Universidad Carlos III de Madrid

OO/UC3M/55- INFRARED (IR) SENSORS APPLIED TO FIRE DETECTION AND TO PEOPLE'S SAFETY.

The IR Imaging and Remote Sensing Laboratory – **LIR-UC3M** of Universidad Carlos III, has developed IR multi and hyper spectral analysis techniques for passive (no emitters) and reliable (low false alarm rate) threat sensing. Specifically, they are based on sensors development and spectral processing for classifying the scene to optimize the discrimination of threats from backgrounds, decoys or other spurious emitting sources, for a dramatic decrease of false alarm rate.

Description and special features

LIR UC3M possesses a vast experience on the development of sensors for the remote detection of fire or of thermal phenomena previous to fire associated to its triggering and that may favour its early detection as well as foreseeing it because of a risk increase.

Specifically, these sensors are based on the special IR spectral characteristics of fire as a combustion phenomenon that make its detection easier compared to other phenomena that although displaying high temperatures do not imply the presence of flames.

Therefore, and basing on the study of fire properties as a combustion process and the emission of typical gases such as CO_2 or the gases previous to combustion itself caused by alterations on production processes or storage conditions, LIR has developed, among others, the following techniques that will allow for the specific development of:

- Bi-spectral sensors to easily and remotely detect small fires or the beginning of a fire.
- Sensors for the elaboration of fire risk maps.
- Sensors that allow seeing through the smoke, either for people rescue or for fire fighting.
- "IR Intelligent Imaging" from multispectral processing for helping on the decision taking of fire extinguishing and people or goods rescue. This system provides quantitative information spatially distributed over the fire area, scene classification, power, location of pockets of gas that may ignite, location and speed of the fire front through the smoke, temperature of flame and embers, risk or rekindling, night detection.

Fig. 1. Mid IR multispectral system (3-5 □m); MIR bispectral system (3-5 □m) – TIR (8-12 □m); and cameras on the visible and near IR

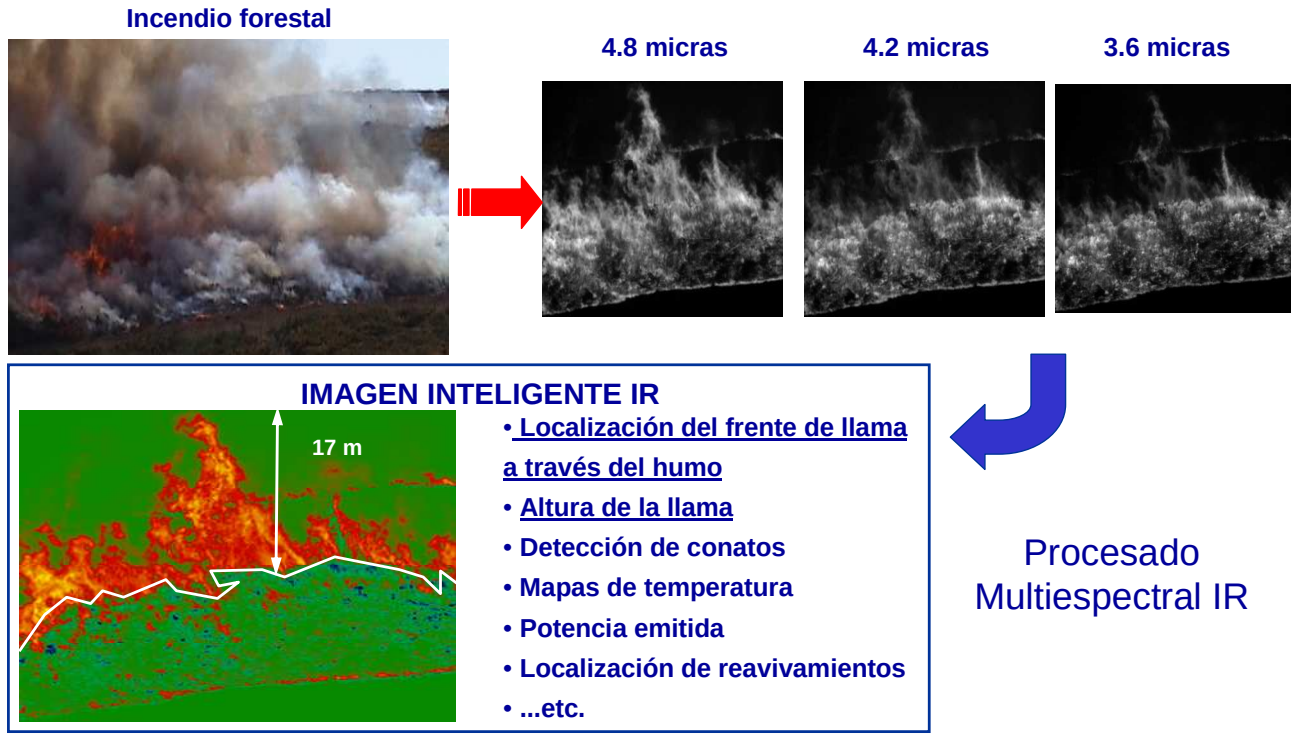

Fig. 2. Application of the multispectral processing of IR image for the remote sensing of forest fires

Innovative aspects
Sensors based on classical IR technology have a high false alarm rate due to their huge sensibility in comparison to those based on different technologies or principles: ionization, etc. However the sensors proposed here are very robust because they use techniques of specific spectral processing based in the analysis of different features and spectral functions and not only on emitted energy as current systems. Greater reach, better detection probability, lower false alarm rate.

Competitive advantages
Dramatic increase of early detection probability greatly reducing false alarm rate compared to current systems.

Technology Keywords
Multispectral IR sensors, spectral processing, IR cameras, passive IR sensors, early remote sensing of fires, fire risk assessment; Sensors / Multisensor Technology, Instrumentation; Optical technology related to measurements; Sensor Technology related to measurements

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