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A Study on Wide Area Situation Recognition by Aerial Image Analysis

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1. Introduction

In this paper, an automatic broad surveillance system is proposed to understand wide area situation. In our study, “wide area situation recognition” is not a fixed board field of view due to a camera which is attached to balloon, but it is intended to cover dynamically wide space from above to track the movement of a person.

Specific contents of the state recognition contain suspicious person detection and tracking, abnormalities detection, confirmation of crop growth state, life log auto-created, and so on. To achieve automatic processing of target tracking and state monitoring, a flying robot that is equipped with camera is used for getting moving images and a new image processing method by confusing multiple modules is proposed for analyzing aerial image and calculating the position and moving direction of the subject. Then, the position and moving direction are used to control flying robot to track the subject automatically.

2. Results and Discussions

In this study, we carry out experiments not only in simple background, but also in cluttered background. Furthermore, the subject can be separated correctly when there are multiple persons exist, and the subject can be tracked successfully. Success rate of each case is summarized in Table.1. The success rate of single person is 80.0% in simple background and 67.5% in cluttered background. When multiple persons exist, we carry out experiments twice, and the number of success is also twice, but we cannot say success rate is 100%. In future, we will perform more and more experiments to verify it.

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Table.1 Success rate of automatic control

Number (person)	Background	Number (experiment)	Number (success)	Success rate
Single	Simple	50	40	80.0%
	Cluttered	40	27	67.5%
Multiple		2	2	undecided

In our study, automatic control of quadcopter by analyzing aerial video image has been achieved. According to experiments result, effectiveness of proposed method and feasibility of proposed aerial shoot system can be verified. In simple background, we perform experiments 50 times, and there are 40 times successful. Reason for the failure is sudden acceleration or sudden changes in direction of the subject. In addition, if walking speed of the subject is fast, he may be soon out of the field of view. In cluttered background, we carry out experiments 40 times, and there are 27 times successful. If states of the subject change suddenly, he is away from the field of view. In addition, when AR.Drone rise up to search the subject again, if there are some patterns exist on the boundary or near to the position of the subject in last frame, false detections and tracking will occur. In future, we are to do a lot of experiments to calculate success rate of this case, and to test and verify the correctness and effectiveness of automatic tracking.

3. Conclusions

In our study, a unique aerial shoot system for status monitoring in wide area is proposed, and it is important to achieve practical realization in the future. From results of experiments, the moving direction of a particular person can be detected automatically and accurately. In addition, the effectiveness of aerial shoot system and proposed visual control method are verified. Furthermore, flying robot can be automatically controlled to track the target, and it further proved correctness and effectiveness of our aerial shoot system.