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Heliport Remote Safeguard System Based on Real-Time Stereovision 3D Reconstruction Algorithm

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Abstract : With the development of optics, electronics, and computers, vision systems are increasingly used in various areas of life, science, and industry. Vision systems have a huge number of applications. They can be used in quality control, object detection, data reading, e.g., QR-code, etc. A large part of them is used for measurement purposes. Some of them make it possible to obtain a 3D reconstruction of the tested objects or measurement areas. 3D reconstruction algorithms are mostly based on creating depth maps from data that can be acquired from active or passive methods. Due to the specific appliance in airfield technology, only passive methods are applicable because of other existing systems working on the site, which can be blinded on most spectral levels. Furthermore, reconstruction is required to work long distances ranging from hundreds of meters to tens of kilometers with low loss of accuracy even with harsh conditions such as fog, rain, or snow. In response to those requirements, HRESS (Heliport REmote Safeguard System) was developed; which main part is a rotational head with a two-camera stereovision rig gathering images around the head in 360 degrees along with stereovision 3D reconstruction and point cloud combination. The sub-pixel analysis introduced in the HRESS system makes it possible to obtain an increased distance measurement resolution and accuracy of about 3% for distances over one kilometer. Ultimately, this leads to more accurate and reliable measurement data in the form of a point cloud. Moreover, the program algorithm introduces operations enabling the filtering of erroneously collected data in the point cloud. All activities from the programming, mechanical and optical side are aimed at obtaining the most accurate 3D reconstruction of the environment in the measurement area.

Keywords : airfield monitoring, artificial intelligence, stereovision, 3D reconstruction
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