DIFFERENT PRECISION, OVERLAPPING TECHNOLOGIES

The 'precision' in Precision Livestock Farming is not the same as that of precision engineering in high-tech industry. It's not about micro- and nanometers, but about the precise control of farming management with the aid of sensing and data processing. However, there is overlap in the technological domain, for instance regarding sensors and robots. So, both worlds can learn from each other. That's why in Den Bosch, mechanical engineering students pursuing a minor in 'Machines in Motion' are working on a farming application. Mikroniek offers a sneak preview.

HAS University of Applied Sciences in Den Bosch, profiling itself as 'the education and expertise centre of the southern Netherlands for the agro, food and living environment sectors', has established a Precision Livestock Farming research group. Its objective is to conduct research into smart farming: the efficient and precise management of daily farming operations using technology and (big) data.

Robots and sensors

High-tech equipment such as robots is already known in livestock farming. Think of the milking robot: a mechatronic achievement that operates under 'rough' conditions, it allows cows to give more milk while at the same time offering them more comfort, because they can determine themselves when they wish to be milked. Feeding robots can already navigate autonomously through a barn.

The latest technological development is the use of various kinds of sensor technology to monitor individual cows. For example, there are pedometers that give an indication of a cow's activity and thus its well-being, and accelerometers that help detect fertility, when cows show increased activity. The trend is now towards smartwatches for cows. The most advanced sensor today is a probe placed in a cow's stomach that measures its temperature (fever, sufficient (cold) water?) and pH (diet), and when required sends alerts to the farmer via his farm management system.

"Sound, movement, growth, production, milk composition; these are all signals that sensors can absorb. Within the research group, the question is how we can use such sensor data to optimise farming", says Lenny van Erp, Professor of

Precision Livestock Farming in Den Bosch for the last year and a half (Figure 1).

Co-operation

Livestock farming is, however, a small world, and therefore co-operation with external technology partners is necessary for the transfer of knowledge and experience, as well as cross-pollination (Figure 2). "With parties such as Eindhoven University of Technology and the province of Brabant, I look for the connection between technology and the agro-food sector. For example, I spoke with Maarten Steinbuch, a professor of control system technology, active in robotics and automotive. Among other things, his group is known for their work on soccer robots that are able to observe each other and work together." This could be

similar to a swarm of robots that monitor the condition of chickens in a barn, by measuring their temperature and activity and so on. "Examples of issues include how to use vision, which cameras to use, how to construct a world view, what software to develop, etc."

Machines in Motion

Recently, a collaboration began with the Mechanical Engineering department at Avans University of Applied Sciences, also based in Den Bosch, within their minor 'Machines in Motion'. This six-month specialisation covers the design of fast and precise machines for the so-called 'high-tech, low-volume' market. In terms of mechanics, the design and tolerances are subject to stringent requirements, and motion control – or motors in servo systems – is just as important. Students learn to work together with other disciplines and gain insight into the relationship between the design of a machine and the processes in which it will operate.

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The minor includes a project, generally suggested by a company (in this case the Precision Livestock Farming research group), which covers the whole process from initiation right through to manufacturing a prototype, from drafting a list of requirements and wishes, to preparing and overseeing manufacture and testing. Here, the objective is to design a robot platform equipped with sensors that can operate in modern broiler farms under demanding conditions, regarding temperature, humidity, manure, obstacles (other animals), etc. The first results will be published next year. ■

2 *Professor Lenny van Erp: "With parties such as Eindhoven University of Technology and the province of Brabant, I look for the connection between technology and the agro-food sector."*

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