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Artificial recharge modeling using analytical and numerical solutions: Case study of Mnasra Aquifer, NW, Morocco

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The coastal area of Gharb Basin containing Mnasra Aquifer constitutes the only hydric resource for region in terms of domestic consumption and agricultural demand; which does not cease to increase. In addition, we recorded a sharp drop in the water table relatively to the last two decades, the problem of saline intrusion and an alarming deterioration in its quality that imposes a major management issue. At this level, we resort to the artificial recharge highlighting a set of techniques, tools and methods that can ensure the sustainability of exploitation in a rational framework despite the eventual constraints: Growth of population, extension of agricultural perimeters, and climate change. However, in order to proceed with the application of artificial recharge, the technique and the tools were accordingly chosen. We have to first identify the area or areas that are favorable for recharge; this requires a thorough knowledge of geology, pedology, hydrogeology and water quality. Indeed, the present work focuses on a comparative approach for two models: Numerical (hydrodynamic), using finite elements method and analytical solution (Glover) that has been programmed with C++ Language. Finally, the level of concordance between these solutions in space and time allows localizing the area that presents the best conditions for artificial recharge relative to the "Flow" and the "Recharge Time" needed to offset the hydraulic deficit of water balance of aquifer.

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Smart identification of overlapping strip pairs/regions for faster and reliable LiDAR system calibration

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Recently, laser scanning systems (airborne and terrestrial mobile mapping systems) have been established as a leading technology for collecting high density 3D information from an object's surface. The availability of generated surface models is very important for various industrial, military, environmental and public applications. The accuracy of the derived point cloud coordinates from a LiDAR system is affected by inherent systematic and random errors. The impact of random errors depends on the precision of the system's measurements, which comprise position and orientation information from the GPS/INS unit, mirror angles and ranges. On the other hand, systematic errors are mainly caused by biases in the mounting parameters (i.e., lever arm offset and boresight angles) relating the system components as well as biases in the system measurements (e.g., ranges and mirror angles). In order to ensure the geometric quality of the collected point cloud, the LiDAR systems should undergo a rigorous calibration procedure to estimate the system parameters that minimize the discrepancies between conjugate surface elements in overlapping LiDAR strips. The main objective of this paper is to look into an existing LiDAR system calibration technique, which is based on selection of overlapping regions between LiDAR strips and how to increase the efficiency of this technique by automatic selection of appropriate overlapping strip pairs, which should achieve the minimum optimal flight configuration that maximizes the impact of the discrepancies among conjugate surface elements in overlapping strips as well as automatic selection of regions within the appropriate overlapping strip pairs. The methodology of the proposed technique can be summarized as follows: First, the LiDAR strip pairs are grouped based on the flight configuration; second, appropriate overlapping strip pairs from each group is automatically selected; third, regions within the appropriate overlapping strip pairs are automatically selected based on their angles (slopes and aspects) and distribution; finally, the calibration procedure is applied. The experimental results have shown that the quality of the estimated parameters using the automatic selection is quite comparable to the estimated parameters using the manual selection while the proposed method is fully automated and much faster.

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