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Scalable Low Power Sensor Based Tactical Border Surveillance System using IEEE Wireless Protocol

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Abstract:

Wireless Sensor Networks (WSN) development has always been driven by the density and diversity of modern military applications. From simple intrusion detection to complex border surveillance and monitoring integrated systems, target location and tracking, WSNs have been included in all types of military scenarios. The real inconvenience to national security is terrorism occurring in borders. In outside ranges, general powers or even satellites can't screen precisely encroaching. The remote sensor arranges plot gives a possible approach to remove this issue. To plot a remote arrangement of assessed sensor units that contains different introduced sensors and a processor to recognize and grant an enemy intrusion diagonally finished outside and battle regions. The thought is to convey many senses inside a large land district. Each one of these units shapes a remote system and one of them will go about as the system coordinator that can control the entire structure and besides goes about as an entry to the outside world. The favored point of view with these little units is that it can be passed on in a few hours by a few men or even dropped from an airborne helicopter. Each piece contains a collection of sensors to recognize every possible kind of intrusion.

Keywords: Camera Sensor, MEMS Accelerometer, MEMS Magnetometer, PIR Sensor, Sound Sensor, and Microcontroller.

INTRODUCTION

Interruption acknowledgement is a unique issue in this application regularly deals with the support of things and masterminds it into human or vehicle or social occasions and track the enemy interference. The battery life of a tidy unit depends on the size and the capacity of the device. This empowers organizers to restrain mote assess and lesser control use. At the point when interlopers distinguished by sensor, the data are sent to a neighboring unit to make important strides. The system continues performing that some routes ignore to work. Once a unit is set in a present frame, it changes with the blend in with exchange centre points to shape a greater system; and when a unit crashes and burns, interchange contraptions in the system expect control over its load. The remote innovation is forced so that there are a few sorts of associations exist, for example, Zigbee, WI-FI, GSM and Bluetooth. Given the system prerequisites, the innovation is favored.

RELATED WORKS

The survey of interloper ready paper clears up how the intruder can be architecture [1]. The detail description about the target tracking is done by Dough Steel [2]. The work says, "Surveillance of action must be multi-mission fitting, flexible, versatile,

practical, upgradeable, interoperable, shareable, and sensible", which can ready to periphery perception and other security issues. The system satisfies the already specified its necessities, and its negligible size is an extra advantage. To give another case, the confirmation of military camps using Radar perception procedures [3-4]. The challenges in the border zone are talked about in this paper [5]. The paper talks three vital issues which are time, region and energy to actualize the system for successful data transmission.

A system that overcomes these troubles will give a practical course of action require the fundamental establishment to meet border monitoring and exact needs. Different characteristic works were done in laying out border surveillance structures and enhances the present systems [6-7]. By using unmanned air vehicles and fiber optic distinguishing the current gets improve utilizing Radar headways [8].The paper proposes a technique to watch the movement around the border range and zones. The third portion in like manner units of knowledge about the parts used and it's set up.

The unit setup territory moreover fuses a strange state stream diagram for the system, and the pending section depicts the yield procured when the structure was put under test [9]. The last territory represents the components, few concerns and a couple of enhancements of the proposed system [10]. In this paper, modernized acknowledgement structures for edge intrusion exist, yet an expensive segment of them require expensive device.

SMART DUST

Intrusion distinguishing proof is a unique issue in borders. A border area of interference is the particularly sensitive part in perceiving the intrusion. Exactly when intervention happens in a full area regions, it was difficult to understand, since investigating those locales through men transforms into a troublesome endeavor. On the off chance that enemy interruption is recognized, additionally move makes put by using the front line shrewd ultra-minimal clean like remote sensor units has inbuilt board sensors and controller, which can distinguish an enemy interference across borders and battle areas. Given the size and similarity, these nodes are deployable, and they outline a system in solitude and give the result through remote affiliation. On board, the structure includes accumulation of sensors like vibration/seismic, movement discovery sensor, acoustic and microcontroller for setting up these sensor esteems over a remote system through radio receiver.

The sensor node includes this system is known as the border unit node. The central surveillance point goes about as a centre point and is related to a circulated remote structure show. Dust is commonly used as the same word for unobtrusive contraptions that join recognizing, enrolling, remote correspondence limits, and independent power supply inside a volume of a simple couple of cubic millimeters quickly.

The little size and small per-device cost allows an ordinary sending of huge and Smart Dust mode in the physical condition. Smart Dust is visualized to be used as a piece of a broad range of use spaces, including biological affirmation (recognizing verification and checking of defilements), living space checking, and military systems.

IV. WORKING PRINCIPLE

Once an intrusion is detected, the system will send warning information to the Base station mote and will be classified as vehicles or individuals and groups.

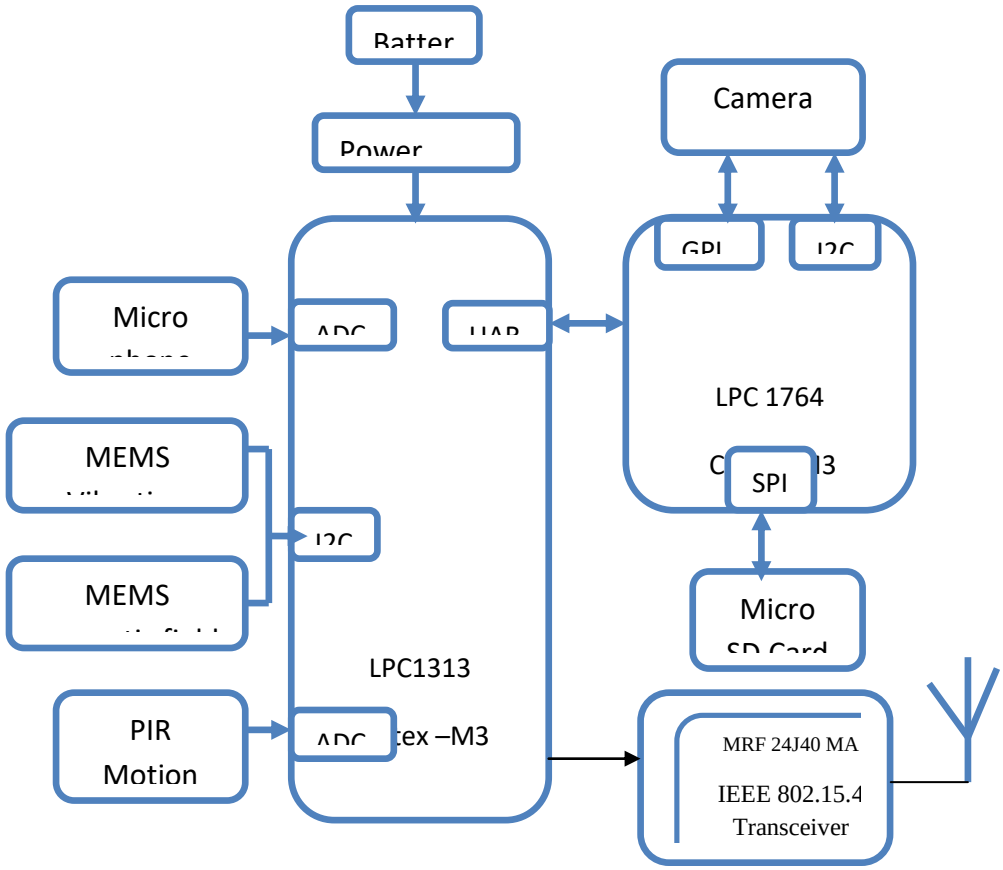

Figure 1: Sensor Mote

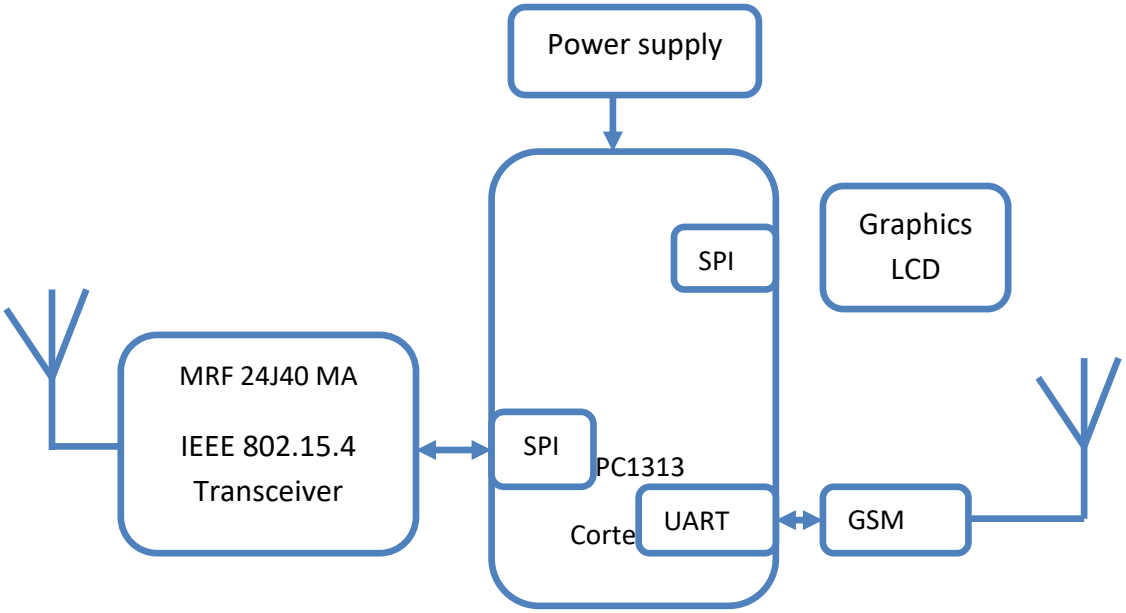

Figure 2: Base Station Mote

The base station mote process the sensor readings, sort the targets and the tracking history can be viewed in a Graphics LCD attached with it. The base station mote is capable of sending an alert SMS to the authorized person about the intrusion through a GSM unit. Figure 1 and 2 shows that the sensor unit and base station unit. The coordinator mote acts as the base station in a peer to peer wireless network model and will be powered by a larger battery or by mains power. Wireless sensor network is constructed based on IEEE 802.15.4 low power wireless network protocol. A 32-unit ARM Cortex-M3 microcontroller is used as the brain of all these sensor and base station motes. Each mote will consume very low power to stay longer and will be equipped with a tiny battery. A separate ARM Cortex-M3 microcontroller will be used to interface and process the camera images from the vision sensor.

When some vehicle movement detected means the vibration sensor in the border gives data like vibration found to the authorised person. In the event, if the change occurs means sensor detects it and guides the data to the controller. Finally, controller gathers all these data sensed by the sensor and transmits to the receiver through wireless GSM modem. The receiver shows all the assembled data in GLCD.

Each mote are built with a variety of sensors to detect all types of possible intrusion

1) **Visual** – A Camera sensor will be used to recognize movement caused by humans or vehicles and the pictures will be stored in a permanent memory for future reference
2) **Magnetic** – A MEMS magnetometer sensor will be used to identify magnetic signature of a large metallic bodies such as a weapon carried by an intruder or a vehicle
3) **Acoustic** – A Microphone sensor will be used to sense the acoustic sound signals of human or vehicle
4) **Thermal** – A PIR sensor will be used to identify movement of humans via the heat emitted from their body.
5) **Vibration** – A MEMS Accelerometer sensor will be used to sense the physical vibration caused by the intruder or a vehicle.

RESULTS AND DISCUSSION

Project Demonstration Procedure

Figure 3 shows that the smart dust hardware implementation.

1) Switch ON the central monitoring mote and Dust mote.
2) After 5 seconds, IEEE 802.15.4 network will be formed. This is indicated using LED D4 on the central monitoring mote and dust mote on the LPC1313_MBV14 board. Both LEDs should be in to state at this point.
3) Immediately GLCD display this options
    - **Mote**
    - **Type**
    - **Total**
4) Mote indicates interrupt occurred in mote 1.
5) Type indicates which type of interrupt occurred in mote1.
6) Total shows totally how many interrupt took place in all motes.

7) Now just shake the MEMS Accelerometer sensor in Mote 1, immediately it transmits the data to central monitoring mote.
8) GLCD display the result as
    - **Mote**: Mote1,
    - **Type**: Vibration
    - **Total**: 1
9) Raises the buzzer sound to alert the surroundings, immediately the dust mote camera will be ON and take a snap which is stored in memory card.
10) Next show any metal in MEMS magnetometer in note 1, immediately it transmits the data to central monitoring mode
11) GLCD display the result as
    - **Mote**: Mote1,
    - **Type**: Metal
    - **Total**: 2

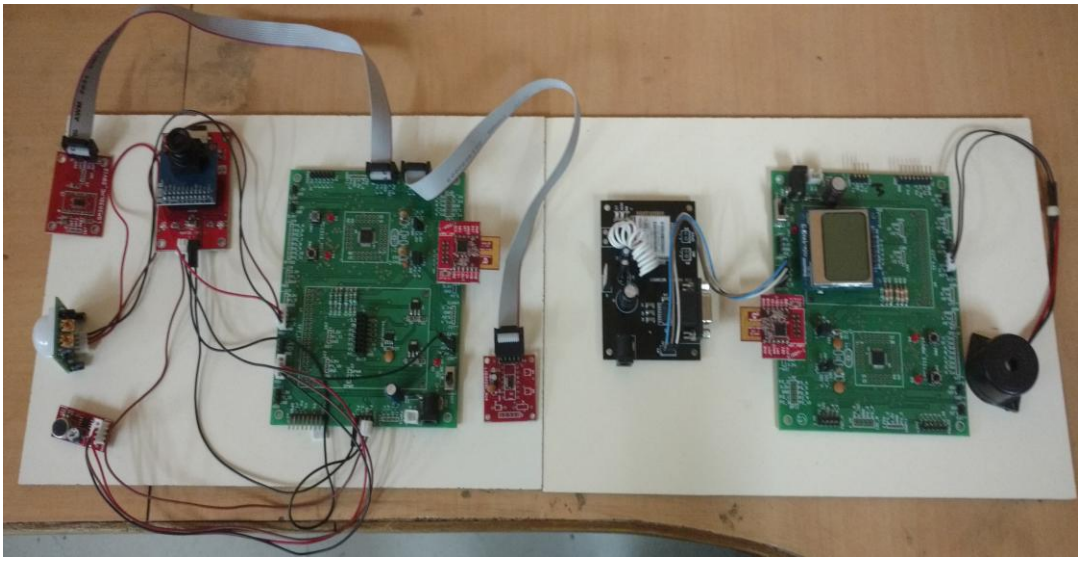

Figure 3: Implementation of Smart Dust

12) Raises the buzzer sound to alert the surroundings, immediately the dust mote camera will be ON and take a snap which is stored in memory card.
13) If you keep a hand in front of the PIR sensor (within 1m) that sensor will recognise that a new person has come near to the border. Immediately it transmits the data to central monitoring mode
14) GLCD display the result as
    - **Mote**: Mote1,
    - **Type**: Motion
    - **Total**: 3
15) Raises the buzzer sound to alert the surroundings, immediately the dust mote camera will be ON and take a snap which is stored in memory card.
16) Now blow air into the MIC which recognises the sound, so it transmits the data to central monitoring mode
17) GLCD display the result as

- **Mote**: Mote1,
- **Type**: Noise
- **Total**: 4

18) Raises the buzzer sound to alert the surroundings, immediately the dust mote camera will be ON and take a snap which is stored in memory card.

19) Finally, take the memory card and read the images through PC using a card reader.

The central Monitoring continuously receiving the data from those notes whenever the interrupt occurred**.**

CONCLUSION

Finally, the proposed strategy is a composed remote sensor but which has different locally available sensors and a processor. It can distinguish an adversary intrusion transversely finished edges and battle regions. The system uses an assortment of sensors for vibration/seismic, appealing, acoustic and warm stamp, a microcontroller for setting up these sensor esteems over a remote structure. The sensor conveyed on the border region readings will be gathered and send an alarm all the while showed in the GLCD of the monitoring unit.

REFERENCES

[1]. Girard, A.R., Howell, A.S. and Hedrick, J.K., 2004, December. Border patrol and surveillance missions using multiple unmanned air vehicles. In *Decision and Control, 2004. CDC. 43rd IEEE Conference on* (Vol. 1, pp. 620-625). IEEE.

[2]. Mishra, A., Sudan, K. and Soliman, H., 2010, June. Detecting border intrusion using wireless sensor network and artificial neural network. In *Distributed Computing in Sensor Systems Workshops (DCOSSW), 2010 6th IEEE International Conference on* (pp. 1-6). IEEE.

[3]. Jisha, R.C., Ramesh, M.V. and Lekshmi, G.S., 2010, December. Intruder tracking using wireless sensor network. In *Computational Intelligence and Computing Research (ICCIC), 2010 IEEE International Conference on* (pp. 1-5). IEEE.

[4]. Nohara, T.J., 2010, November. A commercial approach to successful persistent radar surveillance of sea, air and land along the northern border. In *Technologies for Homeland Security (HST), 2010 IEEE International Conference on* (pp. 276-282). IEEE.

[5]. Hussain, M.A. and kyung Sup, K., 2009, February. WSN research activities for military application. In *Advanced Communication Technology, 2009. ICACT 2009. 11th International Conference on* (Vol. 1, pp. 271-274). IEEE.

[6]. Kondaveeti, A., Runger, G., Rowe, J. and Liu, H., 2010, August. Border Security: Supplementing Human Intelligence in a Sensor Network Using Sequential Pattern Mining. In *Human-Centric Computing (HumanCom), 2010 3rd International Conference on* (pp. 1-6). IEEE.

[7]. Breed, D.S., Intelligent Technologies International Inc., 2005. *Low power remote asset monitoring*. U.S. Patent 6,919,803.

[8]. Pratap, P., Kallberg, J.M. and Thomas, L.A., 2010, November. Challenges of remote border monitoring. In *Technologies for Homeland Security (HST), 2010 IEEE International Conference on* (pp. 303-307). IEEE.

[9]. Choo, C.S., Chua, C.L. and Tay, S.H.V., 2007, July. Automated red teaming: a proposed system for military application. In *Proceedings of the 9th annual conference on Genetic and evolutionary computation* (pp. 1936-1942). ACM.

[10.] Hussain, M.A. and kyung Sup, K., 2009, February. WSN research activities for military application. In *Advanced Communication Technology, 2009. ICACT 2009. 11th International Conference on* (Vol. 1, pp. 271-274). IEEE.