Detection and tracking of objects in water using a novel sonar technique

Reference No: B75144

CHALLENGE

A constant monitoring of the fish population and floatsam is essential to the correct functioning of a hydropower plant. Nonetheless, all the conventional monitoring techniques present several disad-vantages. Tracking techniques based on optical observations can be unfeasible in the case of pertur-bed water. Optical observations in the IR-range lack of sufficient contrast, because water animals are cool-blooded. Radio frequency measurements are disadvantageous, because they require the implementation of a tag, which increases the costs and administrative efforts due to animal testing permissions.

INNOVATION

The invention consists of a method for constantly monitoring moving objects in water around a hy-dropower plant, which overcomes the difficulties of the conventional methods. According to the in-vention, active hydrophones are installed at the borders of the basin. **The tomographic measurement approach is based on detection cycles,** each consisting of the following steps:

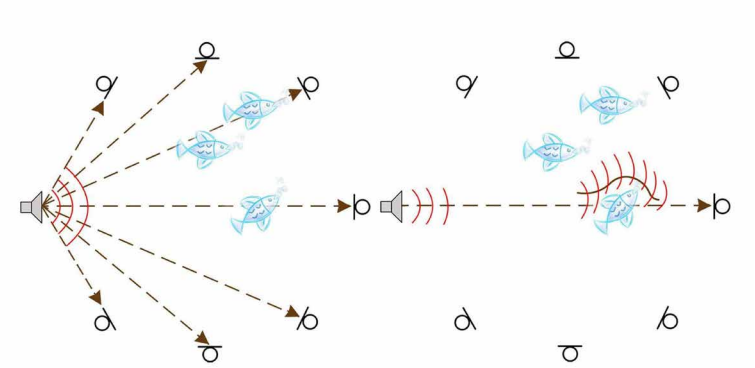
- Each hydrophone sends in sequence and with **high temporal frequency (200-1000 Hz)** a sonic wave while all the other sensors act as receivers;
- The data are analyzed by means of **the change of the acoustic impedance and frequency;**
- The spatial resolution achievable with the array composed by several hydrophones allows **for identifying and tracking single individuals (water animals).**

COMMERCIAL OPPORTUNITIES

The observation and tracking of water animals in the reservoir of a hydropower plant, allows for **operationally reacting to the changes** in behavior and number of their population. In de-pendence of these factors, turbine discharge can be reduced, gated weirs can be opened or discharges in the fishways can be increased. **This active management avoids cost-expensive permanent protecting measures.** This method can also be used to **prevent the obstruction of the intakes** of the plant by detecting the concentration and accumulation of debris.

DEVELOPMENT STATUS

The invention has been tested in the frame of several experiments. The first results have con-firmed the feasibility of the approach.



Exemplary illustration: (left) a sound generator emits a round signal, which propagates to the signal receivers. Upon reception, each of the receivers generates an output signal, which is electronically transmitted to a control unit (not shown) for further processing. **(right)** the presence of a body (for example a fish) changes the acoustic impendence of the medium, correspondingly the signal reaching one of the receivers is delayed compared to the unper-turbed signal received at the other receivers. Furthermore, the body can absorb or attenuate different wavelengths with different efficiency, changing the frequency spectrum at the measured at the receiver. Image adapted from (1).

REFERENCES:

1. EP 3 151 002 A1.

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