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Design and Implement a Livestock Health Management and Environmental Monitoring System

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ABSTRACT

The livestock farms often cover a vast area in Taiwan. It is needed to exhaust a large amount of manpower and financial resources for caring livestock in livestock farms. To care, to manage and to train livestock is an important issue for caregivers. Inefficient management strategies always influence the health of livestock. Hence, NPUST set up a Working Dog Training Center to develop dog trainers from 2004. Nowadays, this center not only is with a complete training environment and a wealth of experience but also has many breeding techniques from NPUST animal hospital. However, Working dogs activity status, health management or environmental monitoring are often required enormous manpower and material resources based on the traditional caring way. Resulting in training, caring and management of working dogs are often unable to become more efficiently. For these reasons, this study designs and develops a Livestock Health Management and Environmental Monitoring System, which is called as LEADER system, to reduce the costs of manpower and to easily handle all situations of dogs. Figure 1 illustrates the design concept of Livestock Health Management and Environmental Monitoring System.

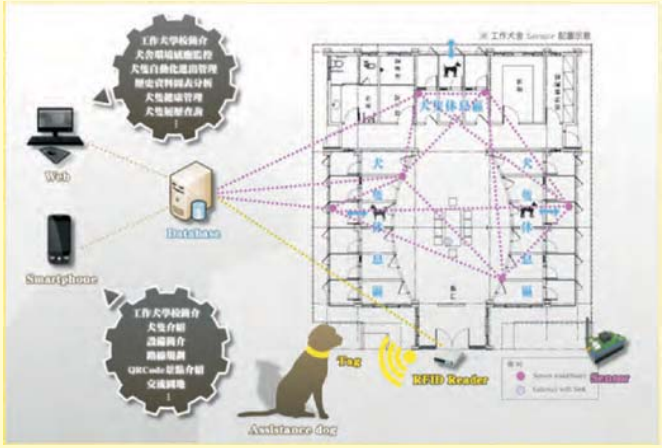

Fig. 1 the design concept of Livestock Health Management and Environmental Monitoring System.

NPUST Working Dog Center has efficiently integrated teaching resources of and training skills of the combination of dogs and equipment. Hence, LEADER system combines existing hardware devices to support the management of kennels and dog records. Furthermore, LEADER system provides kennel environmental monitoring services, dog training information services, dog pass control services, monitoring kennel environment services, and so on. It can let users easily get the realtime information of all working dogs and kennels. To enhance training efficiency can base on the following information techniques.

- An automated pass control service, which is designed for kennel manager and trainer to design to enhance the management efficiency of working dogs based on RFID techniques.
- A realtime response service, which is designed to monitor influence factors and to response unusual conditions based wireless sensor networks.
- A dogs curriculum vitae and rearing record service, which is designed to managers manage all dogs based on database techniques.
- A dog physiological conditions information service, which is designed to provide managers feed suitable feeds for dogs to achieve the purpose of health care and reducing costs.
- A guide service, which is designed to provide figures and illustrations based on QR code techniques.
- A map service, which is designed to decide a suitable routing path based on Google map and GPS techniques.

Fig.2 the system architecture of Livestock Health Management and Environmental Monitoring System.

The proposed Livestock Health Management and Environmental Monitoring System includes kennel environmental monitoring and management service platform, automation dogs passing management service platform and guiding service platform. All components are described as Fig. 2.

Livestock Health Management and Environmental Monitoring System can provides users' use handheld devices with QR code, Google map, GPS and speech-to-text techniques to access the needed information. Using handheld devices, users are unlimited on space contains for get visited information. Not only managers but also visitors can efficiently and quickly use LEADER system. Figure 3 illustrate related functions, which are described as follows.

(1) Realtime information delivery. When a user use a smartphone with 3G networks, decision support system (DSS) of LEADER system will realtime automatically provide the needed and the valuable information to this user.

(2) Realtime environment monitoring. According to arrange wireless sensors in training environments, LEADER system can efficiently monitor dogs activities and the variations of environments. Trainers can communicate with each other, get environment information, get the statuses of dogs, and set exception triggers of all conditions. When an accident occurs, LEASER system will automatically sent warning messages to related staffs.

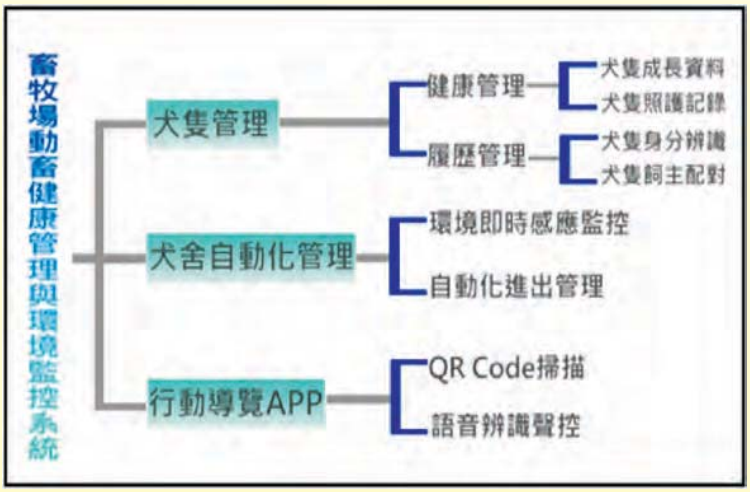

Fig. 3 the functions of Livestock Health Management and Environmental Monitoring System.

(3) Automation dogs passing management. In order to effectively improve the working dogs out of the management problem, using the RFID radio frequency technology. RFID techniques can recognize and store dogs' information by the instant recognition capabilities of the UHF sensing devices. Automatic identification tags can help managers to detect and record the dogs passing information.

(4) Personalized location-based services. Users can use smartphones with 3G or IEEE 802.11 WiFi networks to get latest hot spot information, locate information and kennel visiting services from LEADER system based on QR code techniques.

FIg. 4 Livestock Health Management and Environmental Monitoring System interfaces.

Livestock Health Management and Environmental Monitoring System, which is called as LEADER system, can efficiently use automation dog monitoring services for handle dogs and environments. Furthermore, LEADER system is based on RFID techniques for managing activities of dogs to efficiently reduce the manpower for managing dogs. LEADER system can reduce the influence of abnormal environment and the incomplete animal's records, which keeps dogs and environments have been in steady state. Finally, we hope the Livestock Health Management and Environmental Monitoring System can be a reference model for livestock farms and animal husbandry in Taiwan.