Radio Frequency Identification Technology in Farming Management System

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Abstract

Radio Frequency Identification (RFID) technology refer to a wireless systems that allows device to read information contain in a wireless device or 'tag' from a distance without any physical contact or requiring a line of sight between the two. It provides a method to transmit and receive data from one point to another. This project used RFID technology to identify the status of animal, in this case are cows. The tag stores a serial number that identifies the cow and information such as the Animal ID, Animal Type, Repro Status, Lacto Status and others that are related. When the cows pass through the gate that has reader, the antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers. The interface that is being used in this project is visual basic programming (VB6). This interface will appear on the computer and all the data that are stored can be seen here. The information in the interface can be changed. This system would definitely facilitate the whole management in cow farming to be more efficient and easy.

Keywords:

RFID, Visual Basic, Transponder, Interface

Introduction

The growth of Information and Communication Technologies, have reflected the way in monitoring applications. As such, RFID has gain a lot of interest in monitoring applications and has been widely used in a various field including transportation, business, medical as well as in farming management system. At present, monitoring animal was implemented manually, since the growth of the communication technologies; RFID has been an alternative with low cost, effective and efficient way in monitoring animals. This paper presents the design and development of RFID Animal Monitoring database management system. Information related to animals will be stored in a database such as date of birth, category, gender, and breed information. All the information will be tagged with ID tag place in animals. Each animal by pass the gate will trigger particular information for monitoring and action.

Recent literature has shown the use of RFID in various field including transportation, constructions, shipping, payment system, business in supply chain management, object tracking system and etc. The increasing number of applications that utilizing RFID has shown dramatically since it was introduced to improve the barcode system.

Block Diagram

Block diagram as illustrated in Figure 1 shows an overall look of the systems.

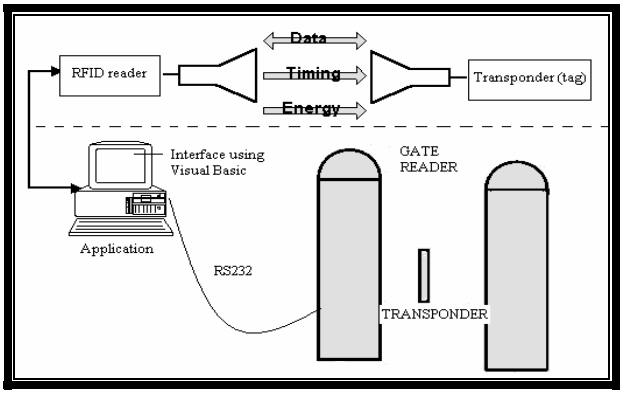

Figure 1 – System block diagram

Figure 1 illustrates the block diagram of monitoring application using RFID to identify the status of animal, in this case are cows. The tag stores a serial number that identifies the cow and information such as the Animal ID,

Animal Type, Repro Status, Lacto Status and others that are related. When the cows pass through the gate that has reader, the antenna enables the chip to transmit the identification information to a reader. The reader converts the radio waves reflected back from the RFID tag into digital information that can then be passed on to computers. The interface that is being used in this project is visual basic programming (VB6). This interface will appear on the computer and all the data that are stored can be seen here. The information in the interface can be changed. This system would definitely facilitate the whole management in cow farming to be more efficient and easy.

Objective and Scope

The objective of the project are i) to design animal tagging system using RFID in farming management ii) to design an interactive database system in monitoring animals iii) to facilitate user in retrieving information using database instead of doing manually.

This paper organized as follows; Introduction of the project, RFID Applications will review some of the recent RFID Applications, Methodology used in order to perform the development, Implementation and Conclusion.

RFID Applications

This section reviews some of recent literature of RFID applications. As mentioned in introduction, RFID application has been widely applied into various field including medical, transportation, constructions, business and etc.

RFID systems are being used in some hospitals to track a patient's location, and to provide real-time tracking of the location of doctors and nurses in the hospital. In addition, the system can be used to track the whereabouts of expensive and critical equipment, and even to control access to drugs, pediatrics, and other areas of the hospital that are considered "restricted access" areas.

Canada had used a bar codes system when the mad cow disease had occurred in December 1993 [1]. The system required manpower and often got damaged or covered in mud. In January 2005 they begin using RFID tags because its technology is more powerful and easy to manage.

Shang-Wei Wanga *et. al* [2] implement the RFID for healthcare to build a system that could detect and track (potential) SARS cases. They build a system of tag plus temperature which will send the data only if the temperature of human body is not in the safety range.

Reiback *et. al* [3] applied the application of RFID in a department store. These stores have one of those new-fangled checkouts, which automatically tallies up items and charges the total cost to customer credit card. For more interestingly, this tag can also send instructions to customers' washing machine at home, which sets the length and temperature of wash cycles, and alert the user whenever dark and light clothing are mixed in a single batch of laundry.

However, Kern [4] has designed the RFID application for security and media circulation in library for book identification, for self-checkout, for anti-theft control, for inventory control, and for sorting and conveying of library books and AV materials. The research shows the components and technical features of a modern RFID library system are described to provide a guideline for the evaluation of different systems. But this huge system needs attention to monitoring.

Chen, *et. al* [5] has developed 'On the potential of Sensor-Enhanced Active RFIDs' which is to show in a practical everyday application the benefit of this *sensor-enhanced* approach towards energy efficient system design. The application idea arises from a frequently observed problem - noticing the cellular phone is left behind only when we need to make a call on the run. The researchers refer to the system which alerts the user of the personal objects going out of proximity as the *personal object alarm*.

Methodology

In order to perform the design and development, the step involved can be summarized as in Figure 2.

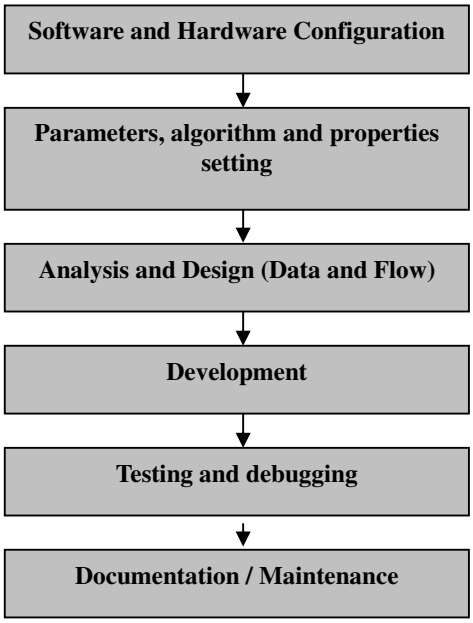

Figure 2 – Development Methodology

Basically, to perform the development of the system, some hardware is required before the program can be written. Hardware such as antenna to emits radio signals to activate the tag and read and write data, transceiver (with decoder) used to transmit RF wave to tag, transponder (RF Tag) electronically program with unique information. Passive RFID tags operated without a separate external power source

and obtain operating power generated from the reader. High Frequency (HF) tags work best at close range but are more effective at penetrating non-metal objects especially objects with high water content.

After the hardware are correctly configured, Visual Basic used to write a program and Microsoft Access used as a prototype databases. In addition, the program will interactively communicate with the hardware configured.

Implementation

In practice, at 13.56 MHz, most systems operate with a range between 1 and 30 cm, considerably shorter than the near field limit. The reader cannot communicate effectively with a tag that is oriented perpendicular to the reader antenna. After testing the RFID, RFID antenna only can detect the RFID tag range between 1 cm to 10 cm (See Fig. 3).

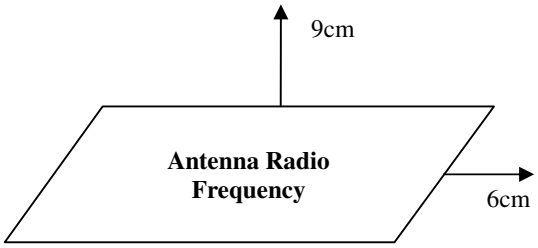

Figure 3 – Distance between antenna and tag

Interface design

Graphical user interface (GUI) developed using Microsoft Visual Basic to facilitate the use of the system. Some of GUI illustrated in Figure 4 and Figure 5.

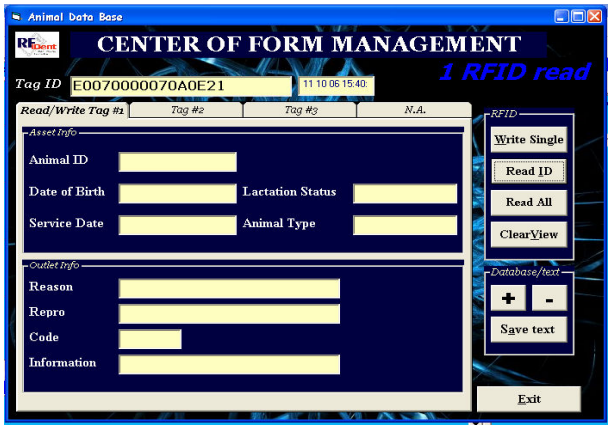

Figure 4 - GUI for Breed Animal – 1 tag has been read

As illustrated in Figure 4, a GUI provided to read the tag. Tag ID show the tag read by the transponder and transceiver.

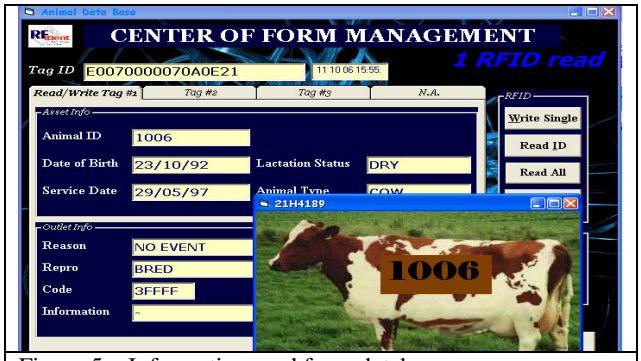

Figure 5 – Information read from database

Figure 5 shows the information retrieved based on tag ID and animal ID. Animal Id used in matching the Animal ID in database. By using this system, it is easy to update any additional information related to particular animal.

All information stored in database represented by Figure 6. The information such as TagID, AnimalID, Date of birth and etc. Database is one of the flexible methods to facilitate in edit and updating information.

No	TagID	Animal ID	Prob at calvi	Date of Birt	Lactation Sta	Service Date	Ani
100652271	E0070000070A0E21(ta	1006		23/10/1992	DRY	29/5/97	CO
(AutoNumber)							

Figure 7 – Database contains animal information

RFID Operating System

Today the vast majority of RFID system operates is passive, i.e. without the need of integrated battery. This application has positive on cost, life time and environment situation. The basic operating of the system is energy and data transmission using inductive coupling. An antenna of the reader generates a magnetic field which induces a voltage in a coil of the tag and supplies the tag with energy.

Serial Communications

The most common standard serial communication is the RS 232 which also called V24 and EIA. The usual RS 232 connector is the 25 pin D connector. A minimum cabling configuration will use pin 2, 3 and 7. Within RS 232 the user may set several options within the communication process. Both communicating devices must agree on these options which are follows:

i. *Baud rate* is the operation speed of the serial interface. It is approximately the number of bits transmitted or received per second.

ii. *Number of bits*. This is the length of the data to be communicated. The ASCII system is normally used. Every letter, number and some special character have a binary equivalent. There is 7 bit ASCII and 8 bit extended ASCII. In 7 bit ASCII there are 128 possible different

letters, number and special characters. In 8 bit ASCII, 256 are possible.

iii. *Parity*. Parity is an optional bit added to the data and provides a way of checking whether data has been corrupted. Even parity is when logic 1 is added to the data the number of logic 1s an even number. Odd parity is when logic 1 is added to the data to make the number of logic 1s an odd number. Space parity is when the parity bit is fixed at logic 0. Mark parity is when the parity bit is fixed at logic 1.

iv. *Stop bits*. Bits added to the end of the data are called stop bits. One or two stop bits may be chosen.

Table 1: The important terms in communication using RS232

TERMS	*DESCRIPTION*
Baud rate	The operation speed of the serial interface. It is approximately the number of bits transmitted or received per second.
Number of bits	This is the length of the data to be communicated. The ASCII system is normally used. Every letter, number and some special character have a binary equivalent. There is 7 bit ASCII and 8 bit extended ASCII. In 7 bit ASCII there are 128 possible different letters, number and special characters. In 8 bit ASCII, 256 are possible.
Parity	Parity is an optional bit added to the data and provides a way of checking whether data has been corrupted. Even parity is when logic 1 is added to the data the number of logic 1s an even number. Odd parity is when logic 1 is added to the data to make the number of logic 1s an odd number. Space parity is when the parity bit is fixed at logic 0. Mark parity is when the parity bit is fixed at logic 1.
Stop bits	Bits added to the end of the data are called stop bits. One or two stop bits may be chosen

Conclusions

Radio Frequency in Farming Management System has successfully developed and tested. There are five categories that conclude the successful of the project are GUI Preferences, source code, execute the program, retrieve the data and database. These five categories ensure that the system successfully implemented. However, further improvement is required in order to fulfill the actual requirement such as the use of SQL server database to support high volume of animal, use active RFID that actively trigger information and applying intelligent system technique to reduce human intervention.

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