

Perception Enhancement Systems

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Person-Machine Integration

In road vehicles new interfaces are being developed which integrate the functions of humans with those of the machine.

What is Perception Enhancement ?

The concept of perception enhancement emerges from the observation that not all environmental stimuli are informative. Only certain cognitively-relevant features from the environment have meaning for humans.

This goal is therefore to design products and systems which selectively amplify only the key environmental phenomena.

Perception Enhancement

The concept of perception enhancement is not a new one, at least not in the area of vision. Optic lenses such as the reducing and the enlarging lenses below were already in use in Roman times.



◆ 4.5. Lente piano concava

Cristallo di rocca
Diam. cm 2,48
Provenienza: Efeso
Londra, British Museum, inv. 1907.12-1.472

Lente piano concava scavata a Efeso, in Asia Minore, particolare per la caratteristica di ridurre l'immagine piuttosto che ingrandirla. La superficie del cristallo, levigata e trasparente, è ancora ben conservata e mette in evidenza caratteristiche ottiche di notevole efficacia.

Bibliografia: TEMPLE 2000, p. 403.

◆ 4.9. Lente

Cristallo di rocca, incolore
cm 2,1 x 2,4; spessore cm 0,6
Provenienza: sconosciuta, forse dall'area vesuviana
SANC inv. 155902
I secolo d.C.

Di forma ovale, perfettamente integra, ha una faccia piana e levigata e quella opposta convessa, producendo l'effetto di lente di ingrandimento. Negli scavi borbonici a Pompei è segnalato il rinvenimento di parti di lastre di vetro (o cristallo) tagliate in maniera tale da farne ipotizzare analoga funzione (*POMPEIANARUM ANTIQUITATUM* 1860, parte III, p. 88).

Bibliografia: inedito.



Perception Enhancement

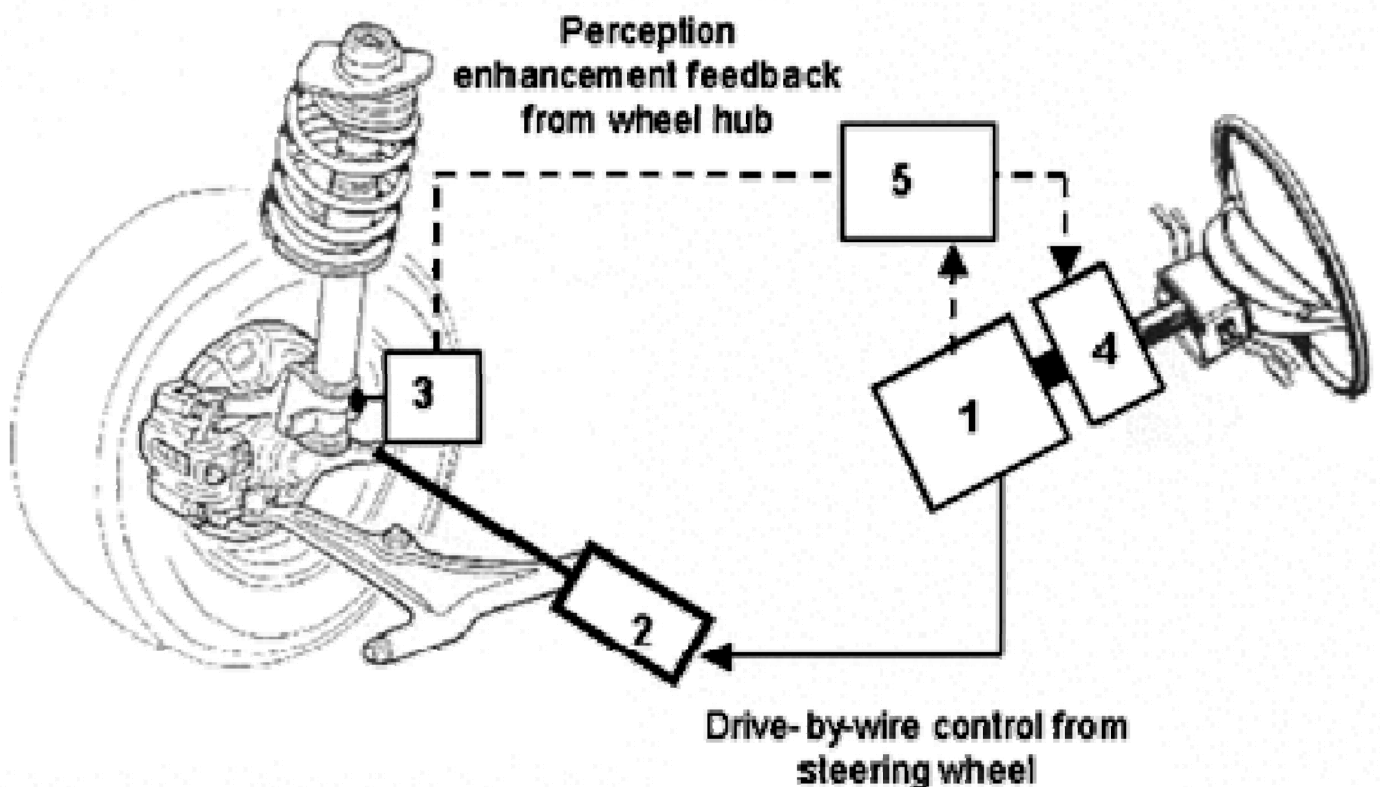
A recent development, however, is the ability of new technologies to provide sophisticated ways of modifying environmental stimuli in order to suit human needs. Devices such as the night vision system below provide new opportunities for improving the human condition.



Perception Enhancement System

The term *Perception Enhancement System* can be used to describe any device which makes stimuli easier to understand and more intuitive.

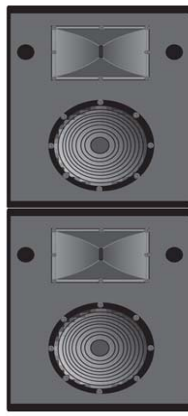
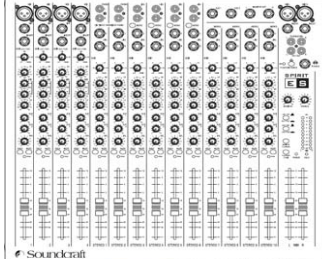
In some situations this can be equivalent to making the product or system feel more like an extension of the human body.



Single Modality Systems

One way of making a perception enhancement system is to operate within a single perceptual modality, enhancing stimuli by means of analytical transformations.

The overall aim in this case is not to change the stimulus to the point of denaturing it, but, rather, to improve its properties as much as is practically possible in order to render it more easy to understand and intuitive.



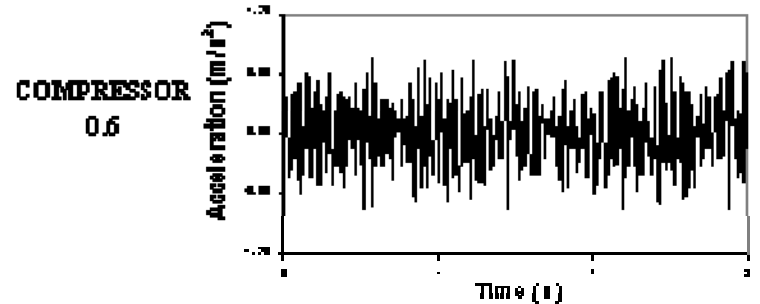
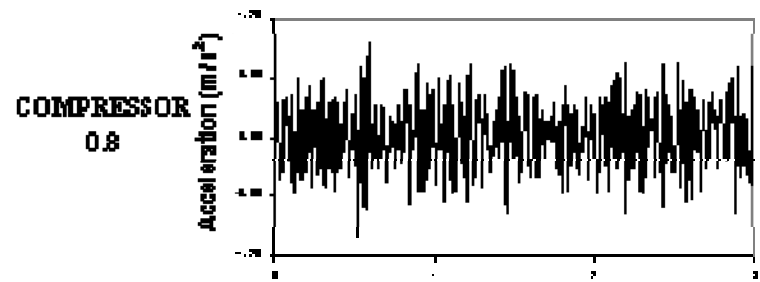
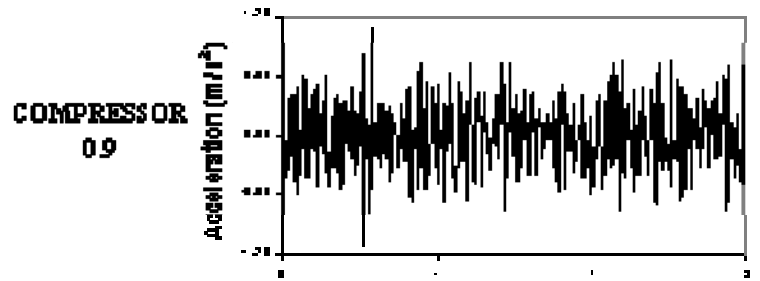
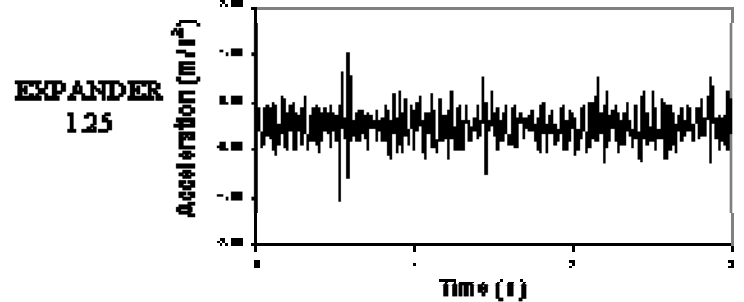
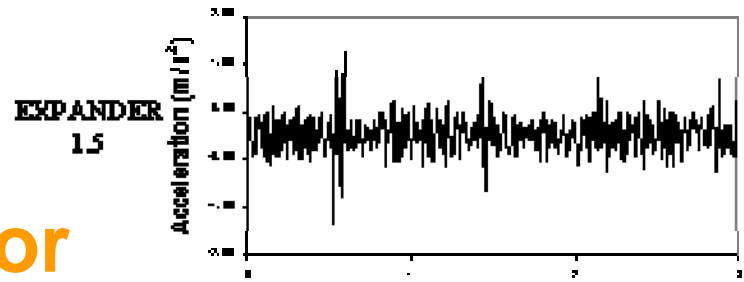
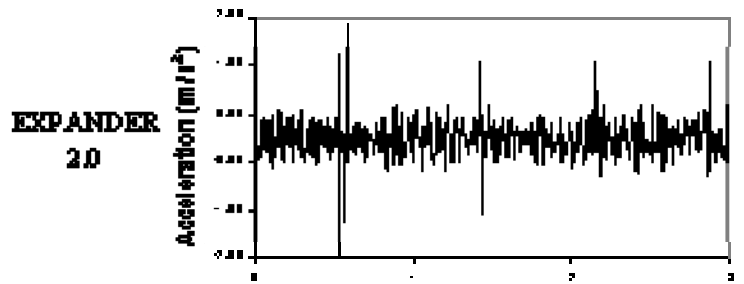
Transformations which are borrowed from the field of music mastering include stimulus compressors and expanders.

Compressors drive large events down into the main body of the stimulus while expanders extract large events out from the main body of the stimulus.

The general concept is to adjust the relationship between the large and the small events, balancing the one against the other in an optimal manner which makes the stimulus easier to understand and more intuitive.

Effect of Stimulus Compression or Expansion

The examples on the right show the effect of various compression or expansion values.

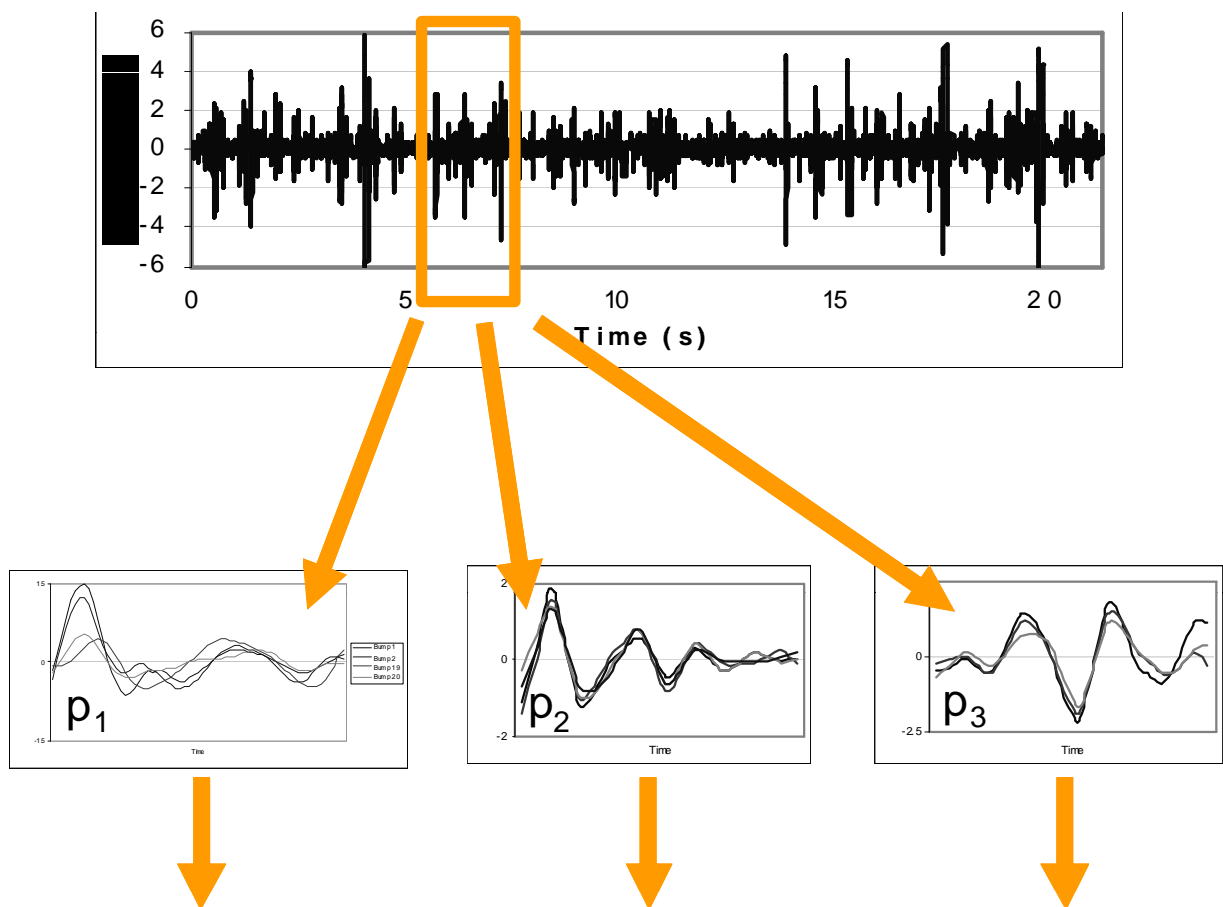


Information Theory

Transformations from the field of information theory are based on the use of information carrying events.

These semiotic symbols which we call “bumps” act as the basic unit of information which humans use when interpreting the stimulus.

Adjusting the number and size of the “bumps” makes the stimulus easier to understand and more intuitive.



$$H = - \sum_{i=1}^n p_i \log_2 p_i \quad \text{bits per symbol}$$

Cross Modality Systems

A second way of making a perception enhancement system is to use the freedom offered by modern technologies to move sensory information from one modality to another.

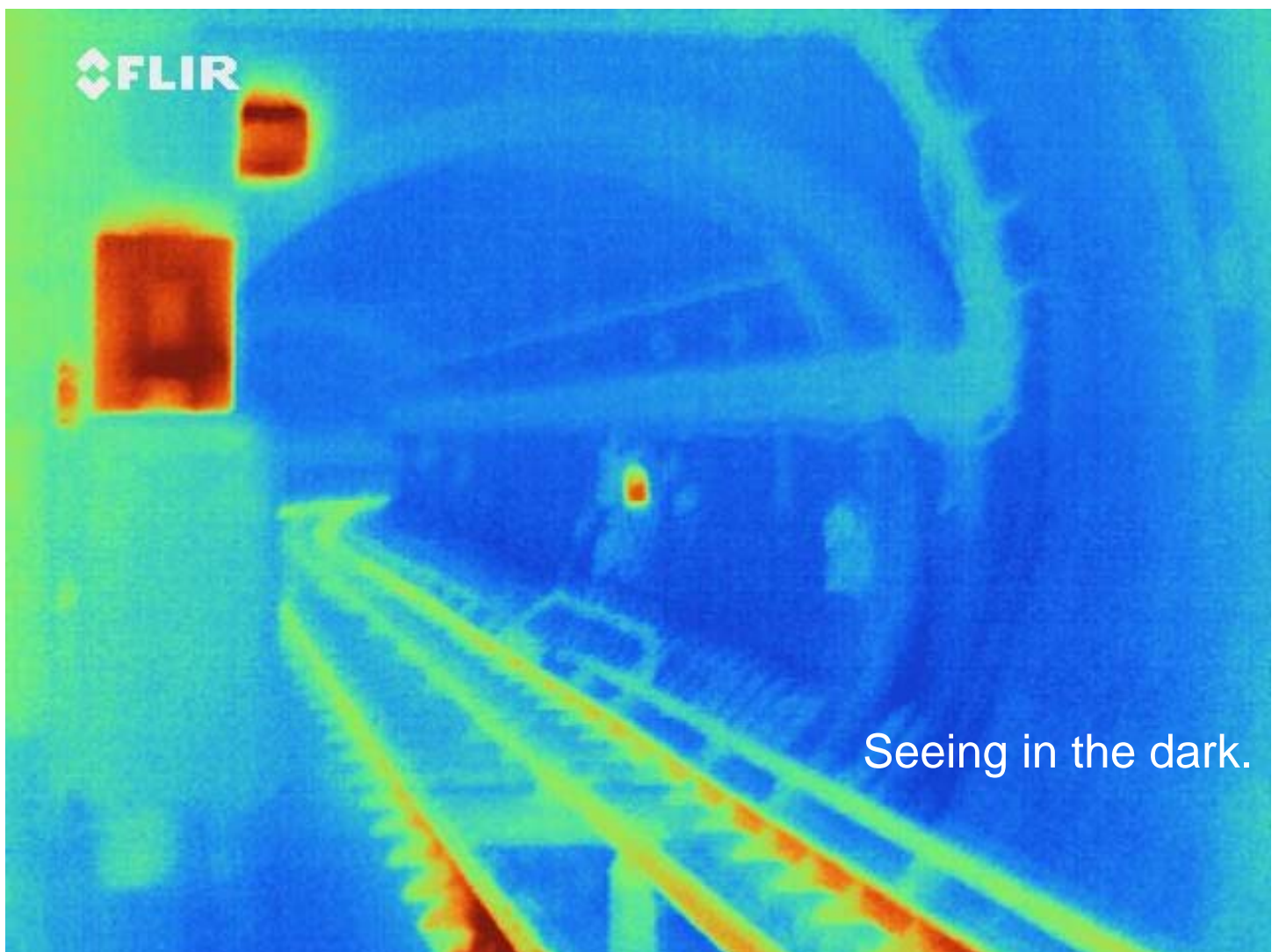
Often, information is moved from a modality which is characterised by relatively limited perceptual abilities to one which is characterised by relatively sophisticated perceptual abilities.

As always, the intention is to make the sensory information more easy to understand and intuitive.

A cross modality system which is used in current research is thermal imaging.

Thermal imaging cameras are in use in speciality fields such as law enforcement, the fire service and the military.

The perception enhancing properties derive from the ability to provide information which is not available in the visible light spectrum.



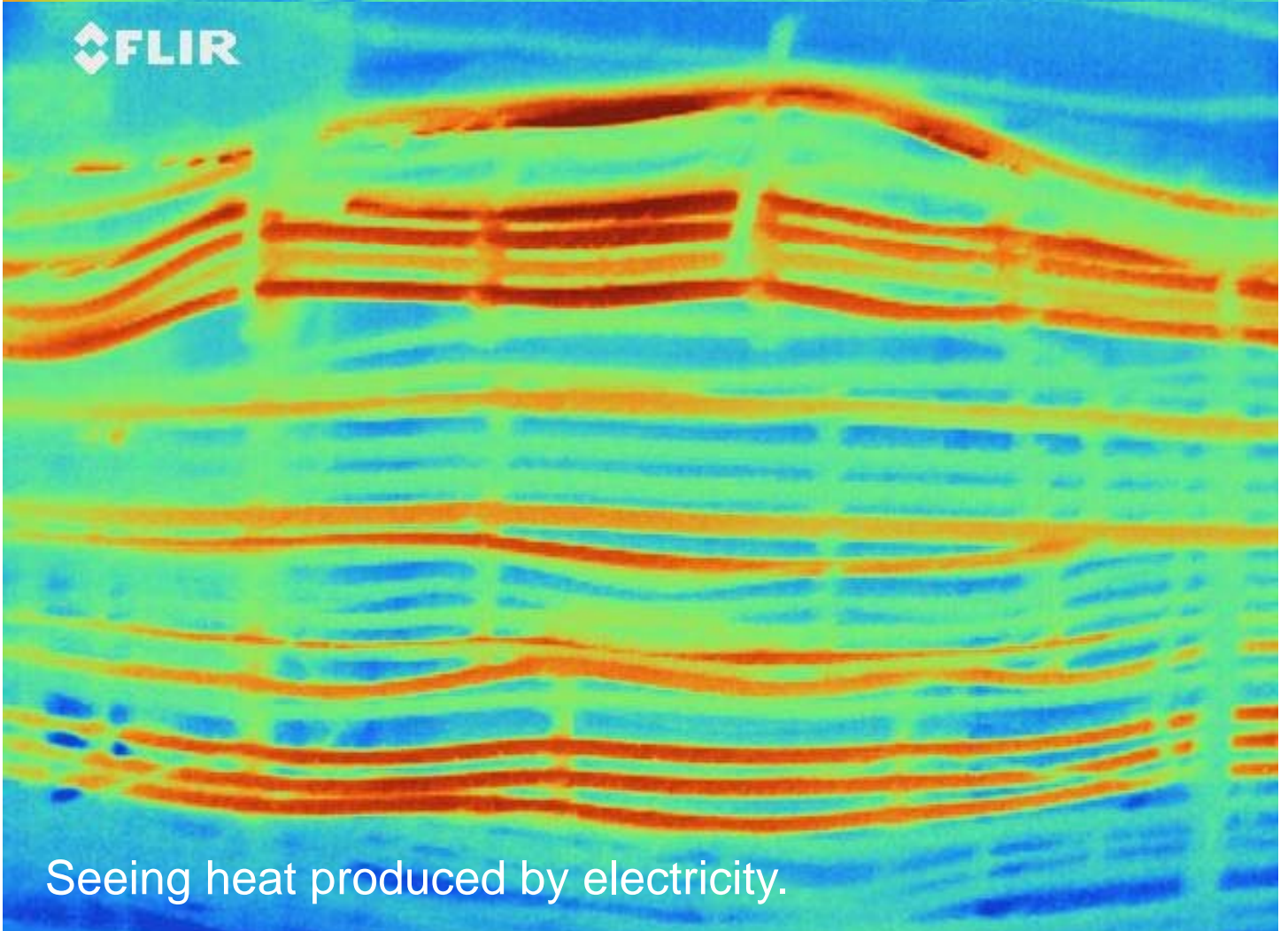
Seeing in the dark.



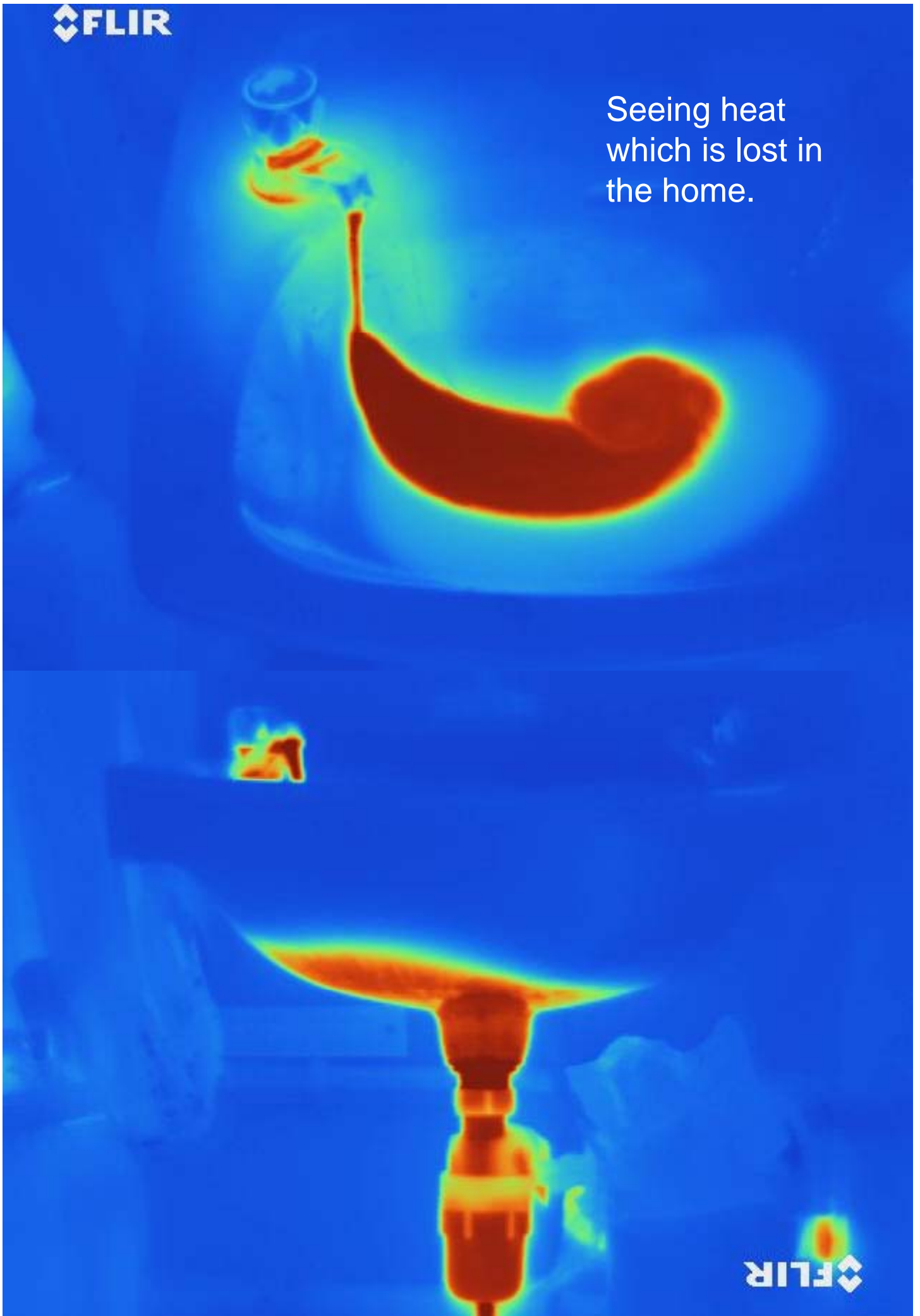
Seeing heat produced by motion.



Seeing heat produced by electricity.



Seeing heat
which is lost in
the home.



FLIR

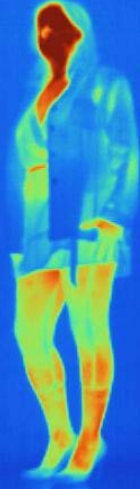


FLIR

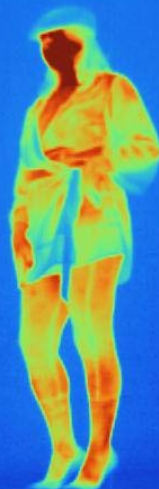


Seeing heat lost from the body.

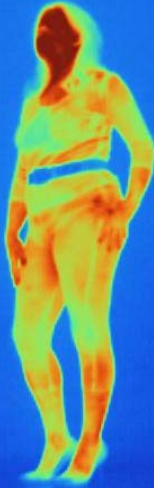
FLIR



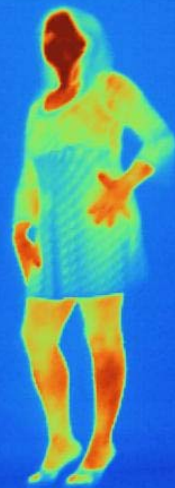
FLIR



FLIR



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FLIR





Thank you.