IP CAMERA SURVEILLANCE SYSTEM WITH AUTOMATED RECORDING

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Abstract: In this article we present the results obtained at the installation and configuration of a video surveillance system for controlling the access in a building. The system uses an IP video camera (NC 1200) connected at a building LAN. The IP camera used allows the visualisation of images by Internet connection but, for recording images, admits only manual command from the human operator that supervises the entrance. The camera has embedded the function of sending an instant picture by e-mail or on a FTP server if the system disposes any of these two facilities. For this reason we created an application that automatically starts recording images, when a motion is detected in the supervised space. The application has the advantage of saving the image frames directly on the monitoring computer and eliminates the constraint to have an on-line server (FTP or e-mail) and also that permits no modification of the camera firmware, being installed only on the monitoring computer. We report here some preliminary results, with only one surveillance camera, but the system will be extended to several ones. We illustrate the advantage of using a cheap IP camera combined with the original application for entrance surveillance.

Keywords*: intelligent building, IP camera surveillance, real-time, intelligent visual surveillance*

I. INTRODUCTION

The building video surveillance has a real importance both from economical and security point of view. The surveillance systems became a real necessity in shops, hypermarkets, stores, galleries, but also in industrial and administrative buildings, where enhancing the adequate protection of goods and protection against intruders is needed. Also video surveillance applications of public places and institutions for a better safety are important in the nowadays-political context, as an efficient way to reduce the criminal and terrorist risks.

The fast progresses in developing new types of data networks and transmission techniques, leads to various methods of implementing video surveillance systems. For example IP video surveillance creates a video stream transferred through wired or wireless networks, for video data monitoring and recording, and also integrates other types of systems as access control. IP video cameras can be directly connected to an IP network, allowing users to remotely monitor, record and analyse images at long distance, including Internet links.

This research describes the results obtained by the installation and configuration of an IP video surveillance system for controlling the access to a building. The used IP video camera (NC 1200) allows the visualisation of images by Internet connection, and includes the feature of recording images manually, by a human operator that supervises the entrance. The IP camera includes a motion detector, and has embedded the function of sending an instant picture by e-mail or FTP service if the system has at least one of the two facilities. Therefore we attempted to automate the operation of recording images, when a motion is detected in the supervised space. The original application has the advantage of saving the image frames directly on the remote monitoring computer and eliminates the constraint to have an on-line server (FTP or e-mail). Also the application has the advantage that does not need to modify the camera firmware, being installed only on the monitoring computer.

II. MAIN CHARACTERISTICS OF THE NC1200 IP VIDEO CAMERA

NC1200W10 is a classical type of wireless network/IP camera, which uses IEEE 802.11b/g standard radio transmission. The camera includes a motion detector that activates a blinking icon on the window opened by the PC connected to the camera. Moreover, the video camera has infrared sensors for night vision (up to 5-6 meters), and is specially designed for indoor use. Outdoor utilisation is impossible because of the overexposure, making the image not visible.

The network connection can be made using any device with Ethernet or WiFI interface, but a better flexibility is achieved with an Internet connection, done through a router (wired or wireless). In our application we use a Canyon CN-WF514 WiFi router. The general configuration of the connection is presented in figure 1.

For viewing images from camera in a local network, the video camera IP address is used in a web browser, while for connections outside the LAN, the browser will

access the IP address of the router, which will send the access request to the IP camera.

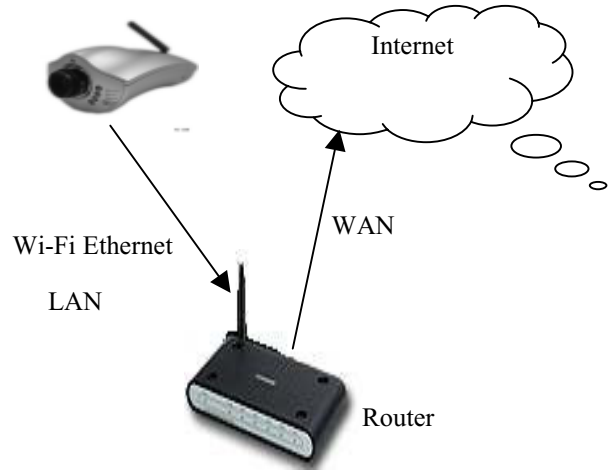

Figure 1. NC1200 camera connection

When connected to the IP camera, the page that opens in the browser displays in the middle the images transmitted by the camera and on the left a column of control-icons.

Saving an image is possible only manually by pressing the corresponding control-icon that yields to a new window where the user sets the name and the saving path on the hard disk.

Similar, for recording a video-clip, the user must set several parameters: number of frames per second, duration of recording, the prefix of the file name and the path for saving location. Records are saved in AVI (Audio Video Interleaved) format.

III. INTRODUCTION TO APPLICATION FOR AUTOMATIC IMAGE RECORDING

From the above short description of main camera embedded functions, we observe that there is no possibility to automate the recording operation of images on the local PC, when motion is detected in the supervised area. The camera only allows transmission of instant frames by e-mail or to a FPT server, if any of these facilities exists. Another possibility is to continuously record images, but this method requests a high number of resources on the hard disk. We tried to implement a simple solution to eliminate the need of a human operator to start the image record.

The application is implemented as a HTML file combined with an image folder and a control one. All these are hosted on an application web site that can be accessed with the web browser of the monitoring PC. At this moment the application works only with Internet Explorer web browser.

The main advantage of the created application is that it offers the possibility to save images on the local hard disk, saving triggered by the camera embedded motion detector. Clicking the related icon on the graphical interface can set this facility. The same icon is used to stop automatic saving.

Another advantage of the application is that only the web site name is required, not the IP of a FTP or e-mail server, as imposed in the embedded camera interface. The camera IP address setting is restricted only to the administrator of the surveillance system, and is preferably to be a fixed address regardless the connection: Internet or through a router (in this case the camera address is the router IP address, as presented above). In the original embedded camera interface the configuration settings are restricted by username and password. Therefore a user authentication is made every time the camera is accessed. Only then, the user has access to configuration settings of the camera. In our application the camera settings functions are not available, being allowed only simple functions, for visualisation and recording.

A screen shot of the application interface is presented in figure 2.

Figure 2. Application interface for visualization of images from camera and automatic record when motion is detected

The application interface contains the main window with images from camera and on the left are displayed icons for control the functions. The firs upper icon controls the manual capture of an image. The next icon controls the manual recording of a video clip. The third icon is an indicator which by grey / magenta colour denote that the motion detection is off / on. The next icon signalise by blinking colour that motion is detected. The last lower icon controls the automatic recording of image frames when motion is detected. This control acts as a flip-flop indicating by different colours if the images are recorded or not when the motion detector discovers any movement in the supervised area.

IV. IMPLEMENTATION OF THE APPLICATION

To implement the application we used the control file *VCViewAtl.dll* extracted from the camera firmware. This file contains a set of predefined functions. The file was decoded for implemented functions determination, using *PE Explorer* utility.

For camera functionality the following functions were implemented:

- startCamera(),
- onRecord(),
- onSnapshot(),
- RefreshAVI(status),
- ChangeMotionLight(bMotion),
- ChangeSetMotionLight(bMotion),
- RefreshMotionDetect(motiondetect),
- RefreshSetMotionDetect(setmotiondetect),
- Automat(), Fotogr_autom().

StartCamera() function is called when the camera web page is loading as follows: *javascript onload="return StartCamera()*". Onload is the event when the function is called, and it contains the path parameter, the address of the loaded images. In the main window will be available the images received from the video camera.

OnSnapshot() function corresponds to the first control-icon and permits saving a snapshot.

```
function onSnapshot()
{
    document.VCView1.CallSnapshot();
}
```

This function is based on an internal function defined in the camera control file (CallSnapshot()). It returns a window where it can be specified the path of saving the images. The function is called by pressing the specific icon, and its code is: *<img src="images/snapshot.jpg" alt="Salveaza imagine" width="65" height="45" border="1" onClick="return onSnapshot();">*. OnClick is the event that starts the call of the function for the selected image.

OnRecord() function is used for video clips recording and corresponds to the next button.

```
function onRecord()
{
  if
(document.menurecord.src.search('images/record.bmp')>
=0)
        {
                document.VCView1.CallAvi();
        }
        else if
(document.menurecord.src.search('images/recording.bmp
' )>=0)
        {
                document.VCView1.Avi = 0;
        }
}
```

This is another function based on an internal one (*CallAvi()*), returning a window where the recording parameters can be set. Also the function changes the colour of the icon, for signalling the recording. Function starts by pressing afferent icon from the interface, and the code is: *<img src="images/record.bmp" alt="Inregistreaza AVI" name = "menurecord" width="65" height="45" border="1" onClick="return onRecord();">*.

RefreshAVI(status) function is called only when special events like AviNotify are detected, specifically when the recording is started or stopped.

```
function RefreshAVI(status)
{
 switch(status) {
    case 0:
          document.menurecord.src =
"images/record.bmp";
          break;
    case 1:
          menurecord.src = "images/recording.bmp";
         break;
    }
 }
```

The call of the function:

```
<SCRIPT LANGUAGE=javascript FOR=VCView1
EVENT="AviNotify(status)" defer>
    RefreshAVI(status);
</SCRIPT>
```

The functions ChangeMotionLight(bMotion), Change SetMotionLight(bMotion), RefreshMotionDetect(motion-detect) , RefreshSetMotionDetect(setmotiondetect*)* are used for motion detection, therefore they are called only when movement is detected.

Here is an example of SetMotionDetect(setmotiondetect) function calling:

```
<SCRIPT LANGUAGE=javascript FOR=VCView1
EVENT="SetMotionDetect(setmotiondetect)" defer>
        RefreshSetMotionDetect(setmotiondetect);
</SCRIPT>
```

ChangeSetMotionLight(bMotion) and RefreshSetMotion Detect(setmotiondetect) functions verify if the motion detection is set. The third icon from left menu indicates this by using different colours: grey for unset movement detection and magenta otherwise.

ChangeMotionLight(bMotion) and RefreshMotionDetect (motiondetect) functions control the fourth icon on the left side, indicating with colours if camera detects any movement: red for motion and grey for no changes in the received image.

Automat() function changes the last icon from menu showing the operating mode.

```
function Automat()
{
        if
(document.automat_oprit.src.search('images/plus.gif')>=
0)
        {
                automat_oprit.src =
"images/minus.gif";
        }
        else if
(document.automat_oprit.src.search('images/minus.gif')>
=0)
```

```
        {
automat_oprit.src = "images/plus.gif";
        }
}
```

The function call is made by pressing the icon "plus" for automatic saving of images when motion is detected, or the icon "minus" to exit this mode: *<img name ="automat_oprit" src="images/plus.gif" alt="inregistrare automata poze la detectia miscarii" width="65" height="45" border="1" onClick="return Automat();">*

Fotogr_autom() function permits automatic saving when movement is detected, using the internal function SaveCurrentJpg together with a parameter that specifies the saving path. Automatic saving is possible only if this mode is set, moment when "minus" button appears on the interface.

```
function Fotogr_autom()
{
        if
(document.automat_oprit.src.search('images/minus.gif')>
=0)
        {

    document.VCView1.SaveCurrentJpg("c:/Fotografiere
_automata");
        }
        else if
(document.automat_oprit.src.search('images/plus.gif')>=
0)
        {
                RefreshMotionDetect(motiondetect);
        }
}
```

Fotogr_autom() is called when is detected the event generated by the movement sensor.

```
<SCRIPT LANGUAGE=javascript FOR=VCView1
EVENT="MotionDetect(motiondetect)" defer>
    RefreshMotionDetect(motiondetect);
    fotogr_autom();
</SCRIPT>
```

V. CONCLUSION

The research presents the software application for automatic data recording when motion is detected. This application must be hosted by a website, using only the site name, without the IP address (the IP being set in the program code).

The main advantage is that the applications can automatically save images when motion is detected. Also the interface introduces a new level of security because it does not allow access to the camera settings.

The present implementation is done only for one IP video camera, but is easy to be modified for several cameras that can be installed on surveillance video system.

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