

An intelligent future for remote inspections

Lumina

While traditional turbine inspection methods can be slow and error-prone, advancements in Artificial Intelligence technology may hold the answer to finding defects faster. A solution that will only grow in importance as wind farms themselves grow and offshore locations become increasingly hard to reach. PES was keen to find out more about the possibilities of AI, and the advantages it may bring to the industry from Brian Kim, Senior Software Engineer at Qii.AI.

PES: It's lovely to welcome you to PES Brian. We're looking forward to introducing our readers to a new name. With that in mind, perhaps you could give us a brief summary of Qii.AI and your role in the wind industry?

Brian Kim: Thank you for the warm welcome. The Qii.AI software is an end-to-end enterprise solution for drone inspections, from data uploading to report generation. The system includes Qii.AI studio, Qii.AI connect, and Qii.AI edge. Qii.AI studio is a cloud software integrating data uploading and processing, data sharing, user management, etc. Qii.AI connects and edge are AI embedded inspection software, web and desktop applications.

PES: Wind turbine inspection methods have traditionally been quite slow and prone to errors. How have you seen this change in recent times?

BK: Traditional inspection methods are mostly human-centric, so they have disadvantages such as slowness, low accuracy, high cost, safety issues and so forth. This becomes more of a problem as the industry grows, wind farms grow and operations happen further offshore.

Being able to carry out remote turbine inspections solves many of these challenges.

As the backbone of remote sensing technology, drone imaging is a promising data collection method since it is fast, safe, cost-saving, and detailed. These days, it is being successfully used to inspect diverse industry assets, including wind turbines.

PES: The take up of drone inspections in particular has been fast paced hasn't it?

BK: Yes, it has. According to a report published by Allied Market Research, the global drone inspection and monitoring market generated \$6.44 billion in 2020 and is anticipated to reach \$35.11 billion by 2030. This projected market growth results from the need for increased cost-efficiency and safety, reduced risk, and high quality of records. These are all benefits of drone inspection, so the time is right for getting on board with this technology.

PES: How has the development of AI helped to move things forward?

BK: Today, many manual processes in various industries are being replaced with AI. This is because AI reduces human errors and risks, makes decisions faster than humans, and increases business efficiency. In drone inspection services, AI is applied to automatically recognize, categorize, and measure defects from drone images. Humans are only required to make a true or



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false decision to confirm defects detected by AI. Thus, AI dramatically decreases human interventions in asset inspection.

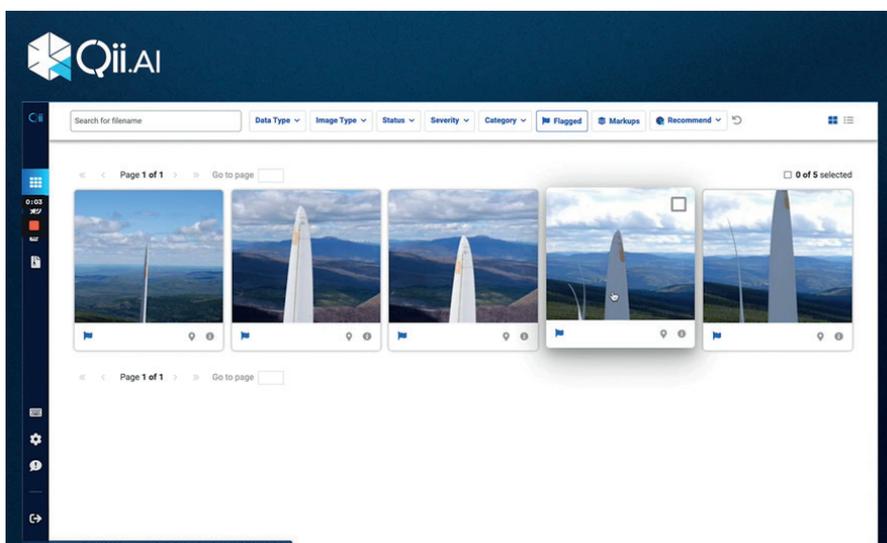
AI has also contributed to new drone inventions, such as a drone attaching a water spray nozzle to clean insulators in power line corridors. In this application, AI needs to identify the insulators from every video frame on the fly, so that the drone precisely sprays water towards them. In this way, AI has helped to start new drone businesses and increase the efficiency of existing businesses.

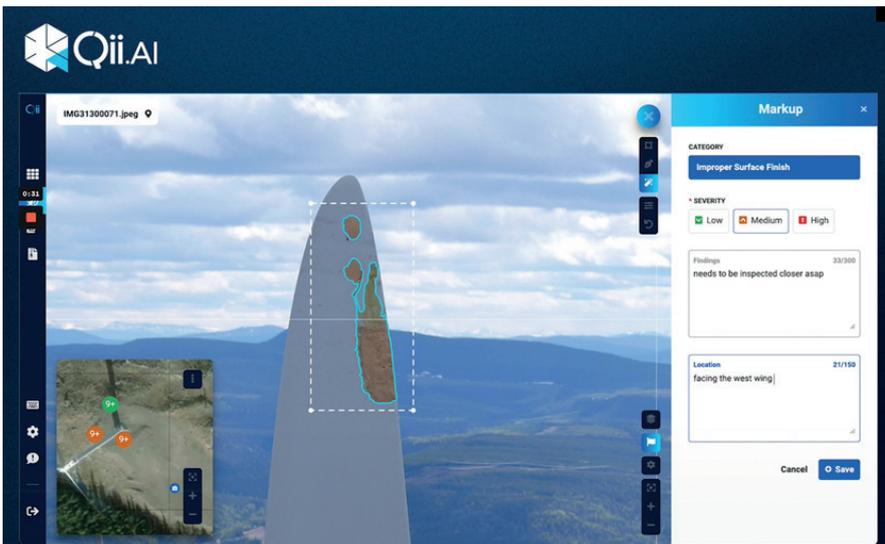
PES: What do you see as the main advantages of using AI for wind turbine inspection, both on and offshore?

BK: AI enables the automation of several key inspection processes. These include detection of wind turbine anomalies, defect categorization, estimating severity levels, measuring the defect area and changing detection from multi-temporal data.

With these key advantages for wind turbine inspection, use of AI can therefore speed up the inspection process, increase accuracy, save labour cost, and ease the workload.

PES: Presumably, once gathered, the data can be shared and analyzed quickly and easily between the necessary teams, which must also save time?





BK: Data sharing is an essential requirement in inspection applications to share observations, analyses, and reviews between collaborators. The Qii.AI software has a feature called Qii.AI link for sharing reconstructed data, i.e., 3D digital twins and defect detections, as well as raw images with a single click. It saves time and secures data, since physical data transfers are not necessary.

Qii.AI link has participant roles in managing the data accesses to invitees, including viewer, inspector, and admin. The functions are customizable and in addition, users can specify data to be exposed to invitees.

PES: Is the data still prone to errors though?

BK: Most errors originally occur from data processing due to poor data acquisitions. For example, insufficient overlaps between drone images fail to create 3D digital twins, and image corruption caused by sensor malfunctions hinders AI detection. It is therefore important for drone pilots to follow the operator guidelines. Other examples may include errors in AI detection, which will evolve and improve by providing more data.

PES: Is this technology specific to drone inspections or can it be used in other ways too?

BK: Qii.AI software has been initially designed for drone data processing and inspection. However, the system can handle any images captured with and without geotags once they comply with data acquisition guidelines. It also supports a combination of multimodal cameras, such as images captured from airplanes, drones, and the ground. In addition to visual inspection, thermographic inspection with images taken by thermal cameras is applicable.

PES: It sounds as if one of the biggest benefits of all this is increased efficiency, not only in terms of the inspection process itself, but also in the operation of the turbines as a consequence of the data gathering and analysis?

BK: Traditional inspections and maintenance activities require high expense and undesired downtime of wind turbines, while the drone-based method maximizes turbine uptime and performance by saving both time and money. These are big advantages that are likely to result in the increased use in such technology in the future.

PES: Are you finding much resistance to the use of AI, or is the sector on the whole quite happy to embrace it do you think?

BK: Customers do have valid concerns

regarding such things as data security, which we can happily alleviate. Generally though, the benefits far outweigh any risk concerns and customers welcome the changes as they result in increased value and efficiency in their work.

PES: This is a fast developing market, but what do you think the next 12 months or so may bring? Are there even more advancements and even greater benefits still to come?

BK: It is fast developing certainly and we are certain that the next advancements are never far away. We have a vision, for example, that remote digital inspection should be as good or even better compared to the inspection performed onsite. To make this happen we are incorporating augmented realities into Microsoft HoloLens for better inspection results. This is just one of the ways we expect things to evolve in the near future.

PES: And for Qii.AI; what might our talking point be the next time we speak do you think?

BK: For certain it will be around AI sovereignty and AI competitiveness. We believe AI will be the core competitive advantage for many inspection companies and we look forward to exploring this topic more with PES as things continue to develop.

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