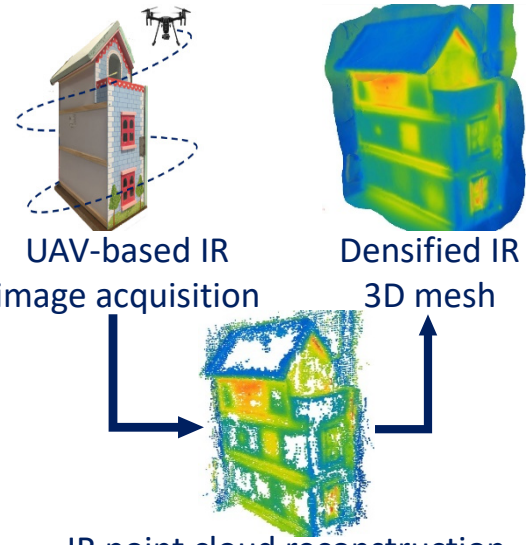
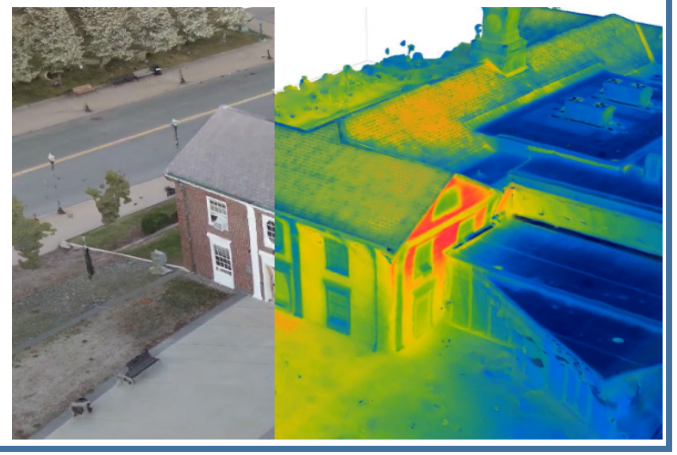
Rapid Energy audit Point-cloud Autonomous InfraRed Sensing (REPAIRS): building retrofit using 3D virtual reality

Proposed solution:

- Collect infrared (IR) images of a building of interest using an **unmanned aerial vehicle (UAV)**.
- Use point cloud reconstruction from IR images to **create a 3D rendering** of a building envelope or town or city.
- Apply advanced image processing techniques to **automatically recognize defects** in the envelope.
- Solution is minimally invasive, low-cost, and makes building retrofits simple.



Automated heat loss mapping and envelope inspection



Needs:

- Millions of buildings in the U.S. are **leaking energy** causing an environmental cost of ~$100B per year.
- Cost-effective procedures to **pinpoint anomalies** within a building's envelope and **identify defects** are required.

SENSING & INSPECTION

MAPPING

Challenge:

- Develop novel and cost-effective **sensing & inspection and mapping** tools to advance buildings' envelope retrofit.

Team:

- Experts in energy analysis, sensing, and robotics from the **University of Massachusetts Lowell** (UML) with 20+ years of experience.
- UML's **Rist Institute for Sustainability and Energy** (RISE) focuses on advancing energy resiliency through research.
- Will involve state and local partners through the UML network and **use the UML campus as a living laboratory** to pilot an approach that could be a model for every campus/city at different scales.

RISE
RIST INSTITUTE FOR SUSTAINABILITY AND ENERGY
at UMass Lowell