Intelligent Pet Collar

1, 2, 3, 4 Electronics and Telecommunication Department.
Sanjay Ghodawat Institutes, Atigre, Kolhapur

Abstract: The field of pet care is gaining more attention, and requires a natural and intuitive methodology to employ. How to raise pets in an easy way has been the main issue recently. This study examines the ability of computation, communication, and control technologies to improve human interaction with pets. Our project aims to overcome the limitations of the current technology associated with the field of ‘pet care’. The ‘intelligent pet collar’ is a new concept that uses advanced embedded technology that enables it to carry out multiple functions associated with ‘pet care’. The concept focuses on making the pet’s collar able to perform multiple functions such as GPS tracking, health monitoring using sensors, protection from rain, daily activity checker, providing recorded voice command, feeding alarm, etc.

Keywords: Intelligent Pet Collar, Bluetooth interface, GSM, GPS, ATmega328P microcontroller

1. Introduction

According to a report, 4 million dogs run away in the United States each year, more so in India. Hence, sophisticated pet tracking system is needed. Also, there are many other problems associated with pet care. Pet freedom is restricted by a leash. A veterinarian cannot get the needed insight into a pet’s daily activities. Police and fire-squad dogs require to act in the absence of their trainer, hence voice training is required. Due to busy schedule, pet owners are ignorant to the pet’s much needed exercise. This causes obesity and many health problems in the pet. Pet feed needs to be regulated according to the pet’s activity throughout the day. Hence, pet activity needs to be monitored.

To provide a feasible solution to the current problems, the pet collar needs to be ‘intelligent’. This can be achieved by adding a microcontroller unit to the collar. The collar will use GSM technology to provide monitoring and updates to your mobile phone. It will use GPS technology for tracking purpose. It uses motion sensing technology for activity monitoring. In addition, the microcontroller program enables a variety of features such as Feeding alarm, active ness based feed advisor, environment sensing using different sensors, etc. An android app will enable the user to obtain real time updates and control on smartphone.

Extensive experiment results demonstrate that our proposed system performs significantly well in day to day use. Our study not only presents the key improvement of the pet monitor systems, but also meets the demands of pet owners, who are out for works without any trouble.

The various features provided by the intelligent Pet collar are as follows:

1. Location tracking
2. Virtual leash
3. Activity monitor
4. Rain sensor
5. Voice training
6. Feeding alarm
7. Smart phone interface

These stated features are explained further in the paper.

2. Proposed system

The proposed project consists of an embedded system with programmable microcontroller unit at its core. The entire system can be mounted on a collar for large size pets (such as large breed dogs). However it is not feasible in case of smaller pets (such as small breed dogs). In this case, the system can be mounted on a ‘body belt’.

2.1 Block diagram

Fig.1.Block diagram of ‘IPC’
2.2 Hardware requirements

- The proposed system consists of a central ATmega 328P microcontroller unit, that will control all external peripherals.
- SIM900 – RS232 (TTL) GSM module is used to enable the collar to communicate with mobile. The collar will use GSM technology to provide monitoring and updates to your mobile phone.
- GPS TTL module is interfaced for tracking purpose. The module will provide a raw data stream to the controller that contains the data of latitude, longitude, speed and direction of the collar.
- The ADXL 335 accelerometer is interfaced with the controller. It is a 3-axis accelerometer(x, y, z). It provides motion sensing technology for activity monitoring.
- A Silabs F411 Recordable Voice Module is interfaced with the controller to record the owner’s voice in the collar.
- The rain sensor module is interfaced to detect if the pet is getting wet.
- A HC-05 bluetooth module is used to interact with a smart phone.

3. Working of the IPC

The IPC works on two levels of coding, the first is the coding for the android app and the second is the microcontroller coding in the collar.

![Fig.2.Coding Flowchart](image-url)

When the IPC is activated a link is established between the Bluetooth module mounted on the collar and smart phone. The IPC android app provides a continuous stream of a single byte integer (6) to the Bluetooth module. This enables the controller in the collar to check if it is within 30m range (Bluetooth range) of the smart phone device.

The GPS module constantly provides the controller with a data string containing the location and direction of the device. When the controller stops receiving data from the smart phone app, i.e., the pet moves out of 30m range of the smart phone, it will execute the instructions to fetch this GPS data and input it to the SIM900 GSM module to be sent as a text message to a preloaded 10-digit no.

A “Get Activeness Index” button provided on the android app will send integer ‘1’ to the Bluetooth module on the collar, when pressed. The accelerometer provides a three line input (X,Y,Z) to the controller. The controller will compare the current values of X, Y, Z with the earlier values and increment counter-value if they do not match.
The final count will provide ‘Activity Index’ which will be sent to the smart phone via Bluetooth Module and displayed on the app, when the controller receives ‘1’ integer from the smart phone.

A “call pet” button provided on the android app will send integer ‘2’ to the Bluetooth module on the collar, when pressed. When the controller receives integer ‘2’ it will activate the pre-recordable voice module which will play the owners recorded voice message to the pet.

Next the controller code will check the input from the rain sensor module, if the input is high, the controller will feed a data string to the GSM module to be sent to the 10 digit mobile number, alerting the owner.

4. Working of IPC android app

In our project we have used MIT app inventor 2 for developing the IPC android app.

User Interface: The UI’s screen of the IPC android app consists of two buttons –
First is the “Get activeness index” button, when pressed the app will send integer ‘1’ to the pet collar. Then the app listens for reply string from the collar.
This reply string will update the value of the activeness index label.
Second is the “call pet” button, when pressed the app will send integer ‘2’ to the pet collar which will activate the pre-recordable voice module.

The UI’s looks as follows:

Coding: The IPC android app also sends a continuous string of the integer ‘6’ to the pet collar. The coding block are as follows:

5. Working prototype of the IPC

The working prototype of the ‘Intelligent Pet Collar’ looks as shown in the figures below.

Fig.3. The UI screen

Fig.4. Coding blocks

Fig.5. Front side of the IPC prototype.

Fig.6. Back side of the IPC prototype.

The activity monitoring output obtained on the IPC smart phone app is as follows:
Fig.7. Activeness index observed on the app

The SMS alert obtained on the smart-phone when the rain-drop sensor in the ‘IPC’ is triggered is as shown-

Fig.8. Rain sensor alert

The GPS data sent by the ‘IPC’ via SMS to the smart-phone is as shown in Fig.8. This GPS data gives us the latitude and longitude of the collar.

Fig.9. GPS data on smart-phone

The latitude in this case is “16°44’28.5"N” and the longitude is “74°22’52.2"E". This data is entered in “Google Maps” to pinpoint the location of the pet.

Fig.10. Location tracking using google maps.

6. Additional features

- **Health Monitoring**: IPC can be made capable of pet monitoring by interfacing the various health monitoring sensors such as the Heartbeat sensor module, Temperature Sensor, etc.

- **PC interface**: The activity information is visually displayed on the device, while more detailed information can be uploaded to a computer via a Bluetooth connection.

- **Electronic Door Alarm**: The Door frame of the house are fitted with special sensors that interact with the IPC to activate an alarm if the pet crosses the door.

7. Limitations

- As the number of features in the ‘IPC’ increase, it becomes costlier.

- The GPS system in the collar is limited by cellular range. It renders useless if the range is lost.

- Battery power is limited and will require timely recharging.

8. Conclusion

Thus the IPC is finding increasing number of applications as a modern electronic device in “Pet Care” sector and has promising futuristic applications.

9. References

