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UNMANNED AERIAL VEHICLE TRAJECTORY VISUALIZATION AND RECONSTRUCTION USING THE CHANGES IN SIGNIFICANT VARIABLES OVER TIME

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ABSTRACT

Advancements in using technology of unmanned aerial systems have made UAVs easier to operate, more affordable, and capable of performing a broader range of tasks.This has led to a large expansion of UAV applications in society, which has led to a large expansion of their applications. However, the main challenge is still to determine the precise location where the UAV would collect the desired data during an autonomous flight. This type of problem often occurs when the purpose of an unmanned aerial vehicle is to perform tasks that require high precision in measurements and when the UAV is not in optical sight. High-precision Global Navigation Satellite System (GNSS) sensors can be used to solve this problem, but this adds significant cost and operational complexity to the operation of a UAV. Also, these sensors cannot be used in urban areas, industrial zones or indoors because the signals become unreliable. By using RTK (real-time kinematic) GPS, sufficient precision is achieved for the reconstruction of the aircraft trajectory. This network operates on the principle of a base station, whose location is precisely determined, while the UAV is a moving body, so it is possible between these two objects to correct or remove errors that either one of them would observe themselves. The objective of this paper is to produce localization of a moving UAV, and 3D visualization its trajectory, using a telemetry data as well as error estimation.

REFERENCES

[1] He, F., T. Zhou, W. Xiong, S. Hasheminnasab, and A. Habib (2018). “Automated Aerial Triangulation for UAV-Based Mapping”. In: Remote Sensing 10.12, p. 1952.
[2] Jebara, T., A. Azarbayejani, and A. Pentland (1999). “3D structure from 2D motion”. In: IEEE Signal processing magazine 16.3, pp. 66–84.
[3] Ess, A., K. Schindler, B. Leibe, and L. Van Gool (2010). “Object Detection and Tracking for Autonomous Navigation in Dynamic Environments”. In: I. J. Robotic Res. 29, pp. 1707–1725. doi: 10.1177/0278364910365417.
[4] Hartley, R. and A. Zisserman (2003). Multiple view geometry in computer vision. Cambridge university press.