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Internet of Things based High Security Border Surveillance Strategy

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ABSTRACT

Wireless sensor nodes are aimed at working within several scenarios, including surveillance, target acquisition, situation awareness, and chemical, biological, radiological, and nuclear early warning. WSN's are in the domain of object detection, recognition, and tracking and a very challenging task is designing distributed video systems within the tight power budget. To support these capabilities, it is now necessary to develop new architectures and design concepts that offer multimodal sensing without sacrificing the attractive low size, weight, and power capability offered by the conventional motes. The key advantage of WSNs is the ability to bridge the gap between physical and logical world by collecting and sending useful information to devices that have the computational resources to process it.

1. INTRODUCTION

RECENT advances in micro-electromechanical systems, embedded computing, and low-power radio communication technology have sparked the advent of massively distributed wireless sensor networks (WSNs). The WSNs consist of large number of low-cost, low-power sensor nodes, which collect and disseminate environmental data. These sensor nodes are aimed at working within several scenarios, including surveillance, target acquisition, situation awareness, and chemical, biological, radiological, and nuclear early warning.

To support these capabilities, it is now necessary to develop new architectures and design concepts that offer multimodal sensing without sacrificing the attractive low size, weight, and power capability offered by the conventional motes. The key advantage of WSNs is the ability to bridge the gap between physical and logical world by collecting and sending useful information to devices that have the computational resources to process it. WSNs, appropriately applied to dangerous tasks, can greatly decrease their risk, or even avoid the need of manpower for safety control.

Within this context, applications that exploit low-power video wireless networks (LP-VWN) consisting of networks of low-cost video sensors connected by low-rate wireless channels and constrained by low-power budget, have gained increasing attention.

Earlier surveillance systems involve low cost, low power IR and PIR sensors, which are susceptible to false alarms and low inference. Wireless smart cameras become an appropriate solution for this problem, but poses a challenge to current hardware capabilities in terms of low-power consumption and high imaging performance and high memory footprint . For this reason, wireless surveillance systems still require a considerable amount of research in different areas such as mote architectures, video processing algorithms, power management, energy harvesting and distributed engine.

Here [1-8], we evolve a solution for this problem through multilevel sensing architecture. The proposed architecture involves a low energy intrusion detection system in the first level. If the system detects any unusual event, it initiates a secondary authentication unit. This is again a sensor that detects the traces of the event. If the secondary sensor detects the same, it authenticates the event and switches ON the wireless camera. This system has multiple advantages like reduced power consumption, improved event detection accuracy, longer life span and enhanced information clarity.

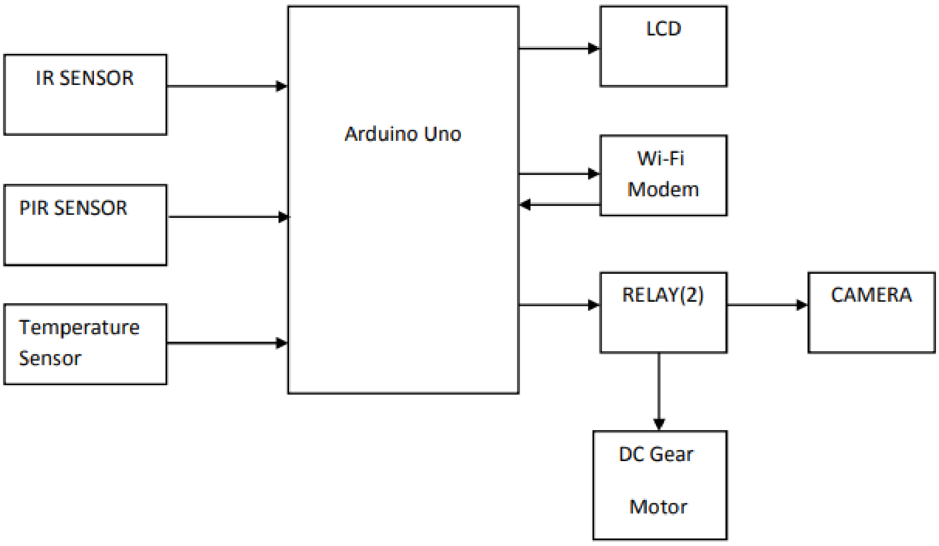


Fig 1: Block Diagram of IOT based Border Surveillance System

2. EXISTING SYSTEM

A huge number of applications in surveillance, health care, environmental monitoring, and entertainment find interest in LP-VWN. Typical applications are in the domain of object detection, recognition, and tracking and a very challenging task is designing distributed video systems within the tight power budget typical of mobile devices and wireless sensor networks. These tasks could be performed after the acquisition of a continuous video stream on a power unconstrained base station.

This approach would be extremely energy and bandwidth inefficient, difficult to implement on stand-alone mobile embedded systems and ultimately not scalable in a network. Clearly, nothing should be done from the point of view of data transmission if the target object/event is not detected. Even in presence of the target object/event, only some very limited amount of information may be transmitted, such as the number of interest objects, their size, position, trajectory, etc.

In terms of computing power, using smart cameras reduces the processing load of the central processing units by means of the execution of low-level image processing tasks within the camera platform and before data transmission to the host system. This way, the amount of data needing to be transmitted is radically reduced since, instead of sending the whole image contents to the host system, only some specific, post processed information is sent. Furthermore, transmitted data is more pertinent than the raw pixel flow, meaning that received data can be promptly used by the central processing units, without the need for running time-consuming tasks.

3. PROPOSED SYSTEM

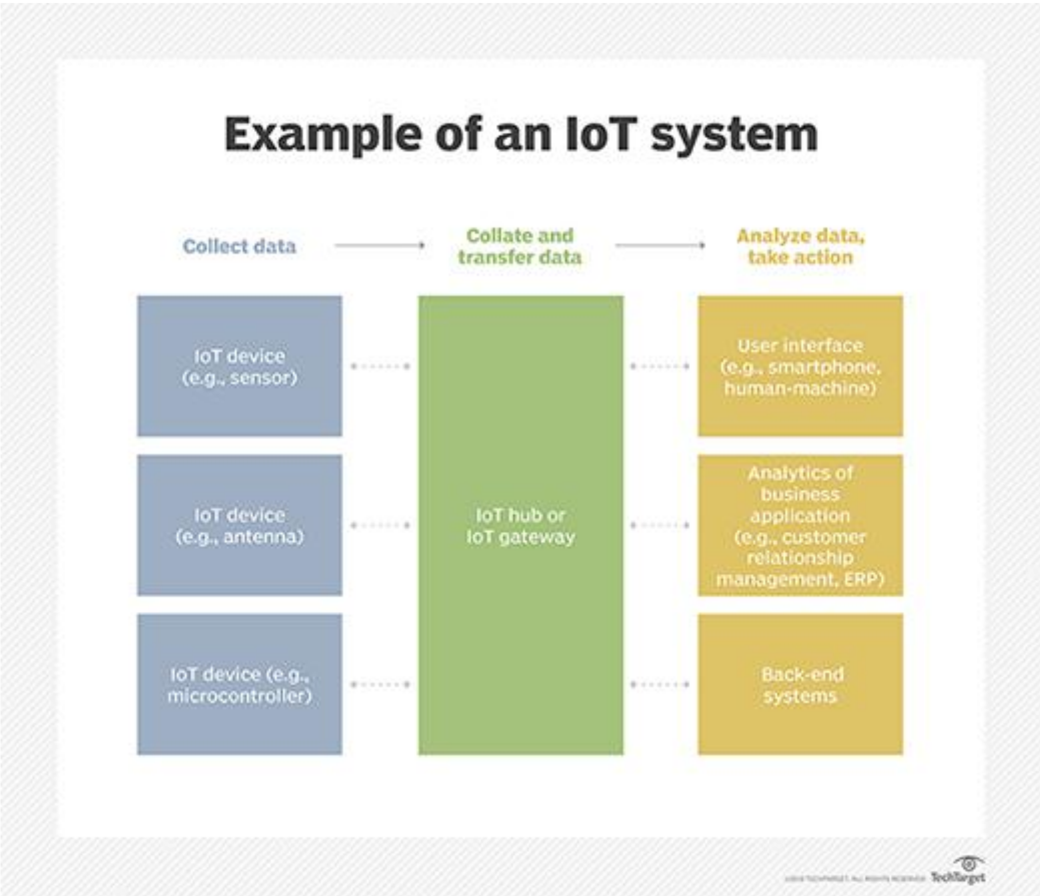
We present a multi-modal video surveillance system based (PIR OR IR) sensor characterized by low power consumption and low cost to be used as a node in a WSN. We propose a solution integrated into a standalone camera with embedded video processing capabilities and wireless communication. The proposed application relies on an advanced video analysis framework that, based on the same low-cost and low-power architecture, is able to detect events such as abandoned or removed objects. The PIR sensor is integrated with the video processing module, since it appropriately triggers the video analysis module based on the absence/presence of people in the scene.

This provides two main benefits. The first one concerns the robustness of the video analysis algorithm, since, as it will be shown more in details in the following, it helps reducing false positives due to occlusions or moving objects. The second one concerns power consumption: by limiting the activity of the video analysis module when this is not needed, there is a notable reduction of the overall power consumption of the system. In fact, in the aforementioned scenario of detection of abandoned/removed objects with a camera sensor network, most of the time the surveyed area is empty and the network should no longer monitor continuously the scene because there is nothing to detect.

When an event is detected by the PIR, the network can be switched on and begin video processing once again. Although the camera is low power, it can last only few hours in continuous mode, however thanks to the energy management policy that uses a sleep and wake-up strategy for energy conservation together with a PV harvester, the video node can work perpetually in the proposed scenario (with 50 events per hour).

4. FUNCTIONING OF IOTS

An IoT ecosystem consists of web-enabled smart devices that use embedded processors, sensors and communication hardware to collect, send and act on data they acquire from their environments.



IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get from one another. The devices do most of the work without human intervention, although people can interact with the devices -- for instance, to set them up, give them instructions or access the data. The connectivity, networking and communication protocols used with these web-enabled devices largely depend on the specific IoT applications deployed.

4.1 Benefits of IoT

The internet of things offers a number of benefits to organizations, enabling them to:

- monitor their overall business processes;
- improve the customer experience;
- save time and money;
- enhance employee productivity;
- integrate and adapt business models;
- make better business decisions; and
- generate more revenue.

IoT encourages companies to rethink the ways they approach their businesses, industries and markets and gives them the tools to improve their business strategies.

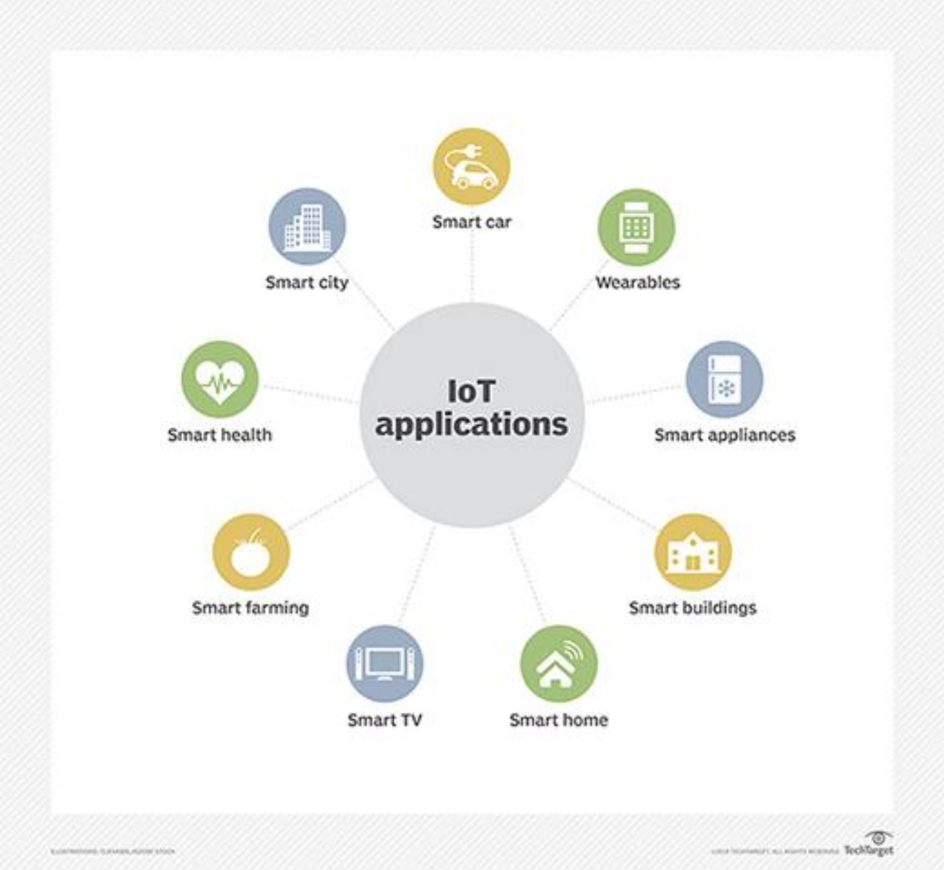
4.2 Consumer and enterprise IoT applications

There are numerous real-world applications of the internet of things, ranging from consumer IoT and enterprise IoT to manufacturing and industrial IoT (IIoT). IoT applications span numerous verticals, including automotive, telco, energy and more.

In the consumer segment, for example, smart homes that are equipped with smart thermostats, smart appliances and connected heating, lighting and electronic devices can be controlled remotely via computers, smartphones or other mobile devices.

Wearable devices with sensors and software can collect and analyze user data, sending messages to other technologies about the users with the aim of making users' lives easier and more comfortable. Wearable devices are also used for public safety -- for example, improving first responders' response times during emergencies by providing optimized routes to a location or by tracking construction workers' or firefighters' vital signs at life-threatening sites.

In healthcare, IoT offers many benefits, including the ability to monitor patients more closely to use the data that's generated and analyze it. Hospitals often use IoT systems to complete tasks such as inventory management, for both pharmaceuticals and medical instruments.



Smart buildings can, for instance, reduce energy costs using sensors that detect how many occupants are in a room. The temperature can adjust automatically -- for example, turning the air conditioner on if sensors detect a conference room is full or turning the heat down if everyone in the office has gone home.

In agriculture, IoT-based smart farming systems can help monitor, for instance, light, temperature, humidity and soil moisture of crop fields using connected sensors. IoT is also instrumental in automating irrigation systems.

In a smart city, IoT sensors and deployments, such as smart streetlights and smart meters, can help alleviate traffic, conserve energy, monitor and address environmental concerns, and improve sanitation.

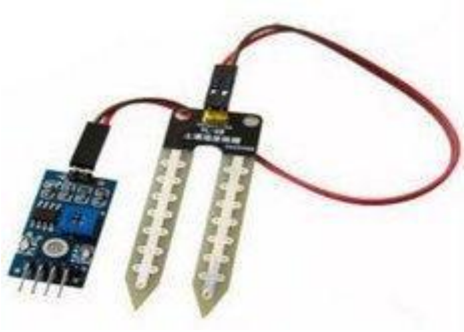
In the Internet of Things, all the things that are being connected to the internet can be put into three categories:

1. Things that collect information and then send it.
2. Things that receive information and then act on it.
3. Things that do both.

And all three of these have enormous benefits that feed on each other.

1. Collecting and Sending Information

This means sensors. Sensors could be temperature sensors, motion sensors, moisture sensors, air quality sensors, light sensors, you name it. These sensors, along with a connection, allow us to automatically collect information from the environment which, in turn, allows us to make more intelligent decisions.



Soil moisture sensor

On the farm, automatically getting information about the soil moisture can tell farmers exactly when their crops need to be watered. Instead of watering too much (which can be an expensive over-use of irrigation systems and environmentally wasteful) or watering too little (which can be an expensive loss of crops), the farmer can ensure that crops get exactly the right amount of water. More money for farmers and more food for the world!

Just as our sight, hearing, smell, touch, and taste allow us, humans, to make sense of the world, sensors allow machines to make sense of the world.

2. Receiving and Acting on Information

We're all very familiar with machines getting information and then acting. Your printer receives a document and it prints it. Your car receives a signal from your car keys and the doors open. The examples are endless.

Whether it's a simple as sending the command "turn on" or as complex as sending a 3D model to a 3D printer, we know that we can tell machines what to do from far away. So what?

The real power of the Internet of Things arises when things can do both of the above. Things that collect information and send it, but also receive information and act on it.

3. Doing Both

Let's quickly go back to the farming example. The sensors can collect information about the soil moisture to tell the farmer how much to water the crops, but you don't actually need the farmer. Instead, the irrigation system can automatically turn on as needed, based on how much moisture is in the soil. You can take it a step further too. If the irrigation system receives information about the weather from its internet connection, it can also know when it's going to rain and decide not to water the crops today because they'll be watered by the rain anyways.

And it doesn't stop there! All this information about the soil moisture, how much the irrigation system is watering the crops, and how well the crops actually grow can be collected and sent to supercomputers that run amazing algorithms that can make sense of all this information.

And that's just one kind of sensor. Add in other sensors like light, air quality, and temperature, and these algorithms can learn much more. With dozens, hundreds, thousands of farms all collecting this information, these algorithms can create incredible insights into how to make crops grow the best, helping to feed the world's growing population.

5. CONCLUSION

The results are in line with the expected output. The project has been checked with both software and hardware testing tools. In this work "**I/O devices**" are chosen are proved to be more appropriate for the intended application. The project is having enough avenues for future enhancement. The project is a prototype model that fulfills all the logical requirements. The project with minimal improvements can be directly applicable for real time applications. Thus the project contributes a significant step forward in the field of "**Project Domain**", and further paves a road path towards faster development s in the same field. The project is further adaptive towards continuous performance and peripheral up gradations. This work can be applied to variety of industrial and commercial applications.

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