Security camera design using smartphones

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Abstract. The purpose of this study is to identify the importance of using information technology for security, especially for supervision. The method used in this research is a descriptive method, describing the function of using smartphones as a security tool. The results of this study that smartphones can be used as a security tool by using a cellphone camera as a surveillance camera and wireless computer network. This research was carried out with the results of analysis and experiments using previous references and supporting equipment. From the results of this study, it can be found that smartphones can be utilized as security systems. Therefore, the results of this study can be utilized by various parties or can be used as a reference in the use of technology and information.

1. Introduction
The use of security cameras now becomes a necessity in the business side. The author makes the design of a security camera using a smartphone because it makes new things using simple tools and can be found easily. Especially if there is an unused device, it can be used as a useful thing.

Some studies assess how much crime has been reduced by using CCTV, from general crimes at the local and national levels, other crimes and prevention efforts, social and economic factors and even pure crime [1]. The mechanism of the purpose behind CCTV is to reduce crime based on assumptions, namely: Prevention, to attempt to warn of the risks that occur. Application efficiency, used for monitoring police precautions. Self-discipline, to change the nature of the risk of doing evil. The presence of protectors, CCTV as a protector is useful to reduce crime. Detection, CCTV cameras capture images can make even large-scale criminal acts such as kidnappings and killings help arrest efforts [2]. In applications that require observation, such as supervision, it is necessary to capture images wide with the camera as little as possible. Wide-angle cameras help in this regard, but the effect makes large image distortion. For image systems that require a wide field of view, the perspective from Wide-Angle may not be suitable for visualization needs. However, recovery efforts from distortion parameters facilitate image mapping using other projection models. For example, for a wide angle system, panoramic projection models or stereoscopic models may be more suitable [3]. In general, CCTV has a hidden camera and a DVR (Digital Video Recorder) that records the events seen by the camera. As time goes by, CCTV changes shape to become more modern and safer. Even now Android smartphones can be used as CCTV by using a Wi-Fi connection on one network or using an internet connection that we can manage remotely [4]. Creative Industry is an industry that is based on high creative power and innovation, in order to produce new and different quality products. Creative industries create works through ideas, ideas by generating more value through the work produced. Through quality, unique products that are more acceptable to consumers [5]. Smartphones or Handheld Personal Computers is an evolution of portable computers and information technology. This tool is equipped with network
connectivity and supports the installation of new applications. Smart phones have the potential to make new habits related to the internet [6]. Just as smartphone personal computers have the same function, the fundamental difference is the use of batteries compared to desktop computers. This affects the usage limits and the need for power consumption management to avoid critical batteries that will affect device performance. One of the power consumption in terms of Network, testing is done by comparing the GPRS connection with Wi-Fi. In the first test showed that the use of batteries using Wi-Fi obtained greater results than GPRS, while the subsequent testing used a metal device cover with a thickness of 2mm. The results are inversely proportional to the previous test; GPRS uses more battery power than Wi-Fi which only decreases 10dBm in signal strength while battery power consumption is not much different from before [7]. The use of cellphones becomes an obligation in terms of communication and industry. However, there will be problems if the use of cell phones together with other activities, for example in driving a car, the cellphone can fall when the bend causes damage. Findings of cellphone holders or holders with closeness, width and length that can be adjusted. Allows various sizes of cellphones sold on the market to be suitable for use [8]. The general view of the internet universe consists of two levels of hierarchy, the top level is the internet as a whole, and the lower level is the network of individuals with each having their network number. The internet does not have a hierarchical topology but has hierarchical addressing. In these two levels, each sees the network as a whole, where each can be likened to a "black box" that is interconnected. After these two levels proved to be simple and powerful in their use, some organizations felt that there were things that were lacking, and they added a third level to internet addresses. In this case, subnet addressing appears. [9] Internet-based networks are currently built using TCP / IP (Transmission Control Protocol / Internet Protocol) and related standards. TCP provides application services, but network infrastructure is adapted to the IP portion of TCP / IP. Some features that are visible include: can be implemented to different technologies and different brands, hide the identity of hardware, allow autonomous networks to be built and managed independently, and become easy to interconnect with routers to build larger networks, and open standards [10].

The purpose of this study is to prove that using simple equipment can make a useful thing. Especially for security and surveillance using smartphones.

2. Method
The author conducted a study on one of the houses in the mountains of Bandung Regency, West Java. The study was conducted on Monday 8 September 2018. The author uses one of the applications available on Google Play, namely the IP Webcam to make mobile camera broadcasts to the connected network. The cellphone used is a smart cellphone type X cellphone with an Android operating system version of Nougat with a RAM memory capacity of 2GB with a quality 13MP camera. The network protocol used is ipv4 because for local scale is more efficient, for network addressing it is expected to use a static IP than dynamic IP so that there is no change in the IP address for the cellphone if there is a network reset.

The first thing to do is to find a position for the placement of a security camera in a room. The placement position also takes into account the signal strength of the wireless router, so testing the strength of the wireless network using third-party applications are also done. Next is the making of a blueprint or design holder for a smartphone that will be used as a surveillance camera. The last is to test with video broadcasts from cellphone cameras to networks that will be used for surveillance.

3. Results and discussion
Innovation in technology is growing, especially with the industrial revolution 4.0. The author will try to provide a surveillance camera / CCTV design using devices that are easy to obtain. First is how to make the cellphone located on the place where the CCTV is located, then it takes a cellphone holder to attach it to the wood or concrete wall. The use of holders can be modified with wood or plastic polypropylene. Design holder that can be used to make a cellphone into CCTV mounted on the wall Figure 1 until figure 4.
The holder’s requirements for cellphones attached to the wall are mobile phones that can be moved to adjust the camera’s view. This is used to find the best visibility for room monitoring which is usually placed in the corner of the room with a slope of an angle of 45 degrees (Figure 5). The holder is also better able to set the buffer scale so that any cellphone can use it.
After choosing the next placement is to make cabling for cellphone resources with a charger, because this cellphone will be active for 24 hours full of much-needed resource use. The network topology used is to use a wireless network, by connecting to available local networks using a router. As shown by (Figure 6).

![Network topology](image)

**Figure 6.** Network topology.

In testing the cellphone battery indicator on the use of the camera's power consumption in a state connected to the power source gets a positive result; in other words, the cellphone battery still charges. This results in the consumption of cellphones not greater than the current of the charger. After the cellphone with the network is connected, supervision can be done by opening the IP address of the cellphone along with the IP port. For dynamic IP usage, there is information about the IP address and port to connect to the cellphone, as shown by (Figure 7).

![Phone view](image)

**Figure 7.** Phone view.

Monitoring results can be performed by activating the periodic recording feature every time interval specified. Recordings are stored on cellphone storage. Therefore, the use of storage cards with a larger capacity will be better. Connection testing is done by trying a connected cellphone at a distance of ± 5 meters on the same floor and a different floor with a concrete floor blocked. On the same floor, the results showed that the video was still clearly visible with the strength of Wi-Fi relatively stable (Figure 8), while for different
floors the results of the video seemed a little broken (Figure 9) but this can be overcome by decreasing the quality of the recording video. This result is directly proportional to the strength of the connected network signal and the bandwidth of each device used, the greater the bandwidth, the clearer the image can be produced.

![Figure 8. Wi-Fi strength 1](image1)

![Figure 9. Wi-Fi strength 2.](image2)

However, the results of cellphone camera coverage still lack for surveillance (Figure 10), so the authors use additional wide-lenses attached to the cellphone camera.

![Figure 10. Without Wide-Lens.](image3)

Wide-lens installation can be directly paired using a clamp or can be affixed to the front of the cellphone camera; this is so that the lens does not fall if a shock hits it. The results of the comparison of sight range without using a lens and wearing a lens are large (Figure 11).

![Figure 11. With Wide-Lens.](image4)
The quality of the lens influences the quality of the resulting image, in practice, the authors only use standard-quality Wide-Lens, the drawback is that there is still a blur effect on the side of the image, but for surveillance cameras, it is more than enough.

4. Conclusion
The use of cellphones other than being used as a communication device can also be used as a surveillance camera. The basic system of smartphones has been designed as well as desktop computers, so it is very easy to set up and use to connect with computer devices. This design can also be used if there is a cellphone or device that has not been used, then its use can be utilized, in addition to utilizing existing technology this design can be used as home security. The results of this study can be used by various parties or can be used as a reference in the use of technology and information.

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