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Low Power Intrusion Detection Using Multi-Level Sensor Authentication

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Abstract: *Surveillance systems be connected with very less cost and less power IR and PIR sensors, which are more capable to find the false alarms and small inference. Wireless smart cameras become an appropriate solution for the upcoming challenges like the hardware capabilities in terms of low - power utilization and high imaging performance and high memory footprint all are very big tasks for the wireless smart cameras. For this reason, wireless surveillance systems still involve a significant aggregate of research in different areas such as mote architectures, video processing algorithms, power management, energy harvesting and distributed engine. Here we evolve a solution for this problem through multilevel sensing architecture. The proposed system to be find the energy interference in the first level. If any unwanted event, it will be occurring at the moment the additional authentication unit become initiate and activities. In this stage, PIR sensor that detects the traces of the event. If the PIR 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.*

Keywords: Embedded smart camera, Power consumption, PIR Sensor, Vibration Sensor, Wireless Sensor Network, RF Transmitter and Receiver.

I. Introduction

The current progresses in micro electromechanical systems, embedded system and low power radio communication technology have generated the initiation of hugely scattered wireless sensor networks (WSNs). The WSNs consist of large number of low-cost, low power sensor nodes, which is used to collect and disseminate environmental data. These wireless sensors are aimed at working within several scenarios, including under surveillance, target acquisition, situation awareness, chemical, biological, radio logical, and nuclear early warning. It is now essential to develop a new designs and that provide many modal sensing without offering the smart size, weight, and power capability offered by the traditional motes. Improving the abilities, it is very essential to create the new architectures then the new design concepts are giving multimodal sensing methods expect sacrificing the small size, weight, and low power consume by the conventional motes. The main advantage of WSNs is the capability of to create the strong link between physical and logical world by receiving and transmitting the important data to devices that have to the calculate by resources to process it. WSNs, suitably to reduce the complicated tasks, can reduce the risk and also to take care the safety of people from high risk. Within this context, applications that exploit low- power video wireless networks (LP-VWN). Network consists of low-cost video sensors connected by low rate wireless channels and constrained. The cost of sensor modules is very few hundreds of dollars and also based on the complexity of the particular sensor nodes.

Size of the device and price of the sensor nodes should be deciding based on power of energy, storing capability, processing speed and Transmission bandwidth. Wireless sensor senses the useful information to the devices and it maintains the bridge gap between the devices. Object detection, recognition and tracking are the very challenging task in WSNs.

These tasks could be performed after acquisition of a continuous video streams. The multimodal wireless smart camera equipped with a piezoelectric infrared sensor and vibration sensor is introduced to achieve low power consumption and details of the particular object.

The false object detection in sensing is due to occlusions or moving objects. The false detection is an unwanted signal, which cannot be avoided and filtered by using multiple sensors. These multimodal sensor integrations used to save on board power consumption. The power consumption can be limited by reducing the activity of the video analysis module when it is unnecessary. The remains of the paper is planned as follows. Related work is discussed in Section II while in Section III describes about the hardware and Section IV describes the power consumption by using multi modal sensors. Experimental measurements and received performance are the focus of Section V. Finally, Section VI draws conclusion.

III. Related Work

Current trends in the exploitation of wireless architectures for smart home applications have been discussed. The wireless technologies usually adopted in smart homes have been considered and WSNs have been analysed as a suitable architectural tool to implement in home monitoring. Both energy saving and the reduction of health related costs are of particular interest in a world where the energy resources are running low and the population is rapidly aging.

[1]. Iota - based services and applications are already becoming an integral part of our everyday life. The enhancements of IoT for smart cities: ubiquitous and collaborative urban sensing integrated with smart objects can vastly improve citizen life by providing an intelligent environment that offers services, precludes emergencies and act in response to them, and permits a fine grained adaptive control for recovered and more accessible management of urban environments.

[2]. Typical applications are in the domain of object detection, recognition, and tracking are a very challenging task is designing distributed video systems within the tight power budget typical of mobile devices and wireless sensor networks. In this tasks should be performed later than the accession 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.

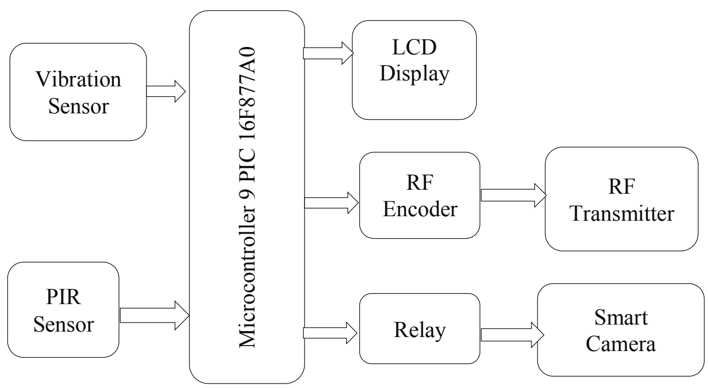

Figure 1: Transmitter Block Representation

[3]. Clearly, nothing should be done in data transmission if the target object/event is not detected. Even in presence of the target object/event, few very limited amount of data should be transmitted, like the quantity of interest objects, their size, position, trajectory etc. In terms of low computing power, smart cameras are used to reduce 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. Furthermore, transmitted data is more pertinent than the raw pixel flow, meaning that received data will be promptly utilized by the central processing units, without the necessity for running time-consuming tasks

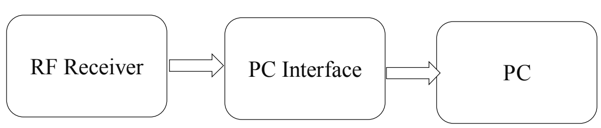

Figure 2: Receiver Block Diagram

IV. Hardware Description

Fig.1 shows the transmitter architecture. The transmitter unit consists of vibration sensor, pyroelectric sensor, embedded processor (PIC), RF transmitter and wireless video camera. Fig.2 shows the receiver architecture. The receiver unit consists of RF receiver, PC with its interface. This system purpose is to attain very less power consumption. Each device provides a power saving mode to reduce consumption when not in use.

4.1 Vibration Sensoribration Sensor

A sensor to sense the physical phenomenon and convert into a determinate analog voltage then to transmitted for further processing.Sensors are widely wont to several things like touch sensitive elevator buttons and lamps which dim or brighten by touching the bottom.There also are uncountable applications for sensors of which most of the people they don't know about the awareness of sensors.

Applications include Automobile industrial, Aerospace controlling, Medicine areas, Industrial manufacturing and Real time robotics.A sensor's sensitivity being measured how much considerable the sensor's output changes when the input quantity being measured changes.If the mercury during a thermometer moves 1 cm when the temperature changes by 1 °C, the sensitivity is 1 cm/°C. Sensors that determine significantly small changes must have very high sensitivities. In our project vibration sensor is used to detect the intrusion of any object.

4.2 Pyroelectric Sensor

Pyro electricity is the electrical response of a polar and dielectric material (crystal, ceramic, and polymer) to a change in its temperature.The basic model of a pyroelectric element is planar capacitor whose charge Q changes according to $\Delta Q=Ap\Delta T$, where A is the area of the element pyroelectric coefficient of the material and T is the temperature.Using electrodes, it is control and detected the current flowing through an external circuit such that $I=AP\ dT/dt$.

The incident radiation causes the changes in temperature of an absorbing structure that is designed to maximize the ΔT at the required wavelength.Commercial PIR detectors typically include two sensitive elements placed in series with opposite polarization Fig.3.Such a configuration makes the sensor immune to slow changes in background temperature.

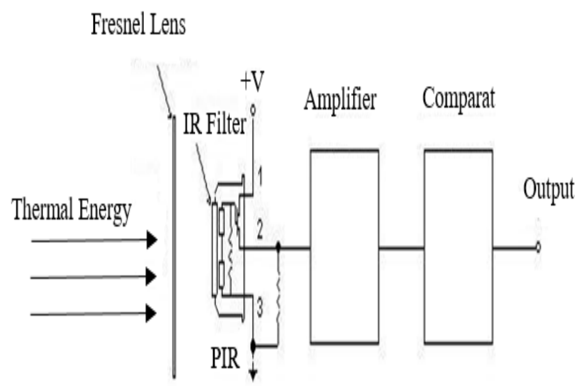

Figure 3: Typical configuration of PIR sensor

PIR sensor are used in conjunction with Fresnel lenses. The aim of the lenses is to detect and regulate the incident of radiation by optically dividing the area to be secured into a number of separate cones.PIR sensors are largely used in modern alarm system to detect presence of people and provide a simple, but reliable, digital presence/absence signal, being reliable and having low prices and low power consumption.

PIR sensor conditioning circuits: Although the PIR analog output is theoretically more informative for the following media analysis stage, in this work we built the circuit to have a digital output, given its increased robustness.The output signal of the sensor needs to be amplified several hundreds of times and filtered in order to be processed by a digital system.Thus we built a two stage of amplifier which achieves a total amplification of about 1500 times and filters the signal between 0, 5 and 12 Hz.

4.3 RF Transceiver

The RF module should be scatter in the range of Radio Frequency.The analogous frequency ranges propagate between 30 kHz & 300 GHz.In this RF system, the digitalized information based the amplitude of carrier signal should be changed.In this type of modulation, it is known as Amplitude Shift Keying (ASK).Transferring the information in the form of RF signal format that should be a better than the transmission of IR signal based transmission because of it having a many advantages, like long range Transmission and it operates in line of sight mode then more reliable data transmission and so on.

RF to transmitting the data in precise frequency dissimilar but IR signals propagate signals are interfering by various IR propagation sources.In this RF segment combined an RF signal Transmitter and an RF signal Receiver.If the Transceiver of RF module should be propagate operate with the frequency of 434 MHz and then RF module transmitter to receives the incoming data in serially then its communicate the pin4.

The signal propagation should be present the rate of signal transmission up to 1Kbps - 10Kbps.The transmitted information is received by an RF module receiver and then to operating the current frequency as that of the transmitter.The RF module to accomplish with a communication of encoder and with decoder.The encoder is used to encrypt the incoming parallel information and to feed to the reception of decoder it should be decrypt the incoming data.HT 12E, HT 12D, HT640-HT648, etc. are some commonly used encoder/decoder pair ICs.The RF transceiver is used to transmit the signals from surveillance unit to alarm unit.

4.4 Energy Harvesting Unit

The energy harvesting is a low cost and very effective operation in term of energy, size and efficiency. The low power required by the circuit, the fast growth of the harvested energy in the accumulator.

This is one of the World's smallest color video CMOS cameras available incorporated with the SDX-22 2.4 GHz video transmitter. The characteristics of wireless smart camera can be shown in Table. I. The camera has 330 lines of resolution, and a wireless system works from 7.5V/68 mA. The frequency ranges from 2400MHz – 2500MHz.It operates in 9v battery. It can have excellent picture quality with 330 lines resolution. With the help of VRX series we can communicate for a long distance. Energy optimization can be achieved, depends on the ON time of camera. In our project camera will be ON only when the signal received from the PIR sensor. Hence the energy optimization can be achieved.

4.5 Relay

A relay act as a switch it should be control the operation of opens an electrical circuits and closed the electrical circuits functionality.The switches are to be perform in electromagnet based open and close the contacts and then to control the output power.Because a relay should be measure the power of output then the power of input circuit, it should be measured, in a wide sense, to be a usage of electrical amplifier.

Table 1: Characteristic Of Smart Camera SDX-22

Operating Frequencies:	2400 MHz- 2500 MHz
Channel:	5-8
DC Voltage:	9 V
RF power:	80 mW
Minimum required voltage:	7.5 V
Battery power:	9 V - 12 V
Video distortion:	N/A
Maximum range:	3 km from the AIR
Video Format:	PAL, NTSC
Current Consumption:	68 mA / 9 V
Antenna:	Attached

The relay has a relay driver (ULN 2003) which is used to drive the relay, it is operate normally open and normally close functionality.At the moment of contacts are Normally open (NO) that time relay is activated then the circuit connection is removed that time automatically the relay is inactivating.

In this type of functionality of the relay called Form A contact.If the Form A contact functionality is requiring to control the huge current power source from remote devices.At the moment of contacts are Normally closed (NC) and disconnect the circuit at the moment the relay is ON if the circuit is connected that moment the relay is OFF.In this functionality to represent Form B contact it is remain closed until the relay will be ON.The other representation of the contact called change over contact it should be control the two circuits of operation one is Normally open contact functionality and another one is Normally closed contact functionalities this also called as From C contact.

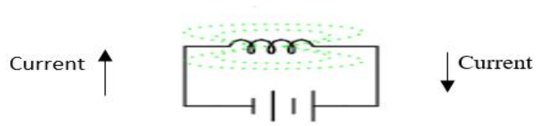

Figure 4: Working Model of Relay

When a current flow along the coil then the resulting magnetic field is attracting an armature then it is mechanically connected to a moveable contact in this movement should be connect or disconnect along with the static contact.At the time of switch is switched off at the movement the armature return back to the inactive position.Latching relays exist that require operation of a second coil to reset the contact position and then the relay is automatically switch ON the PIR sensor with camera.

V. LOW POWER ANALYSIS

In this work the low power analysis carries three modules. First module contains a vibration sensor either authenticates the incident or intimates the false detection. In the second module a PIR sensor sense the human IR radiation and in the final module a video camera provides the complete detail of the incident. It consists of two units [1] Surveillance unit [2] Alarm unit.

5.1 Surveillance Unit

The Fig.5 shows the block diagram of surveillance unit. It consists of vibration sensor, PIR sensor, and RF transmitter with encoder and video camera. Here we use the signal controlling unit to control the signal initially. The vibration sensor can intimate the intrusion to the PIR sensor with the help of relay which was driven by the relay driver. Then the PIR sensor can sense the IR radiation emitted from the human being, if the intrusion is not a human being then the PIR sensor automatically goes to off condition. The relay turns on the video ca mera when the signal received from the microcontroller. The video camera can have a wireless transmitter which is used to transmit the video signal to the alarm unit.

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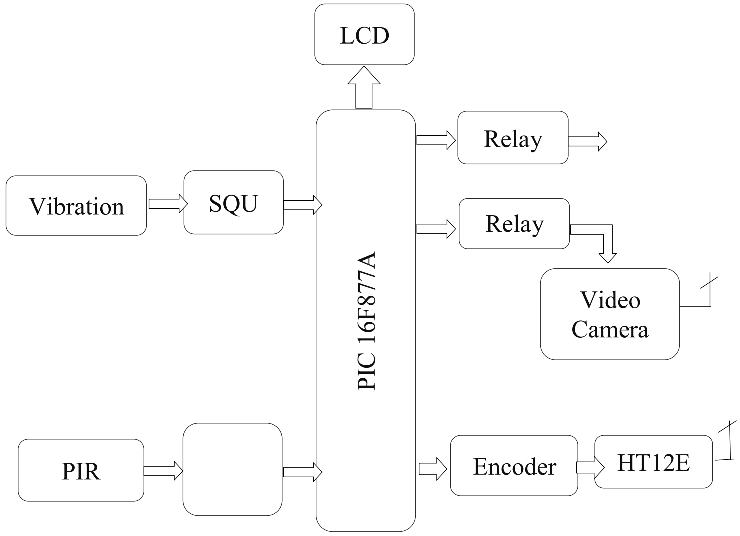

Figure 5: Surveillance Unit Block Diagram

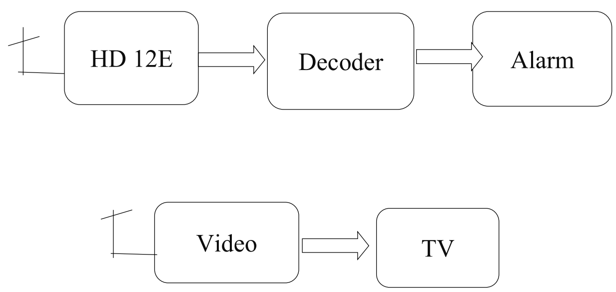

Figure 6: Alarm Unit Block Diagram

5.3 Alarm Unit

The Fig.6 shows the block diagram of alarm unit. It consists of RF receiver, Buzzer, TV monitor. By using wireless transmission, the RF receiver receives the alarm signal and video signal. The TV monitor captures the event happened in the security area and display it. When the buzzer gives the alarm.

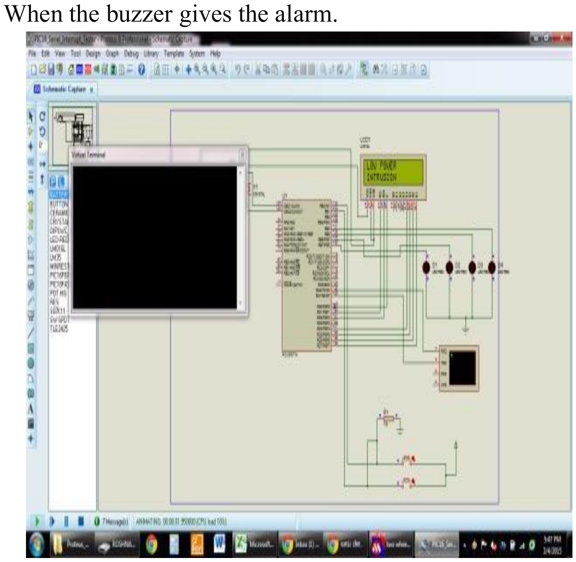

Figure 7: Schematic Representation of Low Power Intrusion Detection

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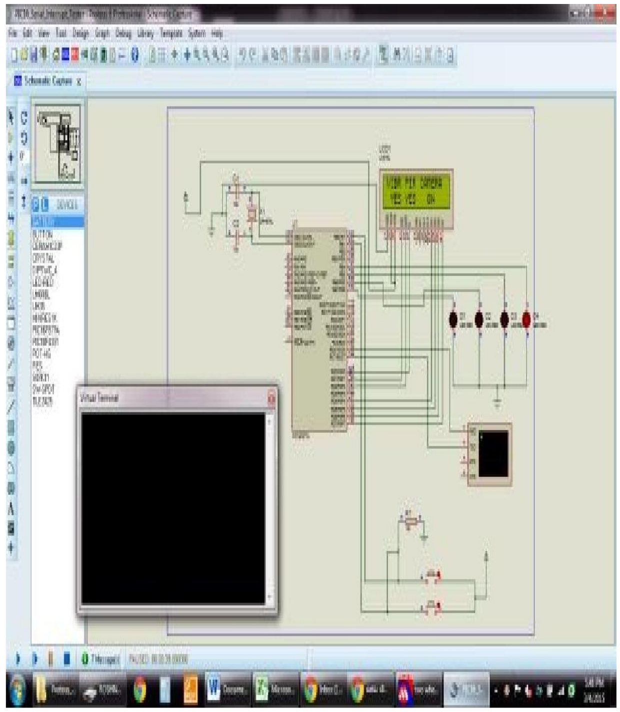

Figure 8: Schematic Representation Of sensor at active state

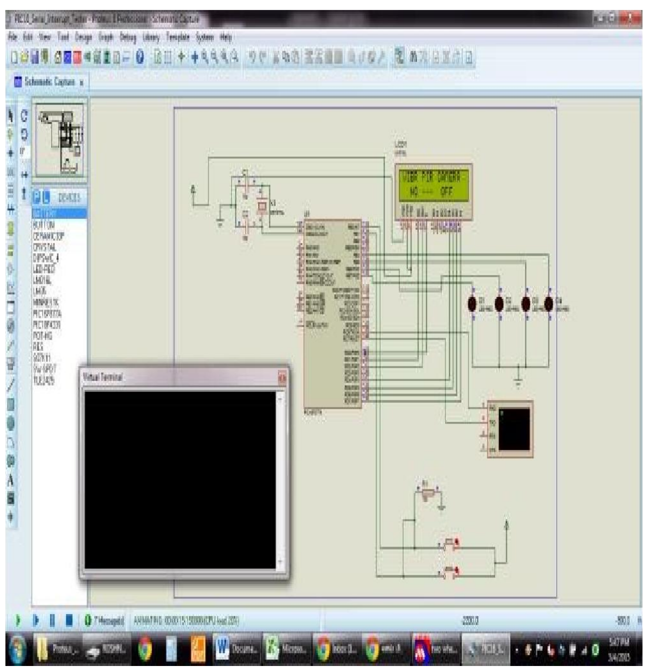

Figure 9: Schematic Representation of sensor at OFF state

VI. CONCLUSION

In this paper we have designed an intrusion detection that reduces the power consumption. We proposed a cost effective system using low cost sensors. The proposed system avoids the false alarm. It is mainly applicable in banking and border security. It detects only the human being intrusion. In future, the work will be focused on the detection of robots and use of solar batteries.

REFERENCES

[1]. Sani AS, Yuan D, Jin J, Gao L, Yu S, Dong ZY Cyber security framework for internet of things-based energy internet. Future GenerComputSyst 93:849–859 , 2019

[2]. Zhang T, Zhang T, Ji X, Xu W Cuckoo-RPL: cuckoo filter based RPL for defending AMI network from blackhole attacks. In: 2019 Chinese Control Conference (CCC). IEEE, pp 8920–8925 , 2019

[3]. Zhang J, Rajendran S, Sun Z, Woods R, Hanzo L Physical layer security for the internet of things: authentication and key generation. IEEE WirelCommun 26(5):92–98. https ://doi.org/10.1109/MWC.2019.18004 55 ,2019

[4]. Conti M, Kaliyar P, Rabbani MM, Ranise S SPLIT: a secure and scalable RPL routing proto-col for internet of things. In: 2018 14th International Conference on Wireless and Mobile Comput-ing, Networking and Communications (WiMob). IEEE, pp 1–8 , 2018

[5]. Jamali S, Fotohi R DAWA: Defending against wormhole attack in MANETs by using fuzzy logic and artificial immune system. J Supercomput 73(12):5173–5196 , 2017

[6]. Fotohi R, Ebazadeh Y, Geshlag MS (2016) A new approach for improvement security against DoS attacks in vehicular ad-hoc network. Int J AdvComputSciAppl 7(7):10–16 , 2016

[7]. Michele Magno, Member IEEE, Federico Tambar, Member IEEE, DavideBrunelli, Member IEEE, Luigi Di Stefano, Member IEEE, and Luca Benini, Fellow IEEE," Multimodal Video Analysis On Self-Powered Resource-Limited Wireless Smart Camera" ,published in JUNE 2013.

[8]. Federico Viani, Member IEEE, FabrizioRobol, Alessandro Polo,Paolo Rocca, Member IEEE, Giacomo Oliveri, Member IEEE, andAndrea Massa, Member IEEE," Wireless Architectures for Heterogeneous Sensing in Smart Home Applications: Concepts and Real Implementation", published in JUNE 2013.

[9]. Paolo Bellavista, Senior Member, IEEE, Giuseppe Cardone, Member, IEEE,AntonioCorradi, Member, IEEE, and Luca Foschini, Member, IEEE,"Convergence of MANET and WSN in IoT Urban Scenarios", published in OCTOBER 2013.

[10]. ElhadiM.Shakshuki, Senior Member IEEE, Nan Kang and Tarek R.Sheltami, Member IEEE, "EAACK-A Secure Intrusion- Detection System for MANETs" ,published in MARCH 2013.

[11]. StevanJ.Marinkovic, Student Member IEEE and Emanuel M.Popovici, Senior Member, IEEE, "Nano-Power Wireless Wake – Up Receiver With Serial Peripheral Interface",published in SEPTEMBER 2011.

[12]. T. Semertzidis, K. Dimitropoulos, A. Koutsia, and N. Grammalidis, "Video sensor network for real-time traffic monitoring and surveil- lance," IET Intell. Transport Syst., vol. 4, no. 2, pp. 103–112, JUNE. 2010.

[13]. W.Chan, J.Chang, T.Chen, Y.Tseng, and S.Chien, "Efficient content analysis engine for visual surveillance network," Trans. Circuits Syst. Video Technol., vol. 19, no. 5, 2009.

[14]. J. San Miguel and J. Martnez, "Robust unattended and stolen object detection by fusing simple algorithms," in Proc. IEEE Int. Conf. Adv. Video Signal Based Surveill., SETEMBER. 2008.

[15]. F.Porikli, Y.Ivanov and T.Haga, "Robustab and one dobject detection using dual foregrounds," EURASIP J. Adv. Signal Process. vol. 2008, no. 1, Jan. 2008.