Science for Environment Policy

Rainforest monitoring network deployed in Amazon

Using open-access software and power saving technologies, researchers have developed an easily deployed, low-cost network for monitoring large areas of the Amazon rainforest. This Peruvian study shows that environmental information, such as soil moisture and rates of photosynthesis, can be recorded and uploaded to the internet without having to make repeated visits to remote areas.

The Amazon rainforest plays a vital role in the global climate system, absorbing approximately five billion metric tons of CO_2 every year. Monitoring this ecosystem for changes in key factors related to the carbon cycle and consequently the climate system, such as temperature, humidity and rates of photosynthesis, is therefore highly valuable. However, monitoring vast areas of rainforest is far from straightforward. Travel between locations can be extremely difficult and returning to areas to make repeated measurements is often not practical.

In this study, Spanish researchers describe a new system based on a wireless sensory network, which is used to monitor large areas of rainforest. In the Maynas province of the Peruvian Amazonian rainforest, a network of long-range wireless links has been installed by the United Nations, to aid malaria control projects. This network, which extends 450 km along the Napo River, is currently the largest wireless network in the world.

The researchers describe how this infrastructure has been used in the design to form the backbone of an environmental monitoring network. The wireless towers, which are powered by solar panels, link to each other and connect to the internet via two satellite connections. For the environmental monitoring network, the researchers deployed 'sink nodes', linked to a wireless router located within range of the main towers (at local health establishments).

In the vicinity of the sink nodes are sensor nodes, attached to instruments that measure humidity, temperature, soil moisture, solar radiation and 'photosynthetic response' estimated as the amount of solar radiation plants are able to use for growth.

These sensor nodes relay the data back to the sink nodes; a useful aspect of this system is that if a sensor node is out of range on the sink node, it can pass data to a nearer sensor node which will then pass the information on. This allows sensor nodes to be deployed up to 600m from the sink node.

The system minimises battery use by employing 'Low Power Listening' which allows the sensor nodes to periodically check the wireless channel for activity, but otherwise go into 'sleep' mode.

Finally, the sink nodes send the data via the tower network to the database stored by the server. This informs user-friendly web pages which display the data in figures and tables. The researchers conclude that this design of monitoring network could be applied to other remote locations. Wireless networks set up to aid medical care in other countries could also be used for environmental monitoring, and the software used for this project is open access and adaptable to other projects. It is available at: http://pareto.ual.es/6LoWSoft_amazon/.

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