

# Camera Distance Effect For Smart Detection Littering

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**Submission date:** 19-Jun-2024 02:31PM (UTC+0700)

**Submission ID:** 2389142613

**File name:** Camera\_Distance\_Effect\_For\_Smart\_Detection\_Littering.pdf (1.08M)

**Word count:** 2134

**Character count:** 10994



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Cite as: [AIP Conference Proceedings 2217](#), 030161 (2020); <https://doi.org/10.1063/5.0001680>

Published Online: 14 April 2020

Dedy Ariyanto, Yusuf Ari Bahtiar, Muhammad Taufik, and Trie Handayani



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# Camera Distance Effect For Smart Detection Littering

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**Abstract.** The behavior of littering is mostly done by Indonesian people. Community indifferently throws out garbage not in the place provided. Seen, in public area, there is a lot of garbage scattered out. This makes the environment dirty, uncomfortable and unhealthy. There needs to be an effort to change the bad habits of this society. By way of being reminded when people throw litter. So that there is a reminder that it will form a mindset from the community. This can change the mindset, to care more about the environment. The camera is used as a sensor to detect people who litter. Image processing needs to be done to determine the next step. The camera is placed in an upright position, also affecting the detection area, where the limited camera resolution makes the detection distance limited. Meanwhile, the position of the sun also contributes to changing the resolution of objects. From the results of the experiments, the detection distance between morning, afternoon and evening has a different value. At distances less than 120 meters and more than 280 meters were not detected, and the highest solar intensity value just above the equator, it's in more than 950x100 luxs.

## INTRODUCTION

### Lack of Consciousness to Disposes Garbage on Its Place

The behavior of littering is mostly done by Indonesian people. According to Ministry of Health Research Data, It is known that only 20 percent of the total Indonesian people care about hygiene and health [2]. That shows the behavior was not care about the environment is still a habit. It can be seen that many people indifferently dispose of food packages not in the trash can, it is shown in Figure 1. Littering has become a habit in Indonesian society. The habit of littering if ignoring will cause many problems, from health to environmental damage.



**FIGURE 1.** Garbage is not disposed on its place at zero point area of Yogyakarta, it's seen on June 22, 2019

There have been several attempts made to change the behavior of littering. Starting from the Government and academics have made efforts to change this behavior. Yogyakarta Regional Regulation No. 18 in the year of 2002 concerned about cleanliness management, for people who throw littering would be fined around Rp. 2,000,000 [2]. In addition to the local regulation, there have been some efforts made by academics. Given pictures of cartoon characters in the trash can, as an effort to instill the habit of throwing trash in its place for children [1]. Obviously, Threatening fine from the local regulation has not been able to change the behavior of littering while giving pictures in the trash can is only limited to children [7]. Then other efforts can be made by reminding people when littering.

That directly and continuously reminder are expected could change people's mindset. Mindset will be formed through habits that are done repeatedly [6]. To being able to leave it, it needs a way to detect people who throwing trash just using a camera [4]. Camera's capture could have been processed by image processing so far. Placement of prototype that specific of camera have to obtain with the light intensity. Tung *et al*, performance with network camera image are short time interval apart and distributed equally between day and night time, YOLO can't consistently detect object from the same camera, so that we can use vision program to improve in large-scale applications [3]. The algorithm need to estimate and to filter the density for operating in different weather and condition [8]. In this experiment, we are concerned to research the lux intensity in around of camera which placed in 1.5 meter height from ground using pole. It is related to give instruction for litter to take his garbage to put in to the trash can have been provided.

## METHODS

Experimental Methods is used to measure the intensity of light from sun by varying object distance to the camera. Otherwise, describing camera's properties and the other parts such as using Raspberry Pi to processing image are needed to support this experimetal methods. As research objects such as bottle caps. Bottle caps are processed according to the specified color, which is orange according to the program that was made. Then check each detected area starting from 0 meters until the maximum is detected.

### Web Camera

A web camera is one type of camera that is widely marketed. Webcams cameras are designed by real-time cameras whose images can be viewed through Waring Wera Wanua, e.g instant messaging processing programs or video calling applications [5]. That type of web camera used in this image processing is Logitech c992 which specification is shown in Figure 2.



Specification	
Max Resolution	1080p/30fps - 720p/60fps
Focus Type	autofocus
Lens Technology	Full HD glass
Internal Microphone	stereo
FoV:	78°

FIGURE 2. Web camera and its specifications

### Raspberry Pi 3 Model B+

Raspberry is one of microcontroller family. It is also called as mini computer and has an operating system like Windows and Linux. The new version of Raspberry pi is Raspberry 3 (Figure 3.) that used in this experiment to process image so far. Pi 3B+'s shape and size are similar to Pi 3B. Raspberry Pi 3 Model B+ was launched with a faster 1.4 GHz processor and a three-times faster gigabit Ethernet (throughput limited to ca. 300 Mbit/s by the internal USB 2.0 connection) or 2.4 / 5 GHz dual-band 802.11ac Wi-Fi (100 Mbit/s) [5]. Futhermore, it has heat sink for decreasing temperature and distribution heat better than version earlier, also support by dual band WLAN 5 GHz [5]. Phyton programming language is provided on Raspberry to process image from camera. The image is shown on LCD screen that connect to it.



FIGURE 3. Raspberry Pi Model 3 B+

### Light Meter

This experiment is related to the sun light distribution and intensity. Therefore, the camera is used in outdoor, so that it causes light intensity interferences coming from the camera and surrounding. Then we can use luxmeter that has wide range of light intensity scale to estimate the large amount of surrounding light intensity. Light meter LX used in this experiment to estimate sun intensity was shown in Figure 4.



FIGURE 4. Light meter LX used in this experiment to estimate a large amount of sun intensity

### Camera Placement

Camera can not be placed stand alone, it mounts to a pole so that the camera easily detects an object as shown in the Figure 5. Camera placed 1.5 meters in height from ground and it put in the box with other electronics componen such as Raspberry, audio, etc. Other function of the bos are protecting camera etc from rain and sun's heat as well.

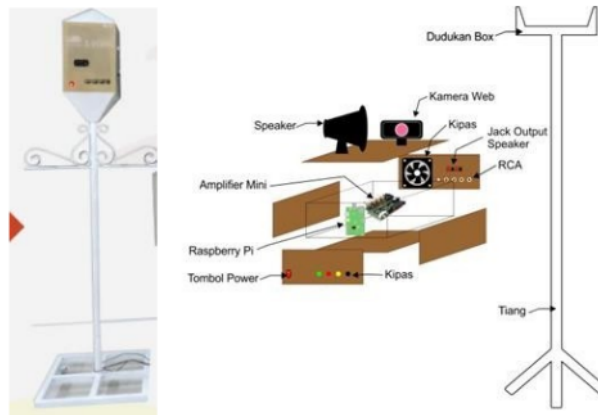


FIGURE 5. Placement of camera for detecting an object

## RESULT AND DISCUSSION

### Distance Detection of Camera

Using cameras for detection the garbage disposal has limited by a distance such limitation in human eyes seeing. Light is the greatest external disturbances of all. The maximum of camera distance detection around 287 meters that took place in the morning. Range of the camera distance can detect an object is in the following.

TABLE 1. Detection distance of camera in the Morning (10 AM)

Distance (meter)	Camera Detection
< 120	Undetected
122 – 165	High
166 – 230	Medium
231 - 287	Low
> 287	Undetected

TABLE 2. Detection Distance in the Afternoon (1 PM)

Distance (meter)	Camera Detection
< 120	Undetected
122 – 175	High
176 – 245	Medium
246 – 298	Low
> 298	Undetected

TABLE 3. Detection Distance in the Evening (4 PM)

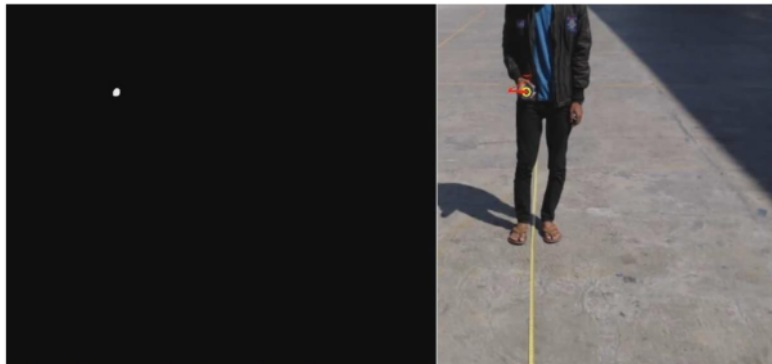
Distance (meter)	Camera Detection
< 120	Undetected
122 – 166	High
167 – 240	Medium
241 – 280	Low
> 280	Undetected



In the next section, image processing from the camera that produce by Raspberry shown in the following figure. There are three position to make differeny object that can be detect, from the far of camera till near the camera's area. This figure shown from heighth's object 0.6 meters from ground.



**FIGURE 6.** Detection Results From a Distance of 287 cm



**FIGURE 7.** Detection Results From a Distance of 220 cm



**FIGURE 8.** Detection Results from a distance of 130 cm



The table in following shows that the maximum distance that can be detected when the object below is 227 cm. For objects out of sight when the camera is less than 145 cm. This is because the camera is above with a height of 180 above the ground, which causes the distance becomes longer and the angle becomes narrower when the object is below.

**TABLE 4.** Detection Distance in the Average Day with the Object Below

Distance (meter)	Camera Detection
< 145	Undetected
145 – 163	High
164 – 230	Medium
231 – 277	Low
> 277	Undetected

In the figure shows the results of detection of existing waste. For garbage detection is to detect the color on the bottle cap. Visible the farther the object from the camera the smaller the detection results which leads to undetectable trash. Also seen getting closer to the detection camera the greater. Which later will not be detected because it comes out of the camera area. Apart from the light intensity the detection distance also varies when the object is at the base.



**FIGURE 9.** Detection Results from Distance 227 with the Object Below



**FIGURE 10.** Detection Results From a Distance of 145 with the Object Below

We also show about the lux intensity from experiment in the table 5.

**TABLE 5.** Detection Light Intensity or Lux from Sun that Effect Camera with Distance 1 – 3 meters

Day	Time	Lux of height = 0.6 meter (value x 100)	Lux of height = 0.6 meter (value x 100)
Morning	10 AM	640 – 669	707 – 727
Afternoon	1 PM	945 - 969	905 – 894
Evening	4 PM	524 - 543	501 - 561

## CONCLUSION

The conclusions obtained from the experiments carried out first value of light intensity affect the detection distance. The higher the value of the intensity of the light the detection distance becomes further away. Likewise when the intensity is lower the detection distance is getting shorter. Apart from the influence of the intensity of the light is also influenced by the position of the object. The more objects aligned with the camera the detection distance will be longer. And the greater the angle of the camera with the object detection distance is getting shorter.

## ACKNOWLEDGMENTS

We acknowledge to the Ministry of Research and Technology that has funded this research and for the Yogyakarta National Institute of Technology Campus, which has supported funding and laboratory facilities as well. We also say thanks to the Head of the Electro Laboratories who gave laboratory use permits and provided guidance. We thank to the Supervising lecturer, Mrs. Trie Handayani ST. M.Kom who has been guiding during the research others who involved in this project.

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