Contactless Multi-Modal Sensing Approach to Assessing Material Value in Existing Buildings for Enhanced Recovery, Circularity, and Reuse

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Presenter Biographies and Experience:

Fope Bademosi is a Circular Economy and Construction Researcher at Autodesk. Her research focuses on construction sustainability and circularity, net zero construction, and the industrialization of construction. With almost ten years of experience in the construction industry, she is a true advocate for integrating technology to transform construction processes and achieve sustainable solutions that tackle pressing global issues.

Sophia Cabral is a computational designer bridging AEC and technology. With a master's in architecture focused on digital fabrication, she has worked on robotics projects in construction. Formerly a lecturer at Florida International University, she taught courses integrating biology and computer science for circularity in architecture. Sophia is pursuing a second master's in design at Harvard, researching computer vision and sensing technologies in architecture with the MaP+S and GRG Groups.

Abstract:

Reusing materials from existing buildings offers a sustainable alternative to raw resources in the face of material scarcity. This study uses advanced sensing technologies, like thermal imaging and computer vision, to improve the assessment and reuse of materials in existing buildings. It focuses on non-contact methods for detecting studs within drywall assemblies and evaluating material conditions using red, green, and blue (RGB), depth, and thermal imaging data.

Case studies and experiments were conducted to evaluate the feasibility of these technologies, revealing their potential and limitations. Thermal imaging, combined with object detection algorithms, locates studs and assesses drywall conditions, while RGB imaging captures surface details for further analysis. Integrating these sensing methods creates a comprehensive material evaluation process that informs reuse decisions.

Industry insights highlight current demolition practices and the challenges of material reuse, emphasizing the need for enhanced detection, such as hyperspectral imaging, to identify hazards like asbestos. While findings show promise, further advancements in imaging and data processing are essential to improve accuracy and streamline reuse workflows.