

Bringing farmers and cows together



Context

Agis Innovations has developed an ear sensor for cows to monitor their health, fertility, and nutrition. However, finding a cow after a health alert occurs poses a significant challenge for farmers, particularly on large farms with thousands of cows. This issue is amplified by the necessity of hiring employees, who are often low-educated, have low literacy levels, and frequently do not speak the same language as the farmer. Consequently, these workers often exhibit low work engagement, treating cows more like machines than living animals.

While there are existing cow localisation solutions on the market, farmers have found them to be either inaccurate, too expensive, or not user-friendly. This highlighted the farmer's conflicting values in locating cows: on one hand, they aim to maintain a productive farm with high milk production, which is essential for their livelihood; on the other, they strive to prioritise the health and wellbeing of their animals, providing the best possible care.

To address these issues, six evaluation criteria were established for the localisation solution. From a technological perspective, the solution must be accurate, cost-effective, support a long battery life for the sensors, and have a long detection range. From a user perspective, the solution must be intuitive with a low learning curve, ensuring ease of use for all employees. Additionally, it should enhance work engagement, as this leads to better care for the cows and, in turn, a more productive farm. By meeting these criteria, the solution can help balance high production with herd wellbeing, aligning with both the economic and ethical priorities of modern farming.

Technology Aspect

On the technology side, a localisation solution was prototyped, achieving an impressive accuracy of 2 metres using Bluetooth's Channel Sounding. This technology is advantageous as it is less affected by multipath interference, consumes less energy than other technologies, and offers a range of 150 metres. The location of a tag is calculated using a trilateration method, but instead of relying on three static beacons, this solution uses only one beacon and a smartphone capable of Channel Sounding. This reduces the investment needed for additional beacons, which are typically expensive.

For trilateration to work effectively, the user with the smartphone must be within range of the tag device. Initial guidance is provided by existing routers, as it is known which router the tag is connected to. By moving towards this router, the user gets closer to the cow, enabling the trilateration method to function. This use of routers for initial direction meets the requirement for a long detection distance. Once the user is within 2 metres of the cow, identifying the correct cow becomes crucial, especially if multiple cows are standing close together. To simplify this, an LED on the sensor starts blinking, pinpointing the exact cow that needs to be found.

Additionally, the system optimises battery life by using a variable update frequency. When the user is far from the cow, location updates are less frequent, conserving energy. As the user gets closer, the update frequency increases, ensuring accurate and timely location information while still saving power when possible. This method balances efficient energy use with maintaining the necessary accuracy for effective cow localisation.

User Aspect

The user aspect aimed to develop an intuitive user interface that simultaneously enhances work engagement. The system's intuitiveness is achieved by dividing the localisation process into three distinct phases. When the user is out of range to use trilateration, the actual location of the cow is unknown, but a rough direction can be provided using a fan-like visualisation. As the user moves closer and the actual location can be calculated, an arrow appears, guiding the user directly to the cow. Finally, when the cow needs to be identified, the arrow disappears, prompting the user to look around for the blinking sensor. This step-by-step process ensures an easy and intuitive way to locate cows efficiently.

To enhance work engagement, several features were designed and integrated into a personal profile. A personal profile gives users a sense of belonging and purpose. Within the profile, users can access interactive tutorials that teach them how to use the localisation solution effectively, thereby enhancing their competence. Timely feedback is also crucial for boosting recognition and competence. Weekly statistics provide insights into whether the user took an optimal route, how quickly they located the cows, and their accuracy. This data can be used for virtual leaderboards and rewards, gamifying the task and making it more engaging. These features collectively enhance work engagement. Coupled with the technological advancements, the user interface connects the user to the technology in a desirable way, enabling farmers and their workers to locate cows efficiently while ensuring the best care for their animals. This holistic approach addresses both the functional and motivational aspects of cow localisation, fostering a more productive and satisfying work environment.

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Bringing farmers and cows together: Designing a solution to locate specific cows in real-time

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