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Bird Activity Monitor (BAM)

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PRODUCT DESCRIPTION

Avian interactions such as collisions and electrocutions with overhead power lines, communication towers, wind turbines, and other utility structures are subjects of increasing concern among utilities, regulatory agencies, and environmental organizations. Our ability to quantify the temporal and spatial extent of the problem or the efficacy of mitigating measures is severely hampered, however, by a lack of standard monitoring methods and tools. EPRI initiated a research project in 2000 that led to development of a bird strike indicator (BSI) sensor to monitor avian collisions. To fully understand and study avian interactions, a bird activity monitor (BAM)—a video-based monitoring tool—is needed.

Results and Findings

This technical update describes the effort to develop functional specifications for the BAM system. The functional specifications will define operational, communication, physical, environmental, and power specifications.

Challenges and Objectives

The two overarching goals of the EPRI research project are

- to develop automated monitors to gather information that is difficult or impossible to obtain through direct human observation and
- to evaluate the efficacy of mitigating devices such as line markers and flight diverters.

This effort is the first phase of the research project. The objective of this effort is to develop the functional specification for the BAM system that will help guide the research and development of the system in the project's next phases.

Applications, Values, and Use

Once successfully developed, the BAM system can incorporate the BSI sensor as a trigger to initiate recording. The BAM system could potentially be used for monitoring other types of assets, such as substations.

EPRI Perspective

Avian interaction with power lines is a growing concern. EPRI has taken the lead in recognizing the need and developing new technologies to study the extent of these avian problems. Development of cost-effective automated tools will make it easier to undertake monitoring of transmission lines in remote areas and to test the efficacy of mitigation devices.

Approach

The project team's goal during the project's first phase was to develop functional specifications for the BAM system. These specifications will define the desired set of features for the BAM system.

Keywords

BSI
BAM

Bird collision
Avian interaction

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BIRD ACTIVITY MONITOR (BAM)

Background

Avian interactions (i.e. collisions and electrocutions) with overhead power lines, communication towers, wind turbines, and other utility structures are subjects of increasing concern among utilities, regulatory agencies, and environmental organizations. Recent studies in North America indicate previous estimates of avian (and bat) mortality from collision or electrocution is far too low. Current estimates around the country indicate birds cause 25% of all outages. The heightened awareness of the problem has led to efforts (sometimes misguided) to mitigate and reduce avian fatalities and to increase power reliability. Our ability to quantify the temporal and spatial extent of the problem or the efficacy of mitigating measures; however, is severely hampered by a lack of standard monitoring methods and tools.

To bridge this technology gap, EPRI initiated research projects in 2000 to develop and deploy automated avian monitors that can be cost-effectively used in remote locations to capture vital information necessary to develop programs to minimize impacts of utility structures on bird populations.

The two overarching goals of EPRI research project were:

1. to develop automated monitors to gather information that is difficult or impossible to obtain through direct human observation, and
2. to evaluate the efficacy of mitigating devices such as line markers and flight diverters.

As part of the research projects, two different types of monitor were identified for development. The first was a Bird Strike Indicator (BSI), an impulse-based vibration sensing and recording tool to study bird collisions with aerial cables. The second monitor needed was a Bird Activity Monitor (BAM), an intelligent image-based sensing and recording tool to assist with detailed study of wildlife interactions with various types of structures. Other situations that could be monitored with the BAM include flight activity near proposed or existing wind turbine sites or communication towers, wildlife activity in/near substations, perching or nesting activity on towers, and the efficacy of mitigating measures.

As a result of the research projects initiated in 2000, a Bird Strike Indicator (BSI) sensor system was successfully developed and deployed. The BSI sensor system was commercialized in 2008.

EPRI initiated this current project to initiate development of a Bird Activity Monitor (BAM) to complete the tools needed to study avian collisions.

BAM Project Approach

The envisioned BAMs will capture, store, and transmit video images of the interaction of birds with power lines, communication towers, and wind towers when their flight paths approach facilities, which have BAMs installed. This video information can then be used as a basis for objective investigation. The video information can be used in concert with ancillary

measurements made by devices such as BSIs. BAMs can also efficiently monitor retrofitted lines to determine if mitigating measures are working as designed.

The BAM design will build on related technology that was developed for real-time monitoring of power line conductor ground clearance. The ground clearance monitor utilizes video technology coupled with sophisticated image processing software to accurately monitor and track the motion of conductors for thermal rating purposes. By leveraging the BAM R&D effort with the ground clearance monitoring technology, this project can proceed at a fast pace with lower cost and greater likelihood of success.

Develop Functional Specification for BAM

Towards development of a BAM system, the first task identified is to develop the functional specifications for the envisioned BAM sensor system. The goal of this task is to develop functional specifications for the BAM system and firmware that will help guide hardware and firmware-component design and development in subsequent tasks. The functional specification will include performance specification, operational specification as well environmental specification.

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BAM FUNCTIONAL SPECIFICATIONS

The Bird Activity Monitor (BAM) system is envisioned as a video/image based system that can be used to monitor the interaction of birds with power lines, communication towers, and wind towers. The BAM system typically will consist of video camera sensors, a video/image processing and recording unit, remote communication module and power supply options. It is likely that multiple video cameras could be integrated into a single processing module. Firmware will also need to be developed for processing the video to automate detection of bird interaction in order to minimize the amount of video recording.

The functional specifications will provide general information on a variety of parameters to frame the Bird Activity Monitor (BAM) system R&D. These specifications will define the key objectives for the system and provide a range for several of the parameters. The functional specifications will consist of the following categories:

- Operational Specifications;
- Physical Specifications;
- Communication Specifications;
- Environmental Specifications; and
- Electrical Specifications.

Operational Specifications

Operational specifications define the desired operational needs and wants for the BAM system that will help guide the overall system design and development. Some of the key items to be addressed as part of the operational specifications are, as follows:

- Desired field of view;
- Desired depth of focus;
- Daylight and night time operation – night time operation will require IR illuminators and/or IR cameras;
- Operating requirement during snow, high wind, fog etc.; and
- Processing requirements for detecting avian interactions.

Physical Specifications

The BAM system typically will be installed on a pole or tower in a transmission line with nothing needed to be installed on the energized conductors. This should minimize the constraints that might be needed as part of the physical specifications. The goal for the BAM system; however, would be to minimize the overall size and weight to make it easier for installation and also to transport.

Communication Specifications

The BAM system will need to be able to provide a means for remote communication. As the system will need to transmit video and/or still images, it will certainly require a high speed communication. This could be achieved by using high speed cellular networks. Cellular network; however, might not be available in remote areas. Another option that would be considered is wireless radio link to a nearby substation that might have dedicated LAN connection or could possibly provide other high speed access to the internet. Satellite internet communication might also be an option of providing high speed communication in remote areas if power consumption is not an issue as it would certainly require AC power.

Environmental Specifications

Environmental specifications will define the environment in which the system should be designed to work. These will include the operating temperature, humidity etc. The environmental specifications will play a major role in helping select components for the BAM system. Typically, all the critical components including the video camera will be housed inside weather proof enclosures.

Electrical Specifications

Ideally to make the system most versatile it should be powered using a solar power system. The electrical specifications for the system might need to be closely watched to see if that would be feasible or not. Because of the need for video cameras and processing requirements, it might be difficult to do without the need for AC power.

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