

A Study on the Android Based Livestock Vehicle Management System

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Abstract

In domestic livestock industry, economic damages of livestock farmhouses have been increased because the livestock mortality rate grows due to the spread of infectious animal diseases. The main cause of animal disease spread is a lack of systems to manage livestock vehicles transporting livestock or feed etc. This paper proposes a livestock vehicle management system based on Android for solving such a problem. The proposed system could prevent the spread of animal diseases in advance by collecting and analyzing the moving routes and access information of livestock-related vehicles. It could monitor moving routes of the contamination-suspected vehicles that visited a farm where the animal disease broke out. It is expected to prevent the livestock disease spread in advance through prompt initial prevention such as controlling the movement of vehicles by systematically collecting and managing information on vehicles accessing to livestock farmhouses through this system.

Keywords: *Livestock, GPS Module, Livestock Disease, Vehicle, Android*

1. Introduction

In domestic livestock industry, wasting animal diseases continue to break out due to scale-up, grouping and dense breeding, and there has been great deal of economic damage. In addition, the foot-and-mouth disease, avian influenza and swine fever of infectious diseases in domestic animals have a large scale of the outbreak and an extensive ripple effect when breaking out, so an action to this animal disease control is needed [1-3].

The main reason of rapidly spreading animal diseases is a lack of systems to manage vehicles transporting livestock, excretions and feed etc. To solve such a problem, the livestock barn vehicle registration system was introduced to register vehicles accessing to livestock-related facilities and to collect access or moving route information of livestock-related vehicles equipped with a GPS terminal [4-6].

However, there is a difficult problem for its enforcement due to financial burdens of farms that should pay the GPS terminal cost and communication charges [7].

Therefore, this paper would like to propose a livestock vehicle management system based on Android to reduce financial burdens for the GPS terminal cost and communication charges and to minimize damage caused by the spread of infectious animal diseases.

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The proposed system uses a GPS module installed in a smart device of the livestock-related vehicle manager to collect the vehicle's location information. The location information of a livestock vehicle is stored in a database and the moving route is acquired by the collected location information. In addition, the information on vehicles accessing to livestock-related facilities and the loading information is collected and stored in the database. Users could use a mobile application to monitor the vehicle management system related information such as location and access information of the vehicles. It designates dangerous farmhouses and provides a notification service to the surrounding farmhouses through information of vehicles that accessed to the outbreak farmhouse when the animal disease broke out.

It is expected to prevent the spread and propagation of animal diseases and to reduce financial damage of livestock farmhouses by managing livestock-related vehicle with the proposed system.

The composition of this paper is as follows. Chapter 2 explains the design of the proposed android-based livestock vehicle management system, and Chapter 3 explains the result of the mobile application implement. Chapter 4, lastly, will conclude the paper through its conclusion.

2. Livestock Vehicle Management System Based on Android

The configuration of the android-based livestock vehicle management system proposed in this paper is as shown in Figure 1. The proposed system consists of livestock manager, livestock access vehicle, and integrated management server.

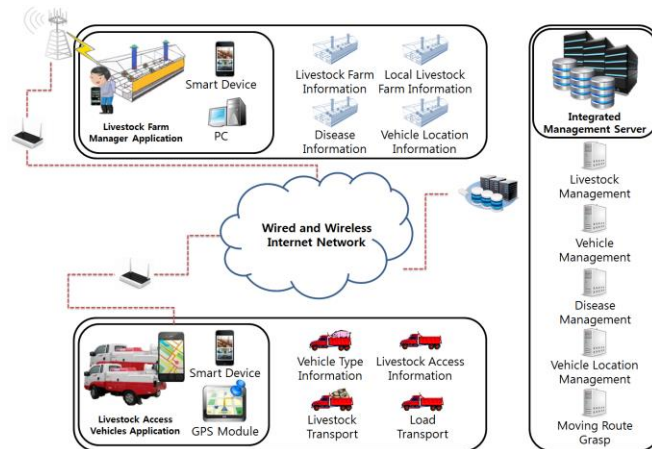


Figure 1. Livestock Vehicle Management System Configuration

The livestock industry managers could use a smart device to enter and modify information of livestock farmhouses. Information of livestock farmhouses is divided into a manager, address, phone, livestock species, any disease infection and vaccination etc. Basic information of livestock farmhouses is managed on an integrated management server. In addition, it could use computers and smart devices to monitor information and moving routes of vehicles that accessed to the farmhouse.

The livestock access vehicle is divided into the livestock move management and the vehicle move management. The livestock move management system collects information of vehicles and livestock by comparing and analyzing information on the moving and transit of vehicles, vehicle information of reference coordinates and the

entire livestock moving route, and reference coordinates, and collects location information by the livestock move management section. The vehicle move management system uses a GPS module installed in manager's smart devices to send location information of vehicles to the integrated management server. In addition, it manages any access to farmhouses and its purposes, and information on the transport object by the type of livestock vehicle.

The integrated management server manages information of livestock farmhouses and livestock vehicles. Location information is collected by a GPS module installed in a smart device, and the collected information is stored in the database. The moving route is set by the collected location information. When an animal disease is confirmed, it checks whether or not the vehicle, which accessed to the livestock farmhouse via the set moving route, was moved to other livestock farmhouses. To prevent the disease spread, it sends a disease outbreak alarm and information on the disease to computers or smart devices of the surrounding livestock farmhouses. In addition, for farmhouses where the vehicle accessed, it sends the information for initial prevention and the information of specialized institutions controlling the relevant diseases.

The process of the proposed livestock vehicle management system is as shown in Figure 2.

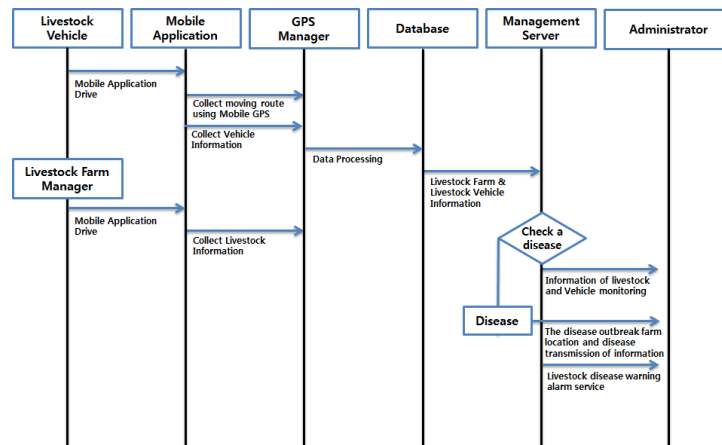


Figure 2. Livestock Vehicle Management System Process

It collects information of livestock farmhouses and vehicles through the mobile's application. It also collects location information of vehicles through the GPS module installed in the smart device. The collected location information is sent to the GPS Manager, the location information of vehicles is converted and processed into a form that could be stored in the database, and then it is sent to the management server to store in the database. When an animal disease breaks out in a livestock farmhouse, it would trace the moving route of vehicles that visited the livestock farmhouse. In addition, it checks whether or not the vehicle, which accessed to the farmhouse where the disease broke out, access to other livestock farmhouses, and then provides an animal disease alarm service to computers or smart devices of managers for preventing the spread of disease.

3. Livestock Vehicle Management System Implement

Visual basic was used as a development tool for the android-based livestock vehicle management system application proposed in this paper, and C# .NET Framework development language was used.

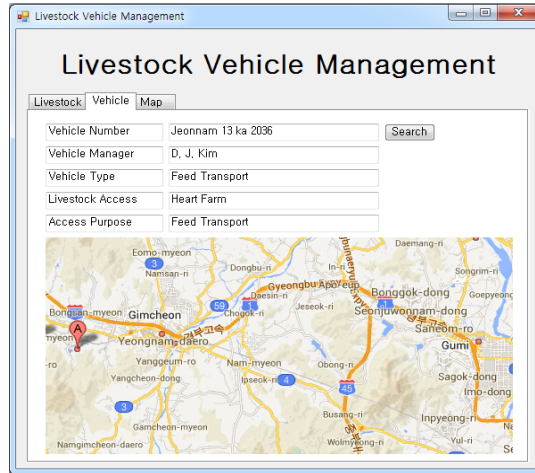


Figure 3. Livestock Vehicle Management Middleware System

Managers could use a computer to manage livestock and vehicle information, and monitor disease information. For the livestock information, it could enter and modify information on managers, addresses, phones, livestock species, presence of disease outbreak, vaccination and its period etc. For the livestock vehicle information, it could enter and modify information on vehicle managers, vehicle types, accessing farmhouses, accessing purposes and transported objects, *etc.*, and monitor recent location information and moving routes of vehicles.

Eclipse 4.2(Juno) was used as a development tool for the smart phone-based livestock vehicle management system application proposed in this paper, and Android SDK 4.1.2(Jelly Bean) version Android OS was used.



Figure 4. Livestock Vehicle Management Mobile Application: (a) Mobile Application Login, (b) Livestock Disease Management, (c) Livestock Vehicle Moving Route

The login screen of the smart phone-based livestock vehicle management is as shown in Figure 4-(a). Manager's ID and password are entered to use the livestock vehicle management system. The livestock vehicle management application menu is divided into the livestock farmhouses, livestock vehicles, diseases and moving routes.

To monitor information of livestock farmhouses, it manages information on managers who manage the livestock barn, address, phone number, livestock species, presence of diseases in the livestock farmhouse and its history, and whether or not to vaccinate livestock and its history. To monitor the type and information of livestock vehicles, it manages information on vehicle managers, vehicle types, accessing farmhouse, and accessing purposes. The vehicle type is divided by the kind of vehicles related to the livestock industry such as livestock, raw milk, feed, and excrements etc., and it could manage information on the farmhouses accessed by the type and the accessing purpose.

The animal disease menu for providing information of animal diseases and notification services is as Figure 4-(b). It could monitor information of diseases related to the livestock industry, and provides the disease outbreak alarm and information on the disease to the relevant farmhouses and surrounding livestock barn managers when a disease breaks out in a livestock farmhouse. In addition, it provides a system to prevent the animal disease spread by offering initial prevention and information on whether or not to be infectious.

The moving route menu for searching the moving route of livestock vehicles is as Fig. 4-(c). It could monitor location information and recently moved routes of a vehicle by inquiring a number of the livestock-related vehicle. For the vehicle's moving routes, it uses a GPS module installed in the vehicle manager's smart device to collect the vehicle's location information, and stores and manages in the integrated management server.

4. Conclusion

This paper proposed the livestock vehicle management system based on Android that could minimize damage caused by the spread of wasting livestock diseases through the livestock vehicle management and systematically manage the livestock-related vehicles.

The proposed livestock vehicle management system could use a GPS module installed in the manager's smart device to monitor location information and moving routes of livestock-related vehicles. It could collect and manage information on livestock farmhouses, livestock vehicles and diseases, and monitor information related to livestock diseases. When a disease broke out along the moving routes of livestock vehicles, it monitors whether or not the vehicles accessed to other livestock farmhouses. In addition, it gives information on the disease and initial prevention by providing the disease alarm service to smart devices or computers of managers in the farmhouse, where the disease broke out, and the surrounding farmhouses.

It is expected to reduce financial damage of livestock farmhouses by preventing the livestock disease spread in advance through the livestock disease information monitoring and the alarm service.

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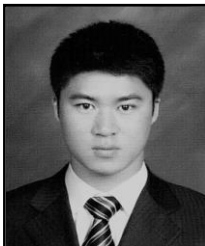
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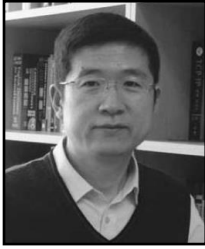
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