

## Design, Implementation And Test Of An Gimbalized LWIR Synchronous Dual Field Of View Thermography System For Overhead Power Line Inspection

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Helicopter based power line inspection has figured out as a proven tool for fault detection in the maintenance of transmission grids. Based on gimbalized electro-optical systems the intense inspection of large grids has become common in many countries over the past decade.

The paper describes design, implementation and test of a novel high resolution gimbalized synchronous dual field of view Thermography System. It combines the quick hunt and detection of hot spots at faster search speed flights with the acquisition of high spatial resolution thermograms for exact fault description at hovering flights.

This demand has been fulfilled with the parallel operation of two thermographic cameras. Both work in the longwave infrared (LWIR) spectral range to ensure accurate temperature measurements under daylight/sunlight conditions.

As fast hot spot detection system a cooled Mercury Cadmium Telluride (MCT) camera with 640 x 512 pixel resolution and 25 mm lens has been chosen. It is working in snapshot mode with integration times of less than 500  $\mu$ s.

For accurate remote temperature measurements on tiny objects an uncooled a-Si microbolometer camera with 1,024 x 768 pixel resolution and 17  $\mu$ m pitch has been equipped with a 120 mm lens. This is resulting in an instantaneous field of view (IFOV) of 0.14 mrad allowing thermographic temperature measurements at objects with dimensions smaller than 10 mm over a distance of 20 m.

A color video camera with full HD resolution and 20 x optical zoom is completing the equipment. All three cameras are bore sighted and arranged in a 400 mm diameter four axis active gyro stabilized gimbal with a stabilization accuracy of better than 20  $\mu$ rad.

The cameras are connected by Gigabit Ethernet to a powerful ruggedized PC with full HD resolution and a second HD display with touchscreen and programmable control keys.

A specialized thermography software permits to control all cameras and the gimbal alternatively by means of a small hand control unit, mouse/keyboard, touchscreen or control keys.

**Keywords:** Power Line Inspection, Thermography System, Synchronous Dual Field Of View, MCT Camera, Microbolometer Camera, HD Resolution, Gimbal, Thermography Software