Yolo Method and Wifi Signal Capture on Drones to Detect Missing Victims

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Abstract. *Increasingly developing technology has opened up new opportunities in various aspects of life, including in military operations. The research focuses on developing to detect Yolo and Wifi signals using drones as a search and rescue tool for missing soldiers on the field of operations. The loss of a soldier on a military mission poses a great risk to both the missing individual and the rescue team. Therefore, technological solutions that are able to provide fast and accurate results are needed. The method developed involves the use of Raspberry Pi devices and cameras on drones to take real-time images and Wifi signal capture and Nodemcu ESP8266 on drones supported by Global Positioning System processes to improve location tracking. The system works by detecting images from Raspberry Pi devices and WiFi signals from Nodemcu ESP8266 devices carried by soldiers the Telegram application to get victim coordination. Therefore, it aims to increase responsiveness and effectiveness in rescuing victims of missing soldiers on the battlefield, through the application of advanced Yolo technology and the integration of real-time communication.*

Keywords: ***Drone, Raspberry Pi, Camera, Yolo Method, Global Positioning System, nodemcu ESP8266, arduino IDE, telegram.***

I. Introduction

The presence of soldiers on a military mission often involves high risks, especially in situations of conflict or natural disasters. One of the critical challenges in military operations is losing contact with soldiers in the field, which can be caused by various factors such as bad weather, difficult terrain, or even enemy attacks. To increase the efficiency and effectiveness of military operations, it is critical to have a system that can detect and track missing soldiers quickly and accurately.
With advances in Drone technology and digital image processing techniques and WiFi signals, this new method was developed to utilize the aerial capabilities of drones in collecting visual data and signals from large areas more quickly, safely and efficiently. Drones can fly over areas that are difficult to reach or dangerous for ground personnel, while installed cameras and sensors can take pictures/video and capture signals that may come from missing soldiers[1]. By using a drone equipped with an image processing system based on the You Only Look Once (Yolo) method, and capturing Wifi signals to determine the victim's position and locations that are difficult to reach. the victim search process can become more efficient and faster. The Yolo method enables real-time object detection with high accuracy, which is very necessary in critical situations such as the search for missing soldiers[2].
Based on the problems in previous research, the researcher will develop a convergent communication method needed for the process of capturing WiFi signals and

N. L. Husni et al. (eds.), *Proceedings of the 8th FIRST 2024 International Conference on Global Innovations (FIRST-ESCSI 2024)*, Advances in Engineering Research 261,
https://doi.org/10.2991/978-94-6463-678-9_5

implementing it by processing image objects from victims, where several reflections from other objects under the rubble can receive victim detection.

II. Method

Research flow is a chronological structure of the processes carried out in research work to focus problems and facilitate the achievement of research objectives, including; Literature Study, Studying the method of capturing Wifi signals on drones to detect missing soldier victims. Designing a method for capturing WiFi signals on drones. After carrying out the literature study process, the next process is to design tools and methods. Tool Making Process: At this stage, we will create a system for the drone using the method of capturing the victim's WiFi signal. Data Retrieval Process After the tool making process is complete, the data collection process is then carried out on the tool.

You Only Look Once Version 3 (Yolov3) is one of the most popular algorithms for object detection in images. Compared to other object detection methods, Yolo is renowned for its very high speed and ability to perform real-time detection[3]. This test was carried out to find out how the Yolo method detects objects in real-team.

1. Data acquisition on Yolov3

The data used is a large dataset, namely COCO. This dataset consists of thousands of images that have been labeled with bounding boxes and object classes. The model then generalizes that knowledge to detect and classify objects in new images with high efficiency.

2. Model training

Use a framework like Darknet to train Yolov3 models. configure file.cfg as per screw detection requirements. Carry out training using a dataset that has been processed with a framework that supports Yolov3[4].

Model	Train	Test	mAP	FLOPS	FPS	Cfg	Weights
SSD300	COCO trainval	test-dev	41.2	-	46		link
SSD500	COCO trainval	test-dev	46.5	-	19		link
YOLOv2 608x608	COCO trainval	test-dev	48.1	62.94 Bn	40	cfg	weights
Tiny YOLO	COCO trainval	test-dev	23.7	5.41 Bn	244	cfg	weights
SSD321	COCO trainval	test-dev	45.4	-	16		link
DSSD321	COCO trainval	test-dev	46.1	-	12		link
R-FCN	COCO trainval	test-dev	51.9	-	12		link
SSD513	COCO trainval	test-dev	50.4	-	8		link
DSSD513	COCO trainval	test-dev	53.3	-	6		link
FPN FRCN	COCO trainval	test-dev	59.1	-	6		link
Retinanet-50-500	COCO trainval	test-dev	50.9	-	14		link
Retinanet-101-500	COCO trainval	test-dev	53.1	-	11		link
Retinanet-101-800	COCO trainval	test-dev	57.5	-	5		link
YOLOv3-320	COCO trainval	test-dev	51.5	38.97 Bn	45	cfg	weights
YOLOv3-416	COCO trainval	test-dev	55.3	65.86 Bn	35	cfg	weights
YOLOv3-608	COCO trainval	test-dev	57.9	140.69 Bn	20	cfg	weights
YOLOv3-tiny	COCO trainval	test-dev	33.1	5.56 Bn	220	cfg	weights
YOLOv3-spp	COCO trainval	test-dev	60.6	141.45 Bn	20	cfg	weights

Fig.1. Dataset COCO

3. Deployment

After the model has been successfully trained and tested, implement the model for use in the company's quality control process. The following are the results of testing the model for detecting objects [5].

III. Results and Discussion

The following are the results of test data that have been examined using the Rvnc Viewer and Telegram remote control applications as recipients of image results and coordinates of the victim's location.

Table 1. Testing wifi signal connection distance on Raspberry Pi

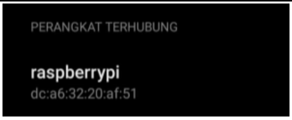
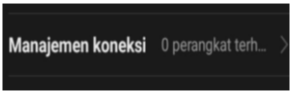
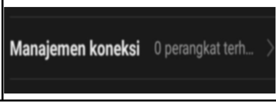
No	Distance (Meter)	Wifi Signal Conected	Status
1	3		Conecting
2	50		Not Conecting

Table 2. Testing the NodeMCUESP8266 wifi signal connection distance

No	Distance (Meter)	Tampilan Sinyal Wifi terhubung	Status
1	3		Conecting
2	40		Not Conecting

Next, it will connect to the Telegram application, then look for the bot that was created previously to find out the victim's location or coordination point, it's below figure 2.

Fig. 2. Tracked coordination view

When you are connected to a WiFi signal, then open the RVNC Viewer signal application to detect victims via the camera.

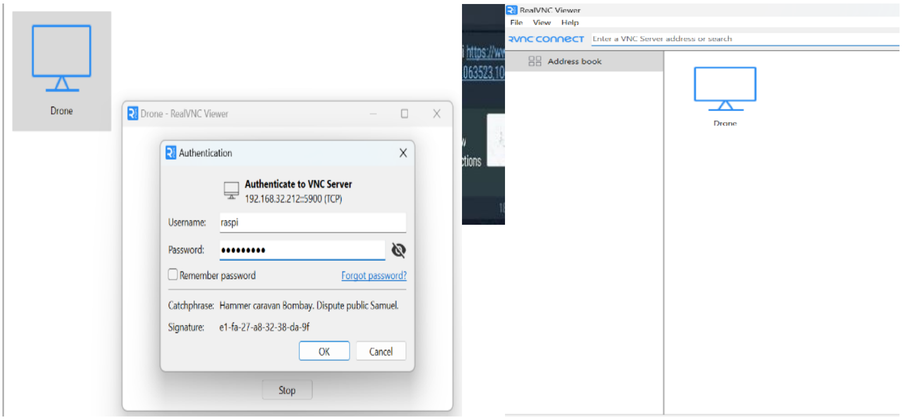


Fig.3. User name RVNC *Viewer*

After opening the RVNC Viewer, enter the username and password that have been created to display the camera on the drone which is functioning properly so that it can detect victims.

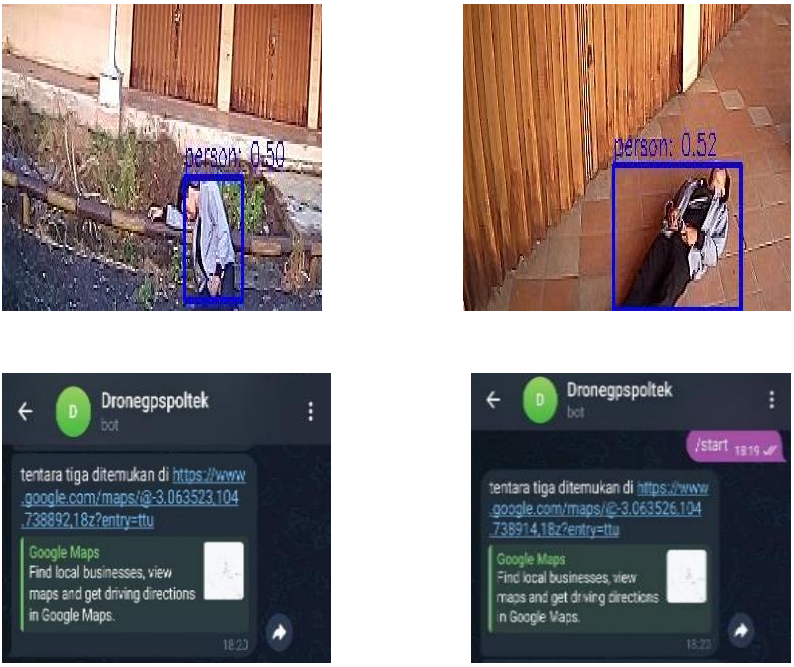


Fig.4. Victim detection test with the RVNC, Map applications and Yolov3 method

IV. Conclusion

Implementation of the Yolov3 method has a fast and accurate process because it has a high level of accuracy and good performance in detecting an object thanks to real-time. This wifi signal capture method requires the WiFi hotspot to be connected to the smartphone, then turn on the Raspberry Pi4 and Nodemcu ESP8266 and connect the camera using RVNC Viewer, once the victim is detected, the victim's image and location will be sent to Telegram.

The range of use of drones to detect the location of missing soldiers depends on a combination of technical and operational factors, including drone sensor capabilities, environmental conditions, and the quality of the data processed. Drones can cover large areas and provide efficient monitoring in searches, but their effective range can be affected by factors such as camera resolution, battery power and weather.

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