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DESIGN OF SMARTSCHOOL WEBCAM SECURITY SYSTEM USING RASPBERRY PI WITH MOTION DETECTION IN SMK PGRI SUKODADI

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DESIGN OF SMARTSCHOOL WEBCAM SECURITY SYSTEM USING RASPBERRY PI WITH MOTION DETECTION IN SMK PGRI SUKODADI

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ABSTRACT

Currently a low cost security system is needed and easy to apply especially at educational institutions that will implement smart school and industry 4.0. Needed devices are raspberry pi and web camera. Raspberry pi will only save moving images taken from the web camera. Because by storing an image whose file size is not too large will ease the performance of the server. In this study, a design for the raspberry pi based motion detection system will be applied at SMK PGRI Sukodadi Lamongan Regency which has not have security system. This system will save the file in the form of an image that will be put together into a moving image that looks like a video that will displayed in a LED monitor.

Keywords: *smart school, motion detection, moving image.*

1. INTRODUCTION.

Internet of things (IoT) is a network of interconnected electronic devices that capable of sending data without interference or with minimal human intervention. This technology is widely used for smart city application, personal health monitoring and smartschool. Some researchers have developed security monitoring system based on IoT concept [1]. IoT, can be viewed as a highly dynamic and widely distributed network system. In other words, it is a system comprising many identifiable components that are able to communicate and to interact, either among themselves or with end-users or other entities in the network.

Cost minimization and target tracking facilitation are the major benefits of optimal sensor localization in smart homes. The Smart Home Management System (SHMS) needs to know the location of the different sensor nodes within the home in order to speed up the processing of data and to minimize the cost of system operation. In smart homes, fixed location or mobile sensor stations could be used [3]. But in this research there will be no sensor, its just adding some codes to raspberry pi to recognized motion.

Webcam only records when there is a movement, it will be placed in a room needed to monitor. webcam that will be connected to Raspberry Pi which is a small computer that uses Linux as its operating system. The Raspberry Pi also has an HDMI input, USB port, audio out jack, LAN port, and affordable memory. In addition to the cost, data storage is also something to consider, the Raspberry Pi can be connected to an internet network so the recorded results are no longer stored on the hard disk or memory card but online cloud storage. Raspberry Pi is also able to become a web server, so that connected webcams can be monitored through websites from anywhere as long as they are connected to the internet.

Continuous monitoring such as CCTV in shopping centers or offices will cause storage on the server, because the file size of the record will be

very large. one way to overcome this problem is to make webcam only record in times of need, for example when someone enters the room. Therefore a monitoring system is needed that can detect motion.

In this research, will be design webcam to monitor motion detection in school by using combination raspberry pi and webcam. The web camera detect a motion then save images to storage and the displayed that images to LED monitor eho looks like veide buat actualy its just some images, so the size is not to big.

2. MATERIALS/METHODOLOGY

Based on the purpose od this research, design a webcam security system with additionally to detect and recognize motion that implemented on raspberry pi. With the motion detection, the images can saved in sd card and displayed n monitor.

Fig.1 Hardware Architecture

Can be seen in Figure 1, hardware architecture consist of one raspberry pi which connected to internet and four webcams. Other devices like PC 1, PC 2, notebook and smartphone or tab/ipad only used for viewing moving images or control the server. All device must be connected to the internet if want to see that moving images.

As shown in Tabel 1. Its just cost Rp.2.865.000 to build the project. Other tools is HDMI cable, to display into LED monitor. Its much cheaper than ordinary cctv also that can be accessed from any devices, such as notebook, smartphone, PC or tab/ipad.

Table 1. Hardware Module and Price

No	Name	Description	Price (Rp)
1	Raspberry Pi	Using Raspberry Pi 3 Model B, ARM Cortex-A53 1.2 GHz, 1 GB RAM, 802.11n wireless LAN	510.000
2	LED Monitor 24"	To display the moving image	2.000.000
3	SD Card 16G	For data storing	40.000
4	Webcam	Using webcam camera USB 2.0 (Logitech c170) for take picture	265.000
5	Raspberry Pi Adapter	AC/DC adapter	50.000
	Total		2.865.000

2.1 Raspberry Pi

Raspberry Pi is a single-board computer with wireless LAN and Bluetooth connectivity, also small sized computer which using Linux as the operating system. There are 7 operating systems that can be installed on Raspberry Pi. The Raspberry Pi also has an HDMI input, USB port, audio out jack, LAN port, and RAM which is the latest technology at a price that is quite affordable, of course it can change for CCTV cameras that cost more. In addition to costs, data storage is also a thing to consider, the Raspberry Pi can connected to the internet network so that the recorded results are no longer stored on hard disk or memory card but online cloud storage. Raspberry Pi is also capable become a web server, so that connected cameras can be monitored through the website wherever you connect to an internet connection, unlike most CCTVs you have to monitored via TV or monitor. This research use Raspberry Pi 3 model B (Fig. 2) which faster processor and faster connection.

Fig.2 Raspberry Pi

2.2 Web Camera

This research uses Logitech C170 webcam (Fig. 3), simple plug and play and easy to use. Its supports plug-and-play connectivity with USB 2.0. It

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features Logitech's Fluid Crystal Technology and the VGA sensor supports video clear video calling at 640 x 480 resolution. C170 can capture video at 1024 x 768 resolution and up to 5-megapixel photos with a little help from the Logitech software. There's a built-in microphone with noise reduction, so you can clearly hear who you are talking with. The webcam includes a universal clip that can attach to your laptop or desktop monitor.

Fig.3 Web camera

3. RESULT AND DISCUSSION.

In Fig. 4 shown that process begin with movement detection from anyplace in SMK PGRI Sukodadi Lamongan Region that covered with webcam. If there is a movement, the picture will be taken and saved to sdcard and displayed to LED monitor.
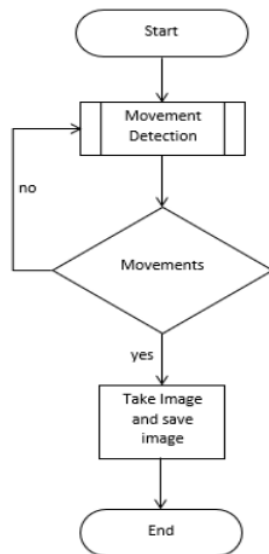

Fig. 4 System workflow

3.1 Setup Operating System in Raspberry Pi

To setup linux operating system in raspberry pi we need a monitor, mouse and keyboard, computer and micro SD card converter. First of all, install Raspbian on SD card and the get some basic setup. Installing Raspbian on the Raspberry Pi is pretty easy. Download Raspbian and writing the disc image to a microSD card, then booting the Raspberry Pi to that microSD card. For this research, we need a microSD card (go with at least 16 GB class 10), a computer or laptop with a sd card slot, and basic peripherals such as a mouse and keyboard, screen, and power source. When raspberry pi has been booted for the first time, a configuration screen called setup option appear, like shown on Fig.5
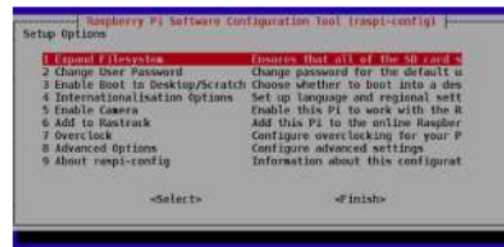

Fig. 5 Setup Option

Second, connect the raspberry pi to the internet via wifi or LAN cable. Then use SSH into Raspberry Pi to issue commands. Enable SSH to raspberry pi using this command:

sudo raspi-config......................................(1)

That command allows to enter a configuration menu. Then go to options and enable SSH, as well as web camera, then exit and reboot raspberry pi.

sudo ifconfig...(2)

The command is used to know the ip address of raspberry pi. The ip address should be in wlan0 section.

Fig.6 Display of ip address

3.1 Setup Motion Detection on Raspberry Pi

Installing and setup motion detection on raspberry pi, first of all installing Raspbian on micro SD. And the installing and setup motion detection.

```
#update pi
sudo apt-get update
sudo apt-get upgrade

#download
sudo apt-get install motion

#edit
sudo nano /etc/motion/motion.conf
#edit
daemon on
stream_localhost off
webcontrol_localhost off
ffmpeg_output_movies on

target_dir /var/lib/motion

#local web browser streaming options
stream_maxrate 100
framerate 60
width 640
height 480
displayed
```

• "*sudo apt-get update*" and "*sudo apt-get upgrade*" its used to update software and application on raspberry pi operating system. Updating the firmware is necessary because certain models of the Pi maybe not have all the required needs to run smoothly or it may have some bug.

The latest firmware might have the fix to those bugs.

• "*sudo apt-get install motion*" its used to inject motion detection on raspberry pi

• "*stream_maxrate 100*", this code will allow for real-time streaming but requires more internet bandwidth and memory resources.

• "*frame rate 60*", means 60 frames to be captured per second, the higher this gets, the video will be slower to process.

• "*width 640*", means the width of the image displayed.

• "*height 480*", means the height of the image displayed.

4. CONCLUSION.

The result of experiments in this research shown that the webcam and raspberry can become a server to save moving image and then display to LED monitor. For next research, raspberry pi will have the ability to send notification to security to give information about intruder via email or mobile phone.

5. ACKNOWLEDGEMENT.

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