

Bomb detecting honey bees



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Police and military personnel have been using dogs to sniff out explosives for decades. According to scientists from Los Alamos National Laboratory, Mexico who have been working with honeybees since 1999, believe that bees can actually challenge dogs when it comes to sense of smell. The buzzing insects that seek out molecular hints of the pollen to make honey can easily detect other minute particles in the air, including traces of materials used to make bombs. Inscentinel Ltd. has developed " Vapour Detection Instrumentation" where trained bees are used for detecting explosives, drugs etc. This approach couples trained honey bees with advanced video computer software to monitor the bee for their strategic reaction.

Training

So how are the ordinary bees trained to respond to TNT (explosives) to the way they respond to pollen? In the same way you train any animal to do almost anything i. e. by associating a particular stimulus with a reward. With Pavlov's dog, the sound of a bell was associated with the smell of food which caused the dog to drool whenever the bell rang. Similarly, by associating the smell of bomb ingredients with sugar water it caused the bees to extend their proboscis, as if they were about to extract sweet nectar from a flower. This is Pavlovian training technique.

Process in Laboratory

Stealthy Insect Sensor Project: The bees are trained and then they are harnessed into a special cassette to aid in the process of biochemical molecular recognition. Trained bees are then carefully strapped into a cartridge. With the bees strapped into small tubes, scientists release the <https://assignbuster.com/bomb-detecting-honey-bees/>

chemical components which are used to make explosives like dynamite, C-4 and liquid bombs. Expecting the sugar water to follow, each trained bee extends its proboscis, which starts waving in the air, searching for nectar. A digital camera watches the bees carefully; if the bees are able to detect a trace of the odor that they have been trained to recognize, image recognition software will see the bees extend their proboscis in the camera image. The machine then reports a " positive" finding of that chemical substance to the human operator. Once the bees have finished their " shift," they are returned to their hive. The bees can detect the target chemicals in the air in concentrations as low as a few parts per trillion.

Second Approach Jerry B., a researcher with the University of Montana, is one of the pioneers of bee detection systems. He has trained bee colonies to detect explosives, meth labs, and dead bodies, but with a different approach. Jerry works with freely-flying bees that are allowed to roam in large, outdoor spaces. When the bees detect the target scent, they tend to slow down and circle the area. Using audio, video, and laser systems, Jerry and his colleagues can analyze the flight patterns of thousands of trained bees and produce a density map indicating the most likely locations of the target substance. With tens of thousands of bees searching, they can quickly canvass an area of a mile. But he believes that the former approach of " bee in a box" detecting explosives still has its place as " Free-flying bees won't be allowed in airports."

Additional Information

No Danger of being stung: As Honeybees are restrained within individual holders throughout their sniffing duty, so there is no danger of being stung

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by the bees. Bees are unharmed during the process: During their sniffing tasks they are made comfortable throughout – as only healthy bees work effectively. After their working shift the bees are returned to their hive where they live out the rest of their lives and are integrated back into the colony.

Odor Remembrance capability: After training, honeybees can remember odors for 72 hours or more, but our bees are usually only used for one to two days before being returned to the hive. **Hive Capacity:** One hive can contain around 60, 000 bees. The queen bee is able to lay up to 2, 000 eggs per day, producing a steady supply of bees to be trained for detection purposes.

Bees' Selection: Honeybee workers live for four to six weeks. For the first three weeks of their lives they remain inside the hive carrying out duties such as feeding larvae and making beeswax. For the last three weeks of their lives they become foragers, collecting pollen and nectar from flowers outside the hive. Honeybees that are foragers are used since they are easy to collect from the entrance of the hive, and they are actively using their olfactory capabilities to seek out flowers.

Bees' Collection: During winter, when the days become colder and shorter, honeybees in outside colonies remain within the hive feeding on stored honey. To continue the research and sensor work, they have developed a system to produce bees indoors throughout the winter. Colonies are kept in special " flight rooms" where the temperature is warm and long days are created using artificial lighting. The bees are able to fly in these rooms and are provided with pollen and sugar syrup on which to forage.

Requires Improvement As Bees respond to food, and this will provide a high rate of false positives as airports have lots of sugary foods. Additionally, a <https://assignbuster.com/bomb-detecting-honey-bees/>

terror group may sprinkle or smear sugary substances all over the airport - like on the luggage conveyor belts and carousels, basically making thousands of pieces of luggage to test positive. Work is ongoing to improve it with the laser technology and other potential solutions have been explored, such as attaching very small radio-frequency ID tags to bees or painting them fluorescent colors to the uncontained bees to make them more visible.

Conclusion

The primary focus of this project is the development of a new generation of handheld portable detectors, through the use of live honeybees. Inscentinel has collaborated with many companies and institutions and actively seeks commercial partners with whom to deploy this technology.