

Remote Monitoring for Flies During COVID-19



Novel AI-based technology is rapidly changing the field of pest monitoring

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I am the President of Semco, which is the largest distributor of professional pest manager products in Japan. Last year we celebrated our 50 years anniversary.

I have been involved in FAOPMA since 2001 as a Board Member for a total of 16 years, arguably the longest among past members, and was President of FAOPMA over 2007-2009.

Today I will review the topic of remote monitoring for flies especially during the COVID-19 pandemic.

First, I must emphasize (again!) that the concept of Integrated Pest Management (IPM) is the foundation of our industry. Yet, I must say that this concept is not fully exploited by our industry due to many reasons that I will discuss in this paper.

According to IPM principles, data is essential, and monitoring is a key component of IPM. Installing light traps to catch and monitor flying insects, and the placement of glue traps for crawling insects, are both basic pest management practices.

Typically these traps are checked monthly, by counting and identifying species of pests collected. A report follows that analysis the results, which is then submitted to the customer.

Based on the monitoring data, the recommended treatment would be carried out.

If the monitored pests are species from outside the premise, we are supposed to check whether the exclusion measures are sufficient. For example, if you monitor and detect larger flies such as house flies and flesh flies, you need to check the outside bins or if there are agricultural fields nearby. In that case, you may need to check if windows and doors are properly closed and sealed, install more light traps indoors, or you may have to treat the outside walls with pesticide.

If the identified species suggest the issues are from indoors, then cleaning, trapping, and chemical applications, would be possible treatment options. For example, if insects such as fruit flies and phorid flies are collected, you may have to clean the breeding grounds. If you find moth flies, then you may have to clean drain pipes and grease traps, possibly with a foam application, where the appropriate pesticides may or may not be mixed.

The above process of IPM is easy to say in theory, but difficult and time consuming to practice. Monitoring is very important but a downside is that it is a very expensive task. According to the

Semco entomologists, it takes approximately 15 minutes per light trap to analyze, which becomes 30 minutes in a summer season when more flies are typically trapped. Then to enter the results into the reporting format requires even more time.

For example, if you manage 20 factories per a single pest technician with the placement of 10 light traps per factory, then you need check 200 light traps. This requires 3,000 minutes or 50 hours every month just to analyse the traps. Plus you are likely also to have monitoring traps for crawling insects, which takes a similar amount of time to inspect and analyse, along with the production of reports; all very time-consuming processes.

It is estimated that 50% of the working hours of technicians, who are typically valuable entomologists, is spent on this monitoring process.

In addition, there are differences in the level of proficiency among employees. Some technicians can identify pests better than others. This leads to inconsistency and inaccuracy of monitoring results between sites and over a period of time.

Thus, the monitoring is a very expensive and labour-intensive job, yet, typically only once-a-month data is obtained.

Taking into account the fact that a pest problem like fruit flies can develop quite quickly, waiting for one month to obtain monitoring data is not timely at all. For example, using a simple mathematical equation, 40 fruit flies can become 150,000 flies in just 15 days. To monitor once a month is not enough at all, as it is often too late!

Ideally, monitoring data should be obtained effortlessly and in real time. Is this possible? Yes, it is!

In recent years we have seen remarkable developments in image analysis technology through Artificial Intelligence (AI). The use of AI in numerous industrial fields has become increasingly popular. AI in a factory can tell defective products, or it can check the behaviour of workers. In many countries, AI face recognition is used to track and trace people. AI can recognize VIPs, or people on a black list. *AI is changing our*

life!

My company has developed a real time remote monitoring system for flying insects using visual recognition AI. The product is called 'Pest Vision'.

Pest Vision is a light trap with cameras that connects to cloud-based AI. Pest vision can be installed at the sites where real time monitoring is conducted. The cameras are controlled by a microcomputer that commands that images are taken at any set interval, which are then uploaded to the cloud via the internet.

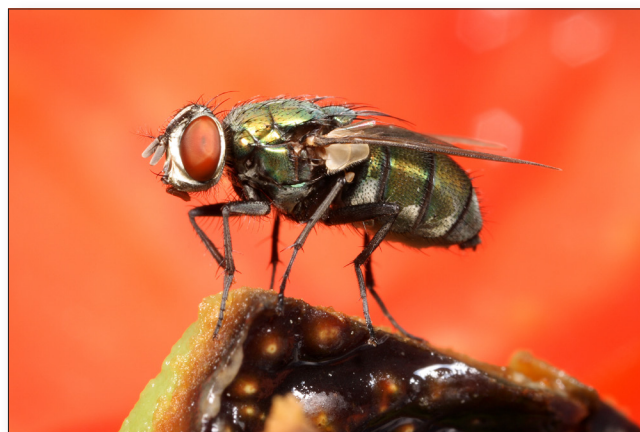
The results, including counts and identifications, are displayed on a website which can be downloaded in CSV format. The data can also be viewed as graphs. This automated process enables the rapid production of reports.

If a sample consists of fruit flies only, by our AI, the counting accuracy is 100%, but identification accuracy is 73%. Some are mistakenly identified as phorid flies or psocids (book lice). In another example of flies, the counting accuracy was again 100%, however identification accuracy was 74.5%. There is similar tendency to mistakenly identify book lice as fruit flies. We are still working to develop and improve on the accuracy of our AI. It is already practical, and can be used in real operations, but still needs to be improved to be compatible with human analysis.

Let's talk about the advantages of AI based monitoring:

1. Reduction of working hours

As discussed earlier, the time spent by technicians



to analyze traps could be up to 50% of their working time. By using an AI based monitoring system, all of the 50% of working time would be saved, as the counting and identification task will be undertaken automatically. Technicians can now spend more time on going to the field, talking to customers, and making recommendations to directly improve pest problems. The monitoring data is important, but ideally it should not take up so much time of experienced technicians, who are valuable assets to the company.

2. Optimization of work

With the AI based monitoring, it is possible to monitor the field situation constantly. This advantage makes it possible for pest management professionals to visit customers as demand requires it. Since the AI based monitoring can set up a threshold level, it is possible to take immediate action when necessary. Or if there is no issue, the scheduled visit can be skipped and only a report needs to be sent to the customer. This is particularly important now during the COVID-19 pandemic when minimal access to the field is required to reduce the risk of the disease.

3. More detailed data

With AI remote monitoring technology, it is possible to gather significantly more information than the current practice has ever yielded. Now we can opt for daily data. In situations with daily monitoring, you can sometimes see a sudden increase of insects during the middle of the month. Then you can ask your customer what



happened during that particular period of time, such as renovation work on that day which led to more flying insects coming in to the facility. You can find out the cause of sudden spikes!

In another example, we monitored hourly data. We found a regular surge of insects in the morning and again in early evening. You can probably guess that this related to insects entering the facility together with inventories through open doors in the morning and goods leaving in the early evening. In this particular case, it would be recommended to install insect proof air curtains to prevent flies entering the facility. Following installation, we can also verify the effectiveness of this intervention with the hourly monitoring data.

Heat maps have been developed to show how COVID-19 has spread across the USA. We can make a similar animation map with AI based monitoring system for insects.

Today the possibility of AI based monitoring system is now becoming a reality. While it is still in the developmental stage, once consistent results are produced, AI will change the face of the industry. ■

This article is a summary of Mr Junichiro Katayama's presentation given at the FAOPMA-Pest Summit 2020 Virtual Conference.

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