Zoological Surveillance and Data Acquisition System

[1]Dipesh D. Nagrale,[2]Gauravkumar P. Wadibhasme,[3]Priyanka K. Bhagwat,[4]Rucha R. Dhumne,[5]Saurabh D. Bisen

[1][2][3][4][5]Department of Electronics & Communication Engineering

Dr. Babasaheb Ambedkar College of Engineering and Research Nagpur, India

Abstract: **Now a day with increase in population human beings is trying to interfere with wildlife for their research and individual purpose. It results the disturbance in wildlife. There are many more applications for collecting information of animals. But it is not easy to detect specific animal in forest so we are introducing this project that is Zigbee based wireless network for collecting the information of animals in the forest such as their behavior, body temperature, pulse rate, and their location using GPS and also for Counting. A tag will be provided to wild animals that transmit their information continuously that will help to have a closer watch on them.**

Keywords: **TCRT1000, ATMEGA16, DS1621, ZIGBEE, GPS.**

INTRODUCTION

There are many species of animals which are present in forest. Each animal have unique survival techniques. Their behavior, body parameters make them different from each other. They make suitable habitus for finding food, sleeping and wandering. They have various survival challenges. For doing illegal business with animal bone, skin, and other body part. Wildlife is being destroyed by human being. Hunting, release of pollutants in environment, industrial activity, cutting forest, global warming this cause harm to their life. It is necessary to save then before get vanished.

We are forming a wireless sensor network using Zigbee module to communicate in real environment with help of sensor. It requires less energy, less memory storage, slow communication and limited frequency range. So it is efficient than other network. . In this network we are transmitting data with help of zigbee module, which contain information of animals that is various parameter related to them.

So for that purpose tag will be provided to individual species, especially carnivorous animals either to detect them or to maintain and monitor their data.

I. MODULES:-

(A) Zigbee:-

Zigbee is a wireless technology use for transmitting as well as receiving data. This module operate with ISM 2.4GHz frequency band. It is a high performance and low cost technology which is used in almost every appliance for controlling and monitoring. It has transmitted output power 100mW and RF data rate of 250,000bps. We are using this module because of its high frequency range of 2.4GHz so that no interference of surrounding signal affects it, and also we can collect the data by its range of 100m.

(B)Global Positioning System (GPS):-

A GPS is a satellite based navigation system. Made up of network of 24 satellite placed in a orbit. GPS works in any whether condition, anywhere in the world and 24 hours a day. This GPS technology is used a determined distance and position of things. GPS shows the position in longitude, latitude and elevation by coordinate points. GPS shows output in digital form on the map. We are using this module to have the position of animal over a range of 100m using Zigbee.

II. MICROCONTROLLER:

ATMEGA 16:-
High-performance, Low-power Atmel, AVR, 8-bit Microcontroller.

Advanced RISC Architecture.
131 Powerful Instructions.
Most Single-clock Cycle Execution.
32×8 General Purpose Working Registers.
Fully Static Operation.
Up to 16 MIPS Throughput at 16 MHz.
On-chip 2-cycle Multiplier.
High Endurance Non-volatile Memory segments.
16 Kbytes of In-System Self-programmable Flash program memory.
512 Bytes EEPROM.
1 Kbyte Internal SRAM .Write/Erase Cycles: 10,000 Flash/100,000 EEPROM.

III.   SYSTEM DESCRIPTION:

Transmitter section:-

In transmitter section sensors and modules have been interfaced. Here ATMEGA 16 is used as controller to which Zigbee, GPS and sensors such as temperature and heartbeat are interfaced
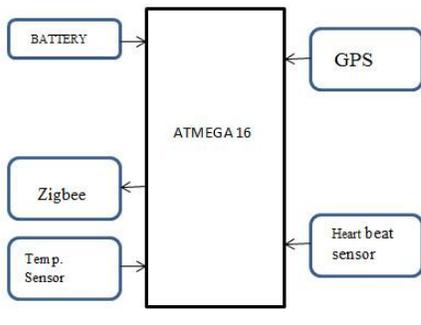

Fig.1 Transmitting section block diagram

The GPS module is used to have the position of animals which is mounted over the tag. The position of animals would be present in longitude and latitude form. Temperature sensor used is DS1621 which gives the body temperature of animals. Through the temperature we can assume that the animal is fit or ill. Another sensor used is a heartbeat sensor to carry out the pulse rate of animals. And finally we get all the information such as animal type, ID number, position, body temperature, pulse rate through Zigbee, where Zigbee works in GHz frequency range so it avoid surrounding inference

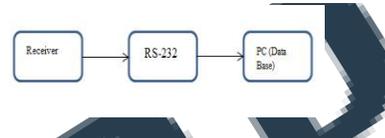### Receiver section
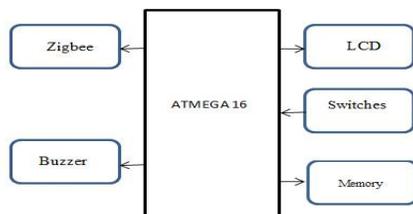
Control Section

Fig. 2 Receiving and control section block

In receiver we have operation in two parts. 1. Forest Device 2.Control Section. In Forest Device we interfaced a Zigbee module, buzzer, memory for storing data and LCD for viewing the data to the controller. Firstly the output of the animal tag is received by the Zigbee module of the receiver. This signal containing the animal position, temperature, heartbeat etc. this data can be seen through 2x16 LCD Display. LCD display will show is position in longitude and latitude, temperature in degree and heartbeat of the respective species. This same information can also be stored into the memory by using 24C512 Memory IC. In the second part, i.e. control section, database of animals is maintained at the PC by connecting the devices through RS232 cable.

IV.   SOFTWARE

GUI stands for "Graphical User Interface". This interface helps to communicate with hardware of electronic devices it provides various graphical icons
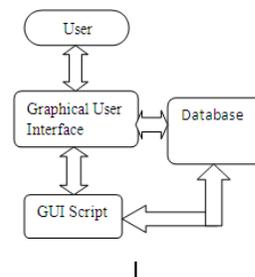

Fig.3
Graphical User Interface Flowchart

Fig.4 Graphical User Interface

like button, textbox, timer and many other. For each icon command line is necessary to interface. We have to provide the database to GUI for accessing the information. The database provides information related to hardware through Graphical User Interface. In this project database contains different parameters like body temperature, pulse rate, latitude and longitude, Sex, name of forest, and their tag ID no So this information becomes easily available through Graphical User Interface

Record NO	id	Date	Temperature in degree	Sex	Forest	Animal type
1	T46	11/12/2014	37	Male	Pench	Tiger
2	L56	12/01/2015	38	Male	Tadoba	Lion
3	T12	16/01/2015	36	Female	Tadoba	Tiger
4	T40	16/01/2015	39	Female	Pench	Tiger

Fig.5 Animal Database Chart

User can add information related to animals in Database through GUI also can search any information about them. Some examples are as follows.

According to survey of Indian forest department the calculated area of forest in India is given as follows

S. No.	State/UT	Geographic area	Reserved forests	Protected forests	Unclassed	Total	(Area in sq.km) % of Forests to total geographic area
1	Andhra Pradesh	275068	50479	12365	970	63814	23.20
2	Arunachal Pradesh	83743	15321	8	36211	51540	61.55
3	Assam	78438	18242	3934	8532	30708	39.15
4	Bihar	173877	5051	24168	7	29226	16.81
5	Delhi	1483	78	7	0	85	5.73
6	Goa	3702	165	0	1259	1424	38.47
7	Gujarat	196024	13819	997	4577	19393	9.89
8	Haryana	44212	247	1104	322	1673	3.78
9	Himachal Pradesh	55673	1896	31473	2038	35407	63.60
10	Jammu & Kashmir	222235	20182	0	0	20182	9.08
11	Karnataka	191791	28611	3932	6181	38724	20.19
12	Kerala	38863	11038	183	0	11221	28.87
13	Madhya Pradesh	443446	82700	66678	5119	154497	34.84
14	Maharashtra	307690	48373	9350	6119	63842	20.75
15	Manipur	22327	1463	4171	9520	15154	67.87
16	Meghalaya	22429	981	12	8503	9496	42.34
17	Mizoram	21081	7127	3568	5240	15935	75.59
18	Nagaland	16579	86	507	8036	8629	52.05
19	Orissa	155707	27087	30080	17	57184	36.73
20	Punjab	50362	44	1107	1750	2901	5.76
21	Rajasthan	342239	11585	16837	3278	31700	9.26
22	Sikkim	7096	2261	285	104	2650	37.34
23	Tamil Nadu	130058	19486	2528	614	22628	17.40
24	Tripura	10486	3588	509	2196	6293	60.01
25	Uttar Pradesh	294411	36425	1499	13739	51663	17.55
26	West Bengal	88752	7054	3772	1053	11879	13.38
27	Andaman & Nicobar Island	8249	2929	4242		7171	86.93
28	Chandigarh	114	31	0	0	31	27.19
29	Dadra & Nagar Haveli	491	198	5	0	203	41.34
30	Daman & Diu	112	0	0.7	0	1	0.63
31	Lakshadweep	32	0	0	0	0	0.00
32	Pondicherry	493	0	0	0	0	0.00
	Total	3287263	416547	223321.7	125385	765253	23.28

Source: Forest Survey of India , The State of Forest Report 1999

CONCLUSION

Humans have generated many problems for wild life. Now this is time to save their lives using advance technology otherwise it will disturb our environment. This paper has introduce the new techniques in our   project named ***Zoological Surveillance and Data Acquisition*** **System that can indirect**ly help to protect the wildlife by giving information about real time location as well as their body parameter, which helps them for their protection. We assumed that hardware of our project is capable of detecting parameters of animals with the help of wireless sensors.

Animal Name	Normal Body Temperature	Pulse Rate (in bpm)
Lion	38.33°C	42-76
Tiger	37.5°C	56-97
Deer	34.2°C-42.8°C	72
Fox	38.7°C	118
Elephant	35.9°C	25-35
Bear	30°C-36°C	55
Cheetah	39.5°C	120-170
Leopard	38.1°C-39.2°C	90-140
Langur	46°C	160-190
Red Panda	37.22°C-38.88°C	130

REFERENCES

[1] Roland Kays, Bart Kranstauber, Patrick A. Jansen, Chris Carbone, Marcus Rowcliffe , Tony Fountain, and Sameer Tilak,2009 "Camera traps as sensor networks for monitoring animal communities". The 34th IEEE conference on Local   Computer Network.

[2] Sumit Kumar Tetarave and Ashish Kumar Srivastava Indian Institute of Technology Patna Patna, Bihar-800013, India.2012 International Journal of Computer Science Issues.

[3] Pankaj Verma, J.S Bhatia, Design and development of GPS-GSM based tracking system with Google map based monitoring.2013 International Journal of Computer Science , Engineering and applications.

[4] Vladimir Dyo, Stephen A Ellwoo, David W. Macdonald ,Andrew Markhar, Cecialia Mascolo, Bence Pasztoi, Niki Traigoni, Ricklef Wohlers "Wildlife and Environmental Monitoring using RFID and WSI Technology",2009.

[5] Antinio Javier Garcia sanchez, Felipe Garcia sanchez, Fernando Losilla, PawelKulalowski, Joan GariciaHaro,AlejandroRodriguez,Jose Vicente Lopez Bao and FianciscoPalomares, "Wireless Sensor network deployment for monitoring wildlife passages", 2010.

[6] Pavan Sikka, Peter Corke and Leslie Overs "Wireless sensor devices for animal tracking and control".

● ● ●