

intelligent analytics



thermal kinetics – the coolest technology in people counting

Irisys pioneering innovation



white paper

Infrared data can reveal an otherwise invisible world



Thermal intelligence has arrived

Although thermal imaging has a long history, it is only relatively recently that the technology has become viable for commercial, industrial and healthcare applications. Its use in search and rescue, medical diagnostics and nature documentaries won't have escaped your notice. Even firefighters now use thermography to see through smoke, maintenance engineers to locate failing parts - and retailers to help with understanding customer behaviour. And 2014 saw the introduction of the first smartphone thermal camera app.

So thermal is the new cool.

Its growing popularity has come about because of the unique capabilities of this technology and the special advantages it provides. This white paper explains how this novel technology works and why it has become the technology of choice for people counting applications.

Seeing a 'temperature picture'

Taking the example of firefighting, we are able to clearly see through the smoke to quickly locate people and localise the base of a fire, even though it is dark. In fact no matter how dark or how cluttered a scene is, the people (and fire) are completely distinct against the background. So how is this possible?

The technology that does this is thermal imaging and what we're seeing is a 'heat image' or 'temperature picture' of the scene. It's exactly like a television, except that what is being visualised is the heat emitted by people - and the hotter they are, the brighter their 'image' is against cooler objects, which appear darker.


To make this a little more complicated though, the cameras which produce this kind of image don't actually see temperature at all. Our eyes only see what is called visible light, but hot objects also give out a type of light that is invisible to our eyes; this longer-wavelength light is called infrared. The cameras capture this infrared energy - or light - from a person and produce an image. Because hot objects like people give out more 'light' than cold ones, they are highly visible.





The technology choice for people counting essentially comes down to performance. Its ability to cope with the physical challenges of varying environments, ease of installation, to provide precise data and have low total lifetime costs. Thermal kinetic sensors accomplish this on every level.

Martin Higgins
Operations Director
Experian Footfall



thermal
kinetic
sensors

The key technical advantage of operating in the thermal domain is that the object of interest – a person – is hotter than the background so they stand out and make the detection task much simpler; in the thermal domain the background scene is generally benign and not full of the clutter and textural detail that distracts in video imagery



Applying thermal intelligence to people counting

Now, the really imaginative thing is to take this innovative technology and use it to answer an apparently simple question: how many people are entering a store or building? The other question of course, is why would a technology used in firefighting provide us with an ideal way of counting people?

Well if you can see people, you can count them - that's basically the idea. The reality of course is much more complex. The challenge is seeing people reliably and consistently, so your counting technique will work. In a shop or building doorway for example, the light level fluctuates from near darkness to bright sunlight; floor coverings come in differing textures and colours; reflections have to be contended with; and people vary in size, height and type of clothes they wear.

So what you need is a picture of a scene which is completely independent of these factors. By using an intelligent thermal sensor, it is possible to exclude this extraneous detail and create a picture of hot objects and how they move – we call this thermal kinetics. All the thermal kinetic sensor sees is the heat given out by moving people and all those unwanted background elements - known as 'clutter', are excluded.

What's more, because there is no background clutter, it is much easier to extract the vital information i.e. moving people to be counted. Compare this with traditional video where scenes have to be 'de-cluttered' and it means thermal kinetic sensors require significantly less processing complexity and power to obtain data - and as a result, have unrivalled reliability in the field.





This advantage allows us to achieve a very high accuracy and reliability using modest processing power, and therefore to use our available computing resources to better effect. We have developed a hierarchy of intelligent detection algorithms, allowing us to seamlessly track individuals over wide areas spanned by multiple sensors and to make complex inferences about their behaviour.

Dr. Neil Johnson
Chief Software Scientist
Irisys

intelligent
algorithms

“...the most successful in-store analytics company in the market today.”

ABI Research
Retail Customer Analytics:
Technologies, Markets
and Revenues.
August 2013



Irisys pioneering innovation - thermal kinetics for people counting analytics

Irisys has driven the innovation to bring this technology, previously regarded as a military or specialist technology, into the mainstream. In developing a unique thermal sensor array to see infrared light and adding leading-edge image processing know-how, the Company has been able to create a thermal kinetic sensor suitable for counting people. Proven the world over, even in extreme environments like the soaring heat of Dubai and chilling cold of Russia, more than 350,000 of these highly reliable and accurate sensors are now counting tens of millions of people - every day.

In optimising this technology, the most important requirement for analytics is to ensure people are accurately counted at the store or building entrance – and sometimes other internal locations within them too.


Unlike search and rescue, there is no need for a high resolution image - you just need to be able to identify a person and count them. In fact, it is a distinct advantage not to have a clear image where you can recognise an individual, as it means their privacy is not compromised. For example, it

removes any concerns about being able to see PIN numbers at a checkout and enables counters to be placed in sensitive areas like fitting rooms.

Similarly in office areas, nobody wants to be under the eye of video, so the anonymity of thermal kinetic sensors become an ideal solution.

People walking under a thermal sensor as it looks downwards into a store entrance, are seen as hot objects. As a person or people move through the entrance, the position of the hot object(s) changes accordingly. Sophisticated machine vision algorithms inside the sensor are designed to track the hot objects by their shape and size and movement. Objects that are determined to have the right combination of shape, size and behaviour to be people, are then selected.





Once people have been detected and their path under the sensor has been tracked, they can be counted via a number of virtual counting lines placed in the field of view of the sensor. As they cross the counting line in a defined direction, a count is triggered. At its lowest level there would be two counting lines, one measuring 'in' count and the other measuring 'out' count.

However it is possible to measure and combine people moving in a variety of different directions through the view of the sensor, enabling an even richer understanding of their behaviour.

Installing and configuring the sensor to count is easy and up to eight sensors can be connected together to form a wide single field of view called WideTracker™ - especially useful for wide entrances like shopping malls.

a range of
counting
modes

Affordable mass-market
technology



Dual technology for real world validation

We also add a conventional video stream into the mix. This allows remote viewing of exactly what the thermal sensor is seeing - and can be used to determine people count accuracy, verify performance or adjust line settings over the internet. It is not necessary to take our word on how accurate thermal people counting is - you can see it!

Using thermal kinetics to solve operational challenges

Shopping malls, retail stores, airports, office buildings, entertainment venues, transport hubs and similar locations are complex places. Understanding how people move and interact in these environments, unlocks opportunities to optimise operations.

Only by 'seeing' can you measure and only by measuring, can you begin to manage. For example, while most retailers have advanced data on their buying customers, many stores miss out on sales opportunities because their traffic

of non-buying customers is invisible to them. Similarly companies and public services frequently have higher energy bills or rent more space than necessary, simply because information on how their buildings are used is not available.

If you take retail for example, by monitoring footfall levels, traffic flows and penetration of people into a shopping mall or store, it can help with allocation of staff, gauging how effective store layout and displays are, determining store opening hours - and much more.

Ultimately of course, the aim is to deliver higher levels of customer service and increase the number of shoppers who buy. In the same way, thermal sensors also help make buildings 'smart' by generating actionable, living intelligence to enable better space utilisation and enhance capability to manage energy demand, - so decisions are made which maximise a building's efficiency, without having to resort to guesswork.



Expanding this intelligence further through the Internet of Things (IoT) – connecting these sensors over the internet, linking them with networks of other sensors, like building management and workforce systems, creates the possibility of a 360° ecosystem of sensors. This scales up to include entire shopping malls or estates of sensors which allow remote configuration, monitoring of device health and constant information flow - enabling dynamic response to events. And thermal kinetics will play a key role in this future - which is already arriving - with Irisys continuing to lead the field and investing heavily in research and development. With the launch of thermal kinetics 2.0 in 2016 - **thermal really is the new cool.**

innovation
and
evolution







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