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Low Cost Webcam Camera and GNSS Integration for Updating Home Data Using AI Principles

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Abstract : PDAM (local water company) determines customer charges by considering the customer's building or house. Charges determination significantly affects PDAM income and customer costs because the PDAM applies a subsidy policy for customers classified as small households. Periodic updates are needed so that pricing is in line with the target. A thorough customer survey in Surabaya is needed to update customer building data. However, the survey that has been carried out so far has been by deploying officers to conduct one-by-one surveys for each PDAM customer. Surveys with this method require a lot of effort and cost. For this reason, this research offers a technology called moblie mapping, a mapping method that is more efficient in terms of time and cost. The use of this tool is also quite simple, where the device will be installed in the car so that it can record the surrounding buildings while the car is running. Mobile mapping technology generally uses lidar sensors equipped with GNSS, but this technology requires high costs. In overcoming this problem, this research develops low-cost mobile mapping technology using a webcam camera sensor added to the GNSS and IMU sensors. The camera used has specifications of 3MP with a resolution of 720 and a diagonal field of view of 78^{0}. The principle of this invention is to integrate four camera sensors, a GNSS webcam, and GPS to acquire photo data, which is equipped with location data (latitude, longitude) and IMU (roll, pitch, yaw). This device is also equipped with a tripod and a vacuum cleaner to attach to the car's roof so it doesn't fall off while running. The output data from this technology will be analyzed with artificial intelligence to reduce similar data (Cosine Similarity) and then classify building types. Data reduction is used to eliminate similar data and maintain the image that displays the complete house so that it can be processed for later classification of buildings. The AI method used is transfer learning by utilizing a trained model named VGG-16. From the analysis of similarity data, it was found that the data reduction reached 50%. Then georeferencing is done using the Google Maps API to get address information according to the coordinates in the data. After that, geographic join is done to link survey data with customer data already owned by PDAM Surya Sembada Surabaya.

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