Lenovo and NVIDIA Metropolis for Bird and Drone Strike Control

Assuring take-off and landing safety in airports and all airfields, with SaaS-enabled AI - software and hardware systems for preventing impacts with flying objects.

Wildlife strikes, the impact between an aircraft and one or more wild animals - mainly birds (the so-called “bird-strike”) - are constantly increasing worldwide, with consequent costs in terms of human lives and material damage to aircrafts.

The civil aviation industry in the United States spends almost a billion dollars a year on wildlife strikes. In Italy, it is estimated to cost 40 million euros per year between repairs and delays in flights. Since 1988, more than 255 people have been killed worldwide because of wildlife strikes, and at least 380 military aircrafts and 88 civilian aircrafts have been destroyed.

Most impacts between an aircraft and wildlife occur at airports or in their immediate vicinity. Approximately 80% of impacts occur below an altitude of 300ft during take-off and landing. The risk of impact during the landing or take-off phase is linked to several contingent factors:

- Type(s) of birds at the airport
- Intensity of the activity
- Number of individuals
- Direction and position

Other typical factors of the airport include:

- Geographical location
- Proximity to foraging areas for birds or sources of attraction such as landfills and cultivated fields
- Presence of wetlands
- Position along particular migration routes for certain bird species
- Management of airport sediments

Lenovo and NVIDIA Metropolis have partnered with The Edge Company to offer airports a risk management solution using artificial intelligence (AI) to improve the detection of birds whether they are on the ground, in-flight, isolated, or in groups, that can be seen from different points of view and at different distances.

Real-time video analytics, camera control, and data management run on a Lenovo high performance compute (HPC) server which is also connected to IP cameras.

Lenovo ThinkSystem servers have a well-integrated management suite that makes them ideal as all-in-one solution nodes in an airport environment. The NVIDIA Quadro RTX 4000 and NVIDIA T4 GPUs, part of the NVIDIA data center product line, perform video decoding and video analytics. The GPUs provide the real-time throughput that this mission-critical application requires. The Edge Company's software offering is designed for small to large-scale deployment, monitoring and management.

Validated Architecture

Lenovo, NVIDIA and The Edge Company's B.C.M.S.© VENTUR solution is able to simultaneously monitor the entire airport area, from dawn to dusk. It can recognize, classify, count and identify the position of the bird species present and provide an estimate of the instantaneous risk for each movement based on the detected species, the number of individuals and the direction. The solution offers:

- Constant risk assessment
- Effective action in the event of an alarm based on risk levels
- Efficient use of deterrence systems (example, distress-call) given real-time understanding of the target species
- Optimized work of the BCUs
- Accurate and consistent data collection on bird activity

In the various phases of the process of mitigating the risk of wildlife strikes, the monitoring phase is certainly the weakest and consequently, the one with the greatest possibility of being improved. Thus, providing a step forward could mean a drastic reduction in the impacts between aircrafts and wildlife.

Design Components*

<table>
<tr><th colspan="4">Servers</th></tr>
<tr><td colspan="4">ThinkSystem SR630 | ThinkSystem SR650 | ThinkSystem SR670 | ThinkSystem SE350</td></tr>
<tr><th colspan="2">Storage</th><th colspan="2">Networking</th></tr>
<tr><td colspan="2">4x 3.5" ; 4TB 7.2K SATA 6Gb Hot Swap 512n HDD in RAID 5</td><td colspan="2">ThinkSystem 10Gb 4-port Base-T LOM</td></tr>
<tr><th colspan="2">Accelerator</th><th colspan="2">Software</th></tr>
<tr><td colspan="2">• NVIDIA Quadro RTX 4000 8GB PCIe ActiveGPU
• NVIDIA T4 GPU 16GB PCIe Passive GPU</td><td colspan="2">• B.C.M.S.© VENTUR by TheEdge Company
• NVIDIA's CUDA, NVDEC, NPP
• Google TensorFlow (GPU accelerated)
• OpenCV (GPU accelerated)
• GStreamer Multimedia Framework
• VMware ESXi
• Lenovo xClarity Pro
• Milestone XProtect VMS</td></tr>
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*The design components shown here are the minimum requirements for illustrative purposes. Customers have the flexibility to scale up the servers and accelerators based on their unique needs and size of the deployment. Sales representatives can discuss and address customer's unique circumstances.

Summary

Civil and military airports, and all airfields, should inherently guarantee the take-off and landing phases with systems designed to prevent impacts with flying objects, such as birds or, as is increasingly the case, drones. Cutting-edge AI-based, automatic computer vision control systems running on Lenovo and NVIDIA hardware and using state of art deep learning models from The Edge Company, make it possible to effectively recognize and classify bird species and calculate their trajectory resulting in immediate actions required to remove the species from the area to be kept safe.

The solution is easy to deploy, maintain and scale as well as to integrate with others already present and to interface in an immediate way to guarantee the activation of the most suitable deterrent system.

Resources

- Explore the Lenovo HPC and AI Innovation and Briefing Center
- Lenovo Validated Design for AI Infrastructure on ThinkSystem Servers
- Lenovo AI Research
- The Edge Company: B.C.M.S.©VENTUR