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MANUFACTURING

MoniCow

Efficient cattle monitoring system

Traditionally farmers were used to closely observing their herd to detect health problems and to follow up on the cow's reproduction cycle. To remain competitive, i.e. to lower farming costs per cow, herds are becoming larger and larger, making simple observation processes to monitor the herd troublesome.

MoniCow provides the tools to detect health problems early on, having a significant positive economic impact, avoiding milk production loss and/or unnecessary veterinary costs. For instance, an udder infection that is detected in a very early stage can save up to € 150. Moreover, the MoniCow system enables farmers to monitor offline the cow's reproduction cycle, determining not only when a cow is about to calve so the right assistance can be provided, but also to monitor when a cow is at its optimal moment for insemination. As such, MoniCow can support farmers to not to miss any oestrus, which has a monetary value of € 250.

Automated cattle monitoring through an advanced and user-friendly data system will lighten the load for farmers and enable them to maintain profitability in the long run. As such, MoniCow supports farmers to step into Industry 4.0, profiting at maximum of The Internet of Things (IoT) and cloud computing, enabling an easy way to monitor their herd and increase their profits.

As part of the MoniCow project, researchers in IoT and animal sciences joined forces with experts from the dairy and semiconductor industry to develop an energy-efficient and user-friendly monitoring system for dairy cattle. The system allows farmers to track their animals' location in real time and monitors specific health aspects, e.g. activity levels, resting times and rumination times. Based on these data, the current prototype allows farmers to detect heat and predict calving. Further developments will allow the technology to evolve and be useful in other contexts, e.g. to predict potential health problems like lameness in dairy cattle or in other animals. What makes the MoniCow system unique, is its user-friendliness. It is not only more complete than competing systems, but also more energy-efficient and self-sustainable.

THE OUTCOMES

1. An integrated solution for efficient cattle monitoring

The MoniCow prototype integrates different technologies, e.g. a compact accelerometer attached to the cow's collar, an extremely accurate location tracker based on ultra-wideband technology, and advanced algorithms to make sense of the combined data. As such, it provides a complete solution for efficient cattle monitoring. While there are already a number of systems on the market today that track one aspect of a cow's health and/or behaviour (e.g. rumination time or location), MoniCow is the only integrated solution that combines different relevant parameters.

2. Inductive charging to enable a fully autonomous system

The cow's collar is equipped with an inductive charging unit. When the cow is eating, the unit automatically and wirelessly hooks up to the charging station built into the feeding rack. In other words, the MoniCow system is self-sustainable, an important asset with regards to user-friendliness. Sending regular and accurate data updates to the farmer requires a lot of energy. For this reason, current solutions generally do not send regular updates, making them less useful to detect health problems preventively. The MoniCow system, on the other hand, uses another method to limit energy consumption: the technology integrated into the cow's collar includes a microprocessor that translates the incoming data into relevant information chunks which are sent to the back-end system via a low-power Internet-of-Things communication technology. The battery will last the cow's entire lifetime, another asset of the MoniCow technology.

3. Accurate localisation using ultra-wideband technology

Current systems to track cattle's location are generally not very accurate (e.g. +/- 5 meter accuracy) and are therefore only useful to locate an animal within the herd.

MoniCow, however, integrates an ultra-wideband localisation unit, enabling an accuracy of up to 30 cm. This increased accuracy opens up opportunities to also deduce information on the cow's behaviour (e.g., what is the cow's travelled distance? How often is the cow eating at the feeding rack, or lying in its cubicle?). This will unlock the potential to detect health problems such as lameness early on and/or to analyse the social behaviour of the herd.

4. Tested in the field

The prototype currently focuses on detecting heat and predicting calving moment, and this has been proven in the field. E.g., a cow that is about to calve can be detected based on her reduced rumination time and her restlessness. Based on field tests with dairy cattle at ILVO, the Flemish Research Institute for Agriculture, Fishery and Food, the researchers managed to develop algorithms that can predict these events with a 6-hour margin. Moreover, it has been shown that MoniCow's simple neck accelerometer performs equally well in monitoring rumination behaviour as a dedicated commercial device.

NEXT STEPS

The end result of the MoniCow project is a user-friendly prototype that can already be used to detect heat and predict calving. The research partners involved in the project intend to continue their collaboration to fine-tune the technology and expand the potential use cases. To do this, the first step is to set up more field tests to gather more real-time data on cows' behaviour. Based on these data, they will further optimize the underlying algorithms, enabling them to draw clearer conclusions. In parallel, it is expected that the technology will be tested in a wider range of contexts, enlarging the deployment potential.

In the meantime, the industry partners involved in the project are planning to valorise individual components of the technology in related markets. The partners are also interested in collaborating with technology integrators to develop and fine-tune the final product.

FACTS

NAME	MoniCow
OBJECTIVE	Developing an efficient, self-sustainable system for cattle monitoring through an advanced data system
TECHNOLOGIES USED	IoT, sensor technology, accelerometer, ultra-wideband localisation
TYPE	imec.icon project
DURATION	01/10/2015 – 31/03/2018
PROJECT LEAD	Danielle Baetens, NXP Semiconductors
RESEARCH LEAD	David Plets, WAVES, an imec research group at Ghent University
BUDGET	2,287,000 euro
PROJECT PARTNERS	DeLaval, Metagam, Multicap, NXP Semiconductors België, SnapTonic Research
RESEARCH GROUPS	WAVES, an imec research group at Ghent University; IDLAB, an imec research group at Ghent University; DraMCo (KU Leuven); ILVO

MoniCow project partners:

DeLaval METAGAM Multicap NXP snapTonic

WHAT IS AN

IMEC.ICON PROJECT?

The imec.icon research program equals demand-driven, cooperative research. The driving force behind imec.icon projects are multidisciplinary teams of imec researchers, industry partners and/or social-profit organizations. Together, they lay the foundation of digital solutions which find their way into the product portfolios of the participating partners.

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