

CLAIMS

What is claimed is:

1. A method for inspecting a wind turbine blade, wherein the wind turbine blade is a blade in a wind power generation device, the wind power generation device further comprising a tower
5 provided with a sound acquisition device; and

the method comprises:

acquiring a sound signal in response to an impingement of wind on the wind turbine blade using the sound acquisition device, wherein the sound signal comprises a sound signal generated by sliding of air between blades in the case that the wind impinges on the wind
10 turbine blade;

generating a frequency spectrogram based on the sound signal; and

obtaining a damage recognition result of the wind turbine blade by performing image recognition on the frequency spectrogram based on a damage recognition model, wherein the damage recognition model is obtained by training a neural network model.

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2. The method according to claim 1, wherein generating the frequency spectrogram based on the sound signal comprises:

extracting a signal envelope from a time domain signal diagram formed by the sound signal by calling a signal analysis algorithm;

20 determining a position of a point, where a wave trough appears on the signal envelope, in a time domain as a segmentation point; and

converting the sound signal into the frequency spectrogram, and obtaining a segmented frequency spectrogram by segmenting the frequency spectrogram based on the segmentation point.

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3. The method according to claim 2, wherein obtaining the damage recognition result of the wind turbine blade by performing image recognition on the frequency spectrogram based on the damage recognition model comprises:

calculating a sound spectrum difference factor in response to in response to the impingement
30 of wind on the wind turbine blade based on the segmented frequency spectrogram, wherein the

sound spectrum difference factor represents a damage degree of the wind turbine blade; and

obtaining the damage recognition result of the wind turbine blade by performing image recognition on the segmented frequency spectrogram based on the damage recognition model in the case that the sound spectrum difference factor is greater than a difference threshold.

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4. The method according to claim 3, wherein the segmented frequency spectrogram comprises frequency spectrum regions of n wind turbine blades after segmentation, where n is a positive integer; and

calculating the sound spectrum difference factor in response to the impingement of the wind on the wind turbine blade based on the segmented frequency spectrogram comprises:

extracting signal peaks in n frequency spectrum regions;

calculating a time domain factor and a frequency domain factor of the sound signal based on the signal peaks of the n frequency spectrum regions; and

determining a weighted average of the time domain factor and the frequency domain factor as the sound spectrum difference factor.

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5. The method according to claim 4, wherein m wind turbine blades are disposed on the wind power generation device, where m is a positive integer; and

calculating the time domain factor of the sound signal based on the signal peaks of the n frequency spectrum regions comprises:

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determining a median of signal peaks of at least two of the frequency spectrum regions corresponding to each of the wind turbine blades;

determining a maximum peak and a minimum peak from m medians corresponding to the m wind turbine blades; and

determining a ratio of the maximum peak to the minimum peak as the time domain factor.

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6. The method according to claim 4, wherein m wind turbine blades are disposed on the wind power generation device, where m is a positive integer; and

calculating the frequency domain factor of the sound signal based on the signal peaks of the

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n frequency spectrum regions comprises:

acquiring a maximum peak from signal peaks of each two adjacent frequency spectrum regions of m frequency spectrum regions and determining the maximum peak as a candidate peak, where m is a positive integer; and determining a median of at least two of the candidate peaks as the frequency domain factor; or

calculating a relative entropy between signal distribution and theoretical distribution in the segmented frequency spectrogram, and determining the relative entropy as the frequency domain factor.

7. The method according to any of claims 3 to 6, wherein calculating the sound spectrum difference factor in response to the impingement of the wind on the wind turbine blade based on the segmented frequency spectrogram comprises:

calculating a signal-to-noise ratio of the sound signal based on the segmented frequency spectrogram;

calculating the sound spectrum difference factor in response to the impingement of the wind on the wind turbine blade based on the segmented frequency spectrogram in the case that the signal-to-noise ratio is greater than a signal-to-noise ratio threshold; and

determining that the sound acquisition device encounters a failure in the case that the signal-to-noise ratio is less than the signal-to-noise ratio threshold.

8. An apparatus for inspecting a wind turbine blade, wherein the wind turbine blade is a blade in a wind power generation device, the wind power generation device further comprising a tower provided with a sound acquisition device; and

the apparatus comprises:

a acquiring module, configured to acquire a sound signal generated by an impingement of wind on the wind turbine blade using the sound acquisition device, wherein the sound signal comprises a sound signal generated by sliding of air between blades in the case that the wind impinges on the wind turbine blade;

a generating module, configured to generate a frequency spectrogram based on the sound signal; and

a recognizing module, configured to obtain a damage recognition result of the wind turbine blade by performing image recognition on the frequency spectrogram based on a damage recognition model, wherein the damage recognition model is obtained by training a neural network model.

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9. A wind power generation device, comprising:

a sound acquisition device;

a memory communicably connected to the sound acquisition device; and

a processor communicably connected to the memory; wherein

10 the sound acquisition device is configured to acquire a sound signal in response to an impingement of wind on the wind turbine blade of the wind power generation device, and store the sound signal in the memory;

the memory is configured to store an executable instruction and the sound signal; and

the processor is configured to load and execute the executable instruction stored in the
15 memory to perform the method for inspecting the wind turbine blade as defined in any of claims 1 to 7.

10. A non-transitory computer-readable storage medium storing at least one instruction, at least one program, a code set, or an instruction set therein, wherein the at least one instruction,
20 the at least one program, the code set, or the instruction set, when loaded and executed by a processor, causes the processor to perform the method for inspecting the wind turbine blade as defined in any of claims 1 to 7.