Image capture device based on Internet of Thing (IoT) technology

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Abstract. Tracing stolen cattle in the Lombok Tengah regency of NTB province is carried out by tracing footprints and waiting at certain location points which are considered as the route to be traversed or the final destination of cattle theft which is called "Ngendeng". Ngendeng is carried out day and night from the time the livestock is declared missing until the livestock is found or the potential to be found is considered lost. The problem that occurs in Ngendeng's activities is that it endangers the safety of life if there is a clash with thieves and a decrease in health for the people of Ngendeng. To replace the role of the community in doing Ngendeng, an Internet of Things (IoT) devices for image capturing was developed. The device can take a picture if someone passes through the front of the device then it is sent to the Telegram account of the District Police and the Community telegram account. The development of devices uses the Research and Development (R&D) method to produce products, and test the product's effectiveness. The placement of the devices will be distributed in three (3) sub-districts in Lombok Tengah Regency based on the results of data analysis obtained from the results of data enumeration. The method used in tracing the point of placement of devices in each sub-district was using the Participatory Rural Appraisal (PRA) method. So that it is found the most frequently traversed point (very potential) to place IoT-based image capture devices as an effort to reduce the crime of cattle theft in Lombok Tengah Regency.

1. Introduction

Advances in information technology affect various aspects of human life, resulting in positive impacts on technological developments in society [1]. To replace the role of the community in doing Ngendeng, technology was developed in the form of an Internet of Things (IoT) -based image capture devices that can take pictures if someone passes the front of the device from the OV2460 2 Mega Pixel camera. Added 20 Infrared LEDs for clear shooting results in dark conditions and the Neo7 GPS module to get the coordinates of the tool. The image files and coordinates obtained are then sent to the Telegram account of the District Police, Community telegram accounts. The coordinates are sent in a text message that has been combined with the Googlemap link so that if the message is Tap it will open Googlemap as a location search guide. The packaging of the tool box is made similar to pieces of logs for disguise, so that if the tool is found by a thief or someone it will be considered a piece of wood.

2. Methodology

The research method used in this research is the Research and Development (R&D) method for development and the PRA method is used for the implementation and evaluation stages. a picture of the research flow as shown in Figure 1 below.
The development of devices uses the Research and Development (R&D) method to produce products and test the effectiveness of the product [2]. The placement of the devices will be distributed in three (3) districts in Lombok Tengah Regency based on the results of data analysis obtained from the results of data enumeration. The method used in tracing the point of placement of tools in each sub-district was using the Participatory Rural Appraisal (PRA) method. PRA is an approach method in the process of empowering and increasing community participation, which emphasizes community involvement in all activities [3], in tracing the point where tools are placed involving the local police and communities who have knowledge of the path to be traversed or the ultimate goal of cattle theft.

2.1 Potentials and problems
Based on data from the Animal Husbandry and Animal Health Service of Nusa Tenggara Barat Province, the livestock population has increased, especially in Lombok Tengah Regency, one of the samples used is Livestock, based on data in 2019 the number of livestock from twelve (12) sub-districts was 176,983, an increase from the previous year. in 2018 there were 173,266 heads [4]. This increase in number provides an opportunity for criminal acts in the form of theft, until 2020 there are still frequent theft of livestock in the Lombok Tengah Regency of Nusa Tenggara Barat province [5]. As much as 90% of theft is still carried out by bringing livestock through rice fields and gardens and 10% using vehicles. The losses resulting from this criminal act ranged from fifteen (15) to thirty-five (35) million for each lost livestock. Tracing stolen livestock in the Lombok Tengah area of NTB province is carried out by tracing footprints and waiting at certain location points which are considered as the route to be traversed or the final destination of cattle theft, called Ngendeng. The problem that occurs in Ngendeng's activities is that it endangers the safety of life if there is a clash with thieves and a decrease in health for the people of Ngendeng.

2.2 Data Collection
Data collection was carried out by interviewing twelve (12) Sector Police in Lombok Tengah to obtain data on livestock theft in the last three (3) years. Interviews were also conducted with the community or livestock groups regarding their willingness to use the devices produced during the theft of livestock. The data obtained were then carried out by processing statistical data on the ranking of the level of livestock theft and the ranking of the level of community willingness in the implementation of
this study. three (3) districts are selected based on the highest rate of livestock theft and the willingness of herd to use devices.

3. Result and Discussion
3.1 Product Design
The performance targeted by IoT-based devices is having a display of natural objects, being able to capture images in bright and dark conditions, sending images and linking the coordinates of the location of the image. In order to fulfill the performance of the research tool, the following three (3) designs were carried out.

1. Circuit Schematic Design

![Figure 3. Electronic Circuit Schematic](image)

2. Box Design
The box is designed to resemble a cut tree trunk to trick the thief or the person who finds the tool. The box material is made of 4 inch AW PVC pipe then covered with bark. On the front are the Peer Motions, Camera and Infrared LED components. On the back there is a Power button, a Micro USB port for charging batteries, a USB port for programming tools, a Reset button and LED for battery indicator and internet connection. The top is placed the Ubox Neo 7 GPS antenna.

![Figure 4. Front view and Figure 4b rear view](image)
3. Device Work Process Flowchart Design

![Device Work Process Flowchart](image)

If the device detects livestock, the device will take photos and coordinate points then send pictures and coordinate messages. The coordinate message is included with the Google map link so that by tapping on the message it will lead your cellphone or laptop device to open the Google map application for location verification. The Device can be a substitute for humans in stalking/Ngendeng and reporting the route of livestock theft.

3.2 Design Validation

Design validation was carried out by conducting FGDs with Lombok IoT experts, the police and the community. IoT experts will validate or correct the circuit scheme and use the appropriate component/module type for the planned performance of the tool. The police and the community validate the performance of the tool and design the appearance of the tool. In design validation activities, direct improvements are made to the design, not using the validation form as a note.

4. Sustainable concept

a. The tracing of stolen cattle in the Lombok Tengah area of NTB province is carried out by tracing footprints and waiting at certain location points which are considered as the route to be traversed or the final destination of cattle theft which is called "Ngendeng". Ngendeng is carried out day and night from the time the cattle are declared missing until the cattle are found or the potential to be found is considered lost. The problem that occurs in Ngendeng's activities is that it endangers the safety of life if there is a clash with thieves and a decrease in health for the people of Ngendeng.
To replace the role of the community in doing Ngendeng, an Internet of Things (IoT) based image capture device was developed.

b. Development of devices using the Research and Development (R&D) method to produce products, and to test the effectiveness of the product. The device is designed to resemble a cut tree trunk to trick the thief or the person who finds the device. The device material is made of 4 Inch AW PVC pipe then covered with bark. On the front are the Peer Motions, Camera and Infrared LED components. On the back there is a Power button, a Micro USB port for charging batteries, a USB port for programming tools, a Reset button and LED for battery indicator and internet connection. At the top is placed the Ubox Neo 7 GPS antenna to get the coordinates of the instrument.

c. The placement of devices will be distributed in three (3) sub-districts in Lombok Tengah Regency based on the results of data analysis obtained from the results of data enumeration. The method used in tracing the point of placement of tools in each sub-district was using the Participatory Rural Appraisal (PRA) method. So that it is found the most frequently traversed point (very potential) to place IoT-based image capture tools as an effort to reduce the crime of cattle theft in Lombok Tengah Regency.

Figure 6. The Cycle of Using IoT-Based Image Capture

1. The device can take pictures if someone passes the front of the device.
2. The image files and coordinate points obtained are then sent to the Telegram account of the District Police, Community telegram accounts.
3. The coordinate point is sent in a text message that has been combined with the Google map link so that if the message is Tap, it will open Google map as a location search guide. So that the IoT-based image capture device is an effort to reduce the crime of cattle theft in Lombok Tengah Regency.
4. Conclusion

Based on the FGD with Lombok IoT experts, the police, and the community, it can be concluded that this tool can function properly, starting from taking pictures, sending images and the coordinates of the location of criminal points so that it has great potential in helping find stolen livestock and increasing the number of thieves who was arrested as an effort to reduce the crime of cattle theft in Lombok Tengah Regency.

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