



Revealing Subtle Heat Flows all around us using Microbolometric Videos

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A Software Fix to Thermal Vision

Thermal is **noisy & low-contrast**. ❌

Everyday Scene Thermal Image Temporal Derivative Isocontour ($r = 0.03$)

Thermal is **dynamic & temporal**. ✅

Thermal Camera Denoised Image Temporal Derivative Isocontour ($r = 0.03$)

Temporal Drift → Spatial Noise

Video of a plain wall at thermal equilibrium

Why do microbolometers drift?

Pixel temp. can't reset instantly

Measuring resistance generates heat.

Sensitive to self-radiation (camera temp.)

Temporal Spatial Video Processing

Noisy Thermal Video

Per-pixel Temporal Wavelet Transform

Noisy Temporal Coefficients

Spatial Processing

Denoised Thermal Video

Inverse Temporal Wavelet Transform

Denoised Temporal Coefficients

Coefficient-domain Prior:
Videos that are spatially coherent at all times & all temporal scales

Approx. (14/35) Detail (14/35)

Visualizing Heat

Low SNR Scene

Visible Image Original Denoised

Cumulative Intensity Change

Visible Image Original Denoised

Temporal Derivative

Original Denoised

Baseline Comparisons

On-board BM3D MDIVDnet

Ours

Fourier Basis DT-CWT Basis

Temporal Phase Map

Visible Image Original Denoised

Manually Rotating Polarizer

Visible Image Original Frames Denoised

Bandpass LWIR Filters

Original Frames Denoised

Downstream Applications

Shape from Heat Conduction Reflection-Emission separation Albedo-Shading separation