A good tern deserves another: Low-power, remote monitoring of island birds cuts bills

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The use of portable, wireless cameras and monitoring equipment for recording and transmitting footage of wildlife is perhaps familiar to anyone who watches nature programs on TV. However, common to all such equipment is the problem of limited battery life, which becomes particularly troublesome when using such equipment in remote and hazardous locations. A new report in the *International Journal of Computational Science and Engineering*, reveals details of an energy-efficient system for monitoring wild birds that reduces power consumption without significantly compromising image quality.

Hsiao-Wei Yuan of the National Taiwan University in Taipei and colleagues were aware that scientific monitoring of the critically endangered Chinese Crested Tern (*Thalasseus bernsteini*) a migratory bird that nests on Taiwan's Matsu Islands is important for conservation. As with many such ecosystems, observations are often unsystematic and rely on manual observation rather than continuous feedback.

The team has now developed a wireless, real-time visual surveillance system for monitoring these birds, TernCam. The system will allow scientists to gain a better picture of the tern's behavior through instantaneous capture of information. Crucially, the team has developed appropriate software for data transmission that retains image integrity but reduces the total number of data packets transmitted by the system and so considerably reduces battery consumption.

"The traditional techniques used to monitor wildlife are labor intensive and costly," Yuan says. "The use of cameras allows large data collection and increases the size of a sampled area without human presence, often giving scientists a glimpse into the secret lives of wildlife and its breeding, feeding and migratory habits." Additionally, monitoring cameras can also be used in anti-poaching efforts.

The team says their system overcomes many of the problems associated with wireless monitoring previously. The TernCam system has demonstrated that it can remain functional in severe weather conditions, wet, hot and salty environments and transmit adequate signals via the mobile phone network that is ubiquitous across Taiwan using the general packet radio service (GPRS) to provide real-time monitoring. The latter has generally not been possible with conventional equipment used in other locations before. The system has four 12 volt batteries to provide power and these are kept charged by two solar photovoltaic panels.

It is the image collection and processing for transmission that makes the system viable for such remote monitoring. Image compression and scheduling of transmission through the GPRS system allows data to be sent at very low energy cost to the scientists' computer server on the mainland 250 km away. Testing the system on the one of the islands through a breeding season has demonstrated how well it works and points the way to the wider use of the same system in monitoring other species elsewhere in a similar manner.

More information: "TernCam: an automated energy-efficient visual surveillance system" in *Int. J. Computational Science and Engineering*, 2014, 9, 44-54

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