthermore, the research will engage critically with the evolving regulatory and technical frameworks that govern geospatial data production and use in Brazil, including recent national ordinances and standards related to spatial data infrastructure and urban planning. Ultimately, the project aims to contribute to the democratization of geospatial technologies, fostering innovative, cost-effective, and inclusive strategies for evidence-based urban governance and sustainable territorial development.

Available Means: Smartphones, Low-cost commercial RPAs, tablets, digital cameras, portable and conventional terrestrial laser scanners, total stations, GNSS receivers

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