

WATCHING SYSTEM USING PC CAMERA

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Abstract. Any space can be watched by a PC camera. Typical software supporting such camera captures an image in a selected time period and saves it to a harddisk. The MATLAB program using the Image Processing Toolbox reads this image from harddisk and compares with the next image. If there is detected any change in the image the program activates an alarm information. In this contribution is presented the program using a 2-D correlation coefficient to compare successive images. To get an absolute time of an alarm the program uses functions from the Data Acquisition Toolbox.

1 Description of Typical PC Camera

Today there are on the market several types of the PC camera. It is also called WebCamera, Internet Video camera or Digital Video camera. We shortly summarize its characteristic parameters. The purpose of such camera is a capture of single photo or short videos, typically 15 seconds. The main advantage is its low price.

The PC camera is mostly connected to the PC via USB port. It has mostly CCD sensor or cheaper CMOS sensor. The image resolution is 640 x 480 pixels or 320 x 240 pixels, with 24bit color information. The image resolution last time rises up to 1280 x 960 pixels, it means 1,3 megapixel. Images are often mailed via Internet. The greater image resolution has more pixels and needs more time for transmitting. Some cameras have also other possibilities, for example a digital zoom or a build-in microphone.

2 Software Supporting PC Camera

Our application captures the image after several seconds, so we omit description of a faster video capture. During our work we got experience with the Picture Works Live used by Kodak and with the VisionGS PE (<http://www.vision.de>). In the next are summarized most important possibilities of the used software:

- a camera settings for the current lightning conditions, shutter speed, exposure, and image quality
- select the image size and quality

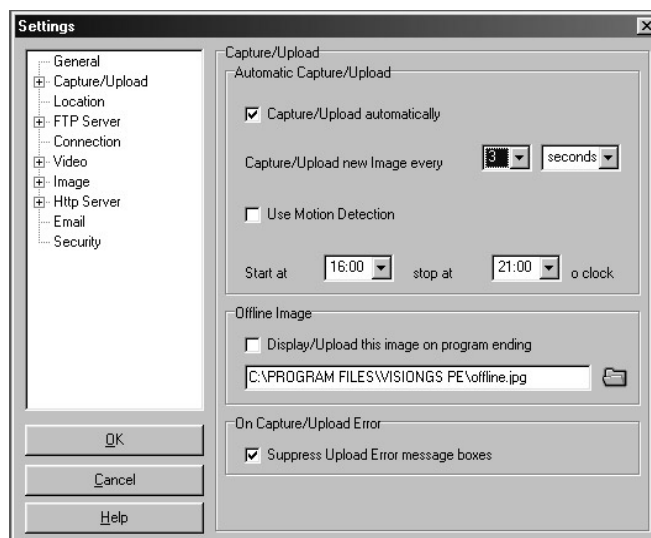


Fig.1 The window for PC camera settings

- automatic capture after selected time period from 1 second to tens of hours
- automatically store an image to a selected directory under one name or changing name
- include to a picture the date and the timestamp
- send an image via FTP server or Http server
- capture a image after defined delay
- define a time of a start and a stop of a camera activity.

The fig.1 shows typical window for PC camera settings.

3 Watching system description

The watching system is based on cooperation between program supporting PC camera (described in section 2) and MATLAB program shown in the fig.2. The program supporting PC camera stores captured image to the directory and name it *cam.jpg*. From this directory is the file loaded to MATLAB and compared with the previous image. The comparison is realised using two dimensional correlation coefficient. If program detects change in the correlation coefficient grater than defined limit generates alarm information.

```

% one create AI to get abstime
AI=analoginput('winsound');           % analog input object is created for a sound card
addchannel(AI,1);                     % one hardware channel is added
fs=8000;                              % sampling frequency defined
set(AI,'samplerate',fs);
duration=0.001/8;                    % I take only one sample
set(AI,'samplespertrigger', duration*fs);

%main program
s=0;e=[];                             % input condition
while s~12;                          % number of images +2
d=imread('cam','jpg');               % reads an image from the file cam.jpg
c=rgb2gray(d);                       % convert RGB image to gray
imshow(c);                           % displays gray picture
if s>1
r=corr2(c,e);                        % compute 2-D correlation coefficient
disp(r);
if r<0.97                             % compares with a condition for ALARM
disp('ALARM!!!!!!');                % display ALARM
beep;
start(AI);
[data,time,abstime,events]=getdata(AI); % in a case of an alarm reads absolute time
abstime                             % display absolute time
stop(AI);
end
end
e=c;
pause(1);                             % waiting for a next image
s=s+1;
end
s                                     % display number of images

```

Fig.2 Program generating the alarm when detects the change in the image from PC camera

4 Conclusions

The presented paper describes the application of the cheap PC camera for surrounding space watching. Also one can get image of anyone who disturbs the space watched by a camera and get an exact time information.