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Virtual Fencing for Animals Managment Using RF Module

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Abstract- This paper presents protecting and maintaining biodiversity. Grazing system employed today demands for new fencing techniques.Here RF module based virtual fencing is proposed. The main object of system aims at whenever the object (animal) tried to cross the range of transmitter, the receiver part will alert and show on LCD, animal is out of range and buzzer will move your attention to the animals area. Several benefits can be drawn from this technology like more precise management of grazing in protected zones, reduction in human efforts, thus improving the lifestyle of livestock managers and enhance ecological management.

Keywords: Virtual fencing, RF module, ecological management.

I. INTRODUCTION

Since India being an agricultural country, farming is a very common activity. Animals need to be crowded frequently to prevent overgrazing of any grazing land. There are various fencing techniques such as conventional, electric fencing etc but having limitations such as less flexible, expensive. These limitations are overcome by a concept called virtual fencing. Developing a 'virtual' fence making physical posts and wire redundant would:

- Reduce labour costs.
- Allow better use of pasture resources.
- Help protect environmentally sensitive area.
- Improve situations where a fence may be difficult to install or subject to flood damage.

The system builds on the basic principle of electric fence, except there is no fence. Instead it includes a wireless sensor network containing microcomputers, radio and sensors, some of which are fitted into cattle neck collars and emit a sound when the animals approach the virtual boundary. This concept of virtual fencing is more imperative to the people like stockpersons, scientists, nature conservationists which manage free-ranging animals [1]. The idea of controlling an animal's movement using a collar on its neck has a great deal of appeal, particularly when it comes to protecting environmentally sensitive areas that may be difficult or costly to fence.

Previous work on virtual fence discusses the use of RF module, GPS to control the animals. However using RF module, electronic collar is very complex. There is always a need of a system which is more reliable and flexible according to advancement in technology.

COMPARISION BETWEEN VARIOUS FENCING:[1]

Table1: Comparison

Features	Conventional fencing	Electric fencing	Virtual fencing using GPS	Virtual fencing using RF module
Flexible	Not flexible	Less flexible	Most flexible	More flexible
Maintenance	Expensive to maintain.	High maintaining and regularly checked is required.	More expensive.	Less expensive.
Safety	Can injure wildlife and livestock	Prone to accidental injury if the animals caught up in electric current.	Least accidents prone.	Least accidents prone.
Cost	High cost	Medium cost	Less cost	cheapest
Visibility	Visible for people	Visible for people	Not Visible for people	Not Visible for people
Applicability	Beneficial in the fields adjacent to road.	Not applicable to far flung areas.	Not applicable where satellite connectivity is not possible.	Most applicable.

In this paper microcontroller is used at both the ends i.e. transmitter (electronic collar) as well as receiver (user end) which increases the reliability of a system. Coding at both ends can be changed according to needs. Hence this makes our system less complex as well as cheap.

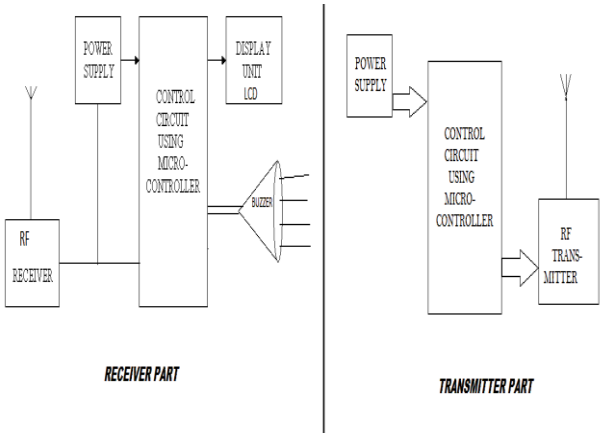
II. SYSTEM MODEL

An operating principle of virtual fence can be defined as a structure serving as an enclosure or a boundary without physical barrier. So hidden fencing has been created using RF module and whenever the animals tried to cross the fence it will alert the user as well as animal.

The system is divided into two parts:

- Receiver part
- Transmitter part

Receiver part is with user while transmitter part i.e. electronic collar is worn around animal's neck.



Fig(1): Bock diagram of virtual fencing using RF module

Transmitter part circuit contains:

- 8051 microcontroller 89xx series(AT89C51)
- Transmitter 433 MHz frequency and antenna with range 300 meter.
- Encoder HT12E

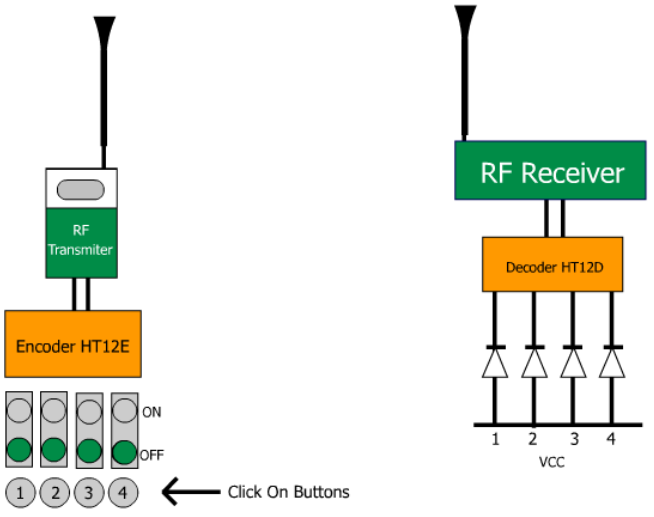
Receiver part circuit contains:

- 8051 microcontroller 89xx series(AT89C51)
- Receiver 433 MHz frequency and antenna with range 300 meter
- Decoder HT12D
- LCD
- Buzzer

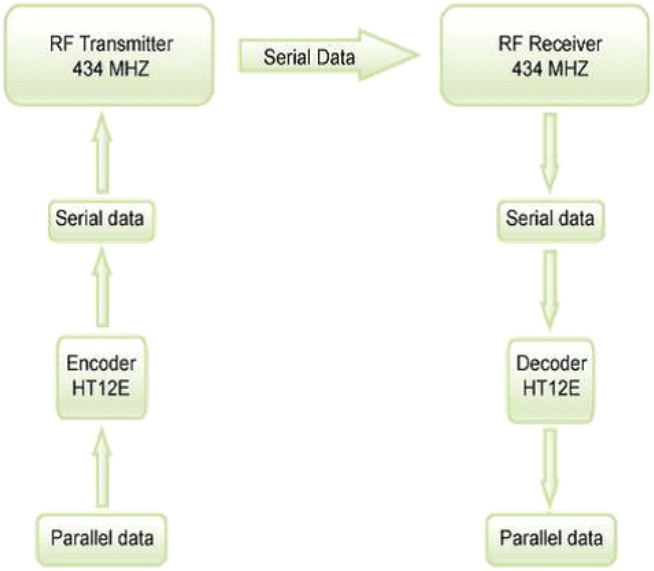
Control unit is a main portion of virtual fencing using RF module. It consists of microcontroller, encoder, decoder and other discrete components. Transmitter (electronic collar) will continue to send digital data when animal is within the range and receiver (user end) will continue to receive it. As animal try to cross the fence transmitter will stop sending data and receiver will not receive anything, which activates the buzzer and LCD will alert the person at user end for immediate action. HT12E encoder is mainly used for interfacing RF and infrared circuits. The chosen pair of encoder/decoder should have same number of addresses and data format. HT12E converts the parallel inputs into serial output. HT12D decoder is used for remote control applications. HT12D converts the serial input into parallel output.

III. RF BASED WIRELESS REMOTE USING RX-TX MODULES (434MHz.)

This circuit utilizes the RF module (Tx/Rx) for making a wireless remote, which could be used to drive an output from a distant place. RF module, as the name suggests, uses radio frequency to send signals. These signals are transmitted at a particular frequency and a baud rate. A receiver can receive these signals only if it is configured for that frequency. A four channel encoder/decoder pair has also been used in this system. The input signals, at the transmitter side, are taken through four switches while the outputs are monitored on a set of four LED's corresponding to each input switch. The circuit can be used for designing Remote Appliance Control system. The outputs from the receiver can drive corresponding relays connected to any household appliance.



Fig(2):Block diagram of RF module with encoder



Fig(3):Block diagram of transmission

This radio frequency (RF) transmission system employs Amplitude Shift Keying (ASK) with transmitter/receiver (Tx/Rx) pair operating at 434 MHz . The transmitter module takes serial input and transmits these signals through RF. The transmitted signals are received by the receiver module placed away from the source of transmission. The system allows one way communication between two nodes, namely, transmission and reception. The RF module has been used in conjunction with a set of four channel encoder/decoder ICs. Here HT12E & HT12D have been used as encoder and decoder respectively. The encoder converts the parallel inputs (from the remote switches) into serial set of signals. These signals are serially transferred through RF to the reception point. The decoder is used after the RF receiver to decode the serial format and retrieve the original signals as outputs. These outputs can be observed on corresponding LED's.

IV.RESULT

Transmitter (electronic collar) will continue to send digital data when animal is within the range and receiver (user end) will continue to receive it. As animal try to cross the fence transmitter will stop sending data and receiver will not receive anything, which activates the buzzer and LCD will alert the person at user end for immediate action. Figure below shows the prototype of virtual Fencing.

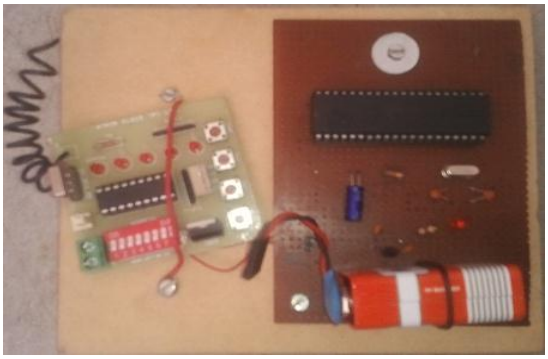


Fig (4): Transmitter (electronic collar) prototype

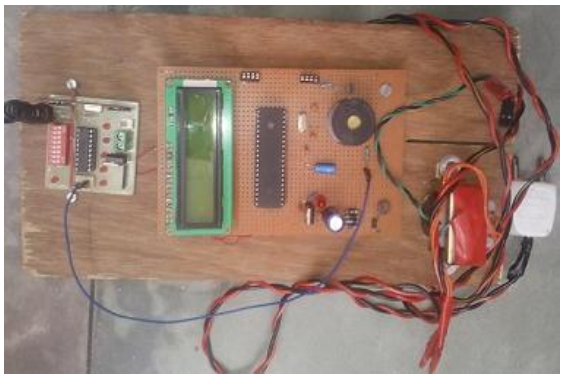


Fig (5): Receiver (at user end) prototype

V. CONCLUSION

The prototype virtual fencing system was successful in eliciting a behavioural response from the cattle. The observational data suggest that most cattle responded immediately after the consequences were administered. However, larger numbers of cattle need to be tested to derive a better understanding of the behavioural variance. Further controlled experimental work is also necessary to quantify the interaction between consequences and cattle learning. Despite the challenges, virtual fencing offers significant promise in pastoral areas but further refinement is needed so that it can be helpful for wild animals.

VI. FUTURE ENHANCEMENT

In this paper we proposed a system for one animal which can be extended for more than one animal and wildlife. We can also use RF module for tracking of animals.

VII. REFERENCES

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