CASE STUDY

How Ryoden is redefining the pest control industry thanks to Calumino's intelligent thermal sensors.

BACKGROUND

Globally, rodents are a significant problem, particularly in industrial areas, and where food is manufactured or stored. Rodents can spread diseases and cause a great deal of damage to property or assets. It's been reported damage caused by rodents has cost the global economy approximately $35b between 1930 and 2018[1].

To be compliant with local policies, food manufacturing sites in Japan and across the world, need to provide proof that the sites are not infected by pests (rodents, insects, etc.). Current methods have vast shortcomings. Ryoden is tackling this problem with the world's first approach based on the latest innovation in thermal sensing by Calumino. Both companies partner together to tackle this multi-billion-dollar challenge.

Ryoden is a dynamic and forward-thinking technology company that excels in providing innovative solutions across various industries. With a focus on research and development, they continuously push the boundaries of technological advancements to meet the evolving needs of their clients. Ryoden's diverse portfolio includes cutting-edge products and services in areas such as automation, renewable energy, and advanced manufacturing.

Calumino is an emerging technology company, who has developed and is manufacturing a proprietary thermal sensor with embedded A.I. analytics. The Calumino thermal sensor closes the gap between low-performing thermopiles and high-preforming, but unaffordable microbolometer thermal sensors. Its innovative and patented thermal sensing technology has the performance of a military-grade microbolometer, at an affordable and scalable price point. In addition, it is very robust and offers the world's best radiometric thermal reading, predestined for industrial applications.

[1] (Source: Economic costs of invasive rodents worldwide: the tip of the iceberg, https://www.researchgate.net/publication/350774665_Economic_costs_of_invasive_rodents_worldwide_the_tip_of_the_iceberg)

AT A GLANCE

Challenges

- Gathering proof a food processing facility is rodent-free
- Unreliable existing detection methods
- Detecting rodents in all lighting conditions
- Monitoring and trail-mapping of rodent in real-time

Benefits

- Highly effective detection platform
- Remote monitoring and real-time alerts
- Visualization and analysis for effective countermeasures

CHALLENGES IN DETECTING RODENTS

Rodents are notoriously difficult to detect due to their ability to hide in small and hard-to-reach spaces. They are nocturnal creatures, often remaining inactive during the day and only coming out to forage for food at night, making it challenging to observe their activities with cameras. Additionally, rodents are intelligent and cautious, quickly adapting to their surroundings and avoiding detection measures, further complicating efforts to identify their presence. They learn quickly and can easily navigate around traps and threats.

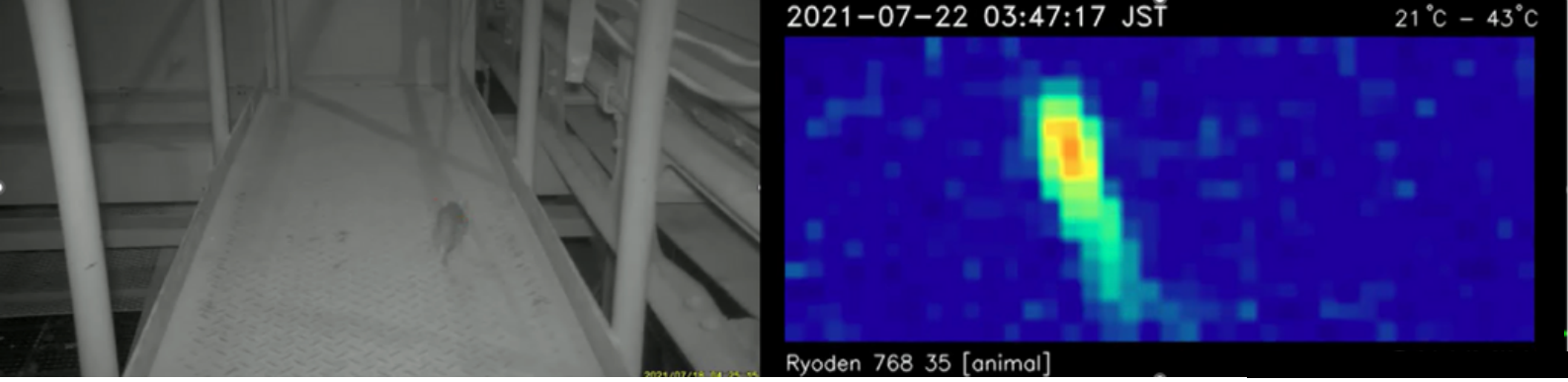
PROBLEMS WITH EXISTING RODENT DETECTION METHODS

Up until recently, rodent detection methods have been limited to human surveillance. This technique is very resource intense, costly, limited to daytime activity only and prohibitive in large spaces.

Only recently has technology been deployed to try to detect rodents, namely motion sensors and trail cameras which get triggered by a motion sensor.

Motion sensors work on heat detection. They sense if a “hot object” is moving across the field of view and trigger a signal. They cannot distinguish between the size or shape of the hot blob, hence cannot distinguish between human, animal or other hot blob.

Typically trail cameras use motion sensors to trigger and then image processing tracks the moving object. The challenges here are that the triggering is done by the motion sensor which has limitations in detecting small animals such as rodents at distances, the camera requires illumination which is high power consuming, the animal has no contrast to its surrounding in the visual band, hence hard to find and detect, and the data captured is relatively large and requires high bandwidth to transfer to e.g. a server.



Real footage

Calumino computer vision

THE PERFECT SOLUTION

A technology that fills the gap and is perfect for rodent detection is thermal imaging. Until now, two classes of thermal imagers exist on the commercial market: 1) microbolometer camera with typically a high resolution of 80x80 IR pixels to VGA resolution, which costs thousands to tens of thousands of dollars, and 2) thermopiles which are low-cost, but have very weak signal-to-noise sensitivity. The problems with these technologies are that they are either unaffordable, hence not mass-deployable, or, in the case of thermopiles, the detection is so weak that a rodent is barely visible even at 2 meters away from the detector and quickly disappears in the detector's noise.

Calumino solves this problem. It has developed a new type of thermal sensor that is high-performing and affordable. This is the key to enabling applications in industrial environments. Ryoden has identified the potential of this technology and in partnership with Calumino, jointly developed a rodent detection solution using thermal AI, and started selling it as RYODEN's pest control data service "Pescle". Firstly, the solution comprises Calumino thermal sensors in an industrial rugged housing, which can be flexibly deployed across an industrial site at scale. The housing includes a 4G antenna to transmit the raw thermal image to Calumino's thermal.ai cloud infrastructure. Secondly, the raw signal gets analyzed in real time by cloud AI for rodent detection. Here the AI has been developed to distinguish between small hot blobs such as rodents versus larger hot blobs such as humans. Other factors are taken into consideration such as shape, size, temperature, and motion to make an intelligent assessment of the target. Thirdly, a notification is sent from Thermal.ai to the Pescle IoT platform if a rodent is captured. In this platform, other data points are consolidated and analyzed. Pescle offers a dashboard to its customers, pest control operators (PCOs), which have valuable insights into rodent behavior, amount, location – and offers a playback function of the event. The notification is also being pushed automatically into e.g., a Slack channel if the end-customer desires. The rodent detection AI is virtually in real time with very low latency.

Such insights are revolutionary in the PCO industry. To date, no technology can provide such situational awareness and transparency into rodent movement, trails, and behaviors. The rich data enables very effective pest termination by the PCOs. Areas, where rodents were thought of being eradicated, were proven to be infested – enabling true proof and validation of effective rodent control. This is a significant value add for food processing operators who feel a direct impact on quality and damage prevention.

The solution has been in development for over 24 months. During trials, the Calumino thermal sensor was compared with trail cameras, where Calumino outcompeted the camera-based system in the detection and accuracy of detecting a rodent.

"We chose the Calumino thermal sensor as it's the only sensor on the market that offers AI that detects rodents with high accuracy while being affordable and scalable. Calumino has been incredibly supportive and has pushed the boundaries on what is possible with thermal sensing and AI. Their sophisticated IoT platform is very impressive and delivers in real time, reliably and in a scalable way."

Tatsuya Kai, Senior manager of new business development at Ryoden Corporation.

SUMMARY OF KEY BENEFITS

- **A highly accurate and very low false positive and negative rate.** Providing only necessary information on rodent detection and not detecting humans. Reducing the time required for data confirmation.
- **Enabling remote surveillance.** Delivering confirmation of detection results and providing data anywhere at any time without a site visit.
- **Visualizing and analyzing information on detected animals.** Visualizing location and movement patterns contribute to more effective countermeasures.
- **Scalable hardware.** Allowing to deploy across multiple areas.
- **Easy setup.** The hardware and IoT system have been developed as a “plug & play” system.
- **Undetectable by rodents.** Rodents can understand the presence of sticky pads and mouse traps, but not the Pescle sensor.
- **Suitable in confidential areas.** Ideal for where manufacturing processes, machine types, and machine layouts are proprietary and confidential as the Calumino thermal sensor only detects heat blobs and cannot identify humans.

Recent data confirmed a positive detection rate of >90%.

IMPACT

- **Digital visualization of the presence or the absence of rodents.** For the first time in the industry, service providers can see digital evidence of the presence or absence of rodents, which is critical for the ISO22000 food safety standard.
- **Detection of rodents in hard-to-reach places.** Many places are not ideal for visual inspection by service personnel, or to install traditional tools such as mouse traps. The Pescle solution can be installed anywhere.
- **Realtime.** The real-time capability of the Pescle product and its tools can alarm the customer immediately. At some sanitary critical locations, this capability is of significant assistance. At other locations, the presence of rodents can require operations to be shut down.
- **Effective path tracing and trap placement.** Calumino’s thermal sensor and innovative AI algorithms can track the path of rodents, helping operators find the best location for traps to increase the hit rate.
- **Cost reduction through minimization of visits by service personnel.** The most expensive part of rodent detection are the pest control operator costs which include labor and travel. With digital monitoring tools, these costs can be minimized.

About Calumino: Calumino is an emerging technology company specializing in patented next-generation thermal sensing with embedded A.I. analytics. The Calumino platform fills the gap between intrusive cameras and low-performance motion sensors, protecting privacy for human centric data aggregation, while delivering powerful operational insights to various industries. Calumino is headquartered in Sydney, Australia. To learn more, visit https://calumino.com.

Contact Calumino for a demonstration, evaluation kit, or a quote at info@calumino.com