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AUTOMATING ROAD FEATURE EXTRACTION PROCEDURE

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Geo-referenced digital images tak en by CCD cameras and integrated with GPS/INS data provide an efficient way for monitoring special objects with high resolution and visual capability in a h ighway/road/corridor inventory system. This research represents some techniques using a binocular/multiple viewing stereo vision system mounted on a mobile vehicle for extraction of spatial information and generation of GIS database on a static scene from a dynamic stereo image sequence. Although GPS/INS data provides a fundamental geo -reference of the camera/imagery motion, some outliers may still exist inside these motion orientation data and it may cause destructive influence on the final spatial result. To reduce this type of errors and refine the motion orientation, a motion recovery algorith m based on matching interest points can be applied and the computed result can b e compared with t he measured geo -reference data. Furthermore, some geometric conditi ons, such as epipolar, trifocal, and quadrifocal constraints, can be introduced to evaluate and/or to correct the measureme nt. Since any spatial object may appear on m ultiple images, an accuracy estimation method is described to search for the optimal resu lt based on the scene geometry utilizing error propagati on theory. Unlike conventional photogrammetr ic systems that use optical instruments and perform measurement on a very limited number of high resolution photos, a softcopy photogrammetric system u ses computer and large number of digital images. It is based on digital images and their orientation details to carry out photogra mmetric tasks in an interactive or automated way. This fast, accurate and convenient system consists of GUI, geometric functio nalities and real time results displaying in a graphics environment. It can process images to improve the quality in terms of grey level enhancement, edge sharpening and noise removal, perform the measurement and the triangulation to get 3D object coordina tes, as well as object surface descriptions, structured vector data, and attribute informatio n about those objects. A more importan t part in our research is the automatic/semi automatic object measurement and positioning. To this end, cross correlation mat ching, least squares matching, feature based road central line and road edge matching are studies and implemented. Since all the images are geo -referenced, epipolar geometry is applied for the purpose of improving the efficiency and the reliability of the matching. A feature -based matching method to acquire 3D linear feature is investigated and studied. Since the aut omatic information extraction from the stereo image sequence has become the most important research topic in our system, the main features to b e extracte d from our road corridor images are edges and cen ter lines of roads. Our research concentrate s on an automat ic edge extraction and positioning procedure. This studied procedure includes the steps and algorithms of edge detection, skeletonization, edge following, vectorization, and edge -based stereo matching. Some of the research results ha ve been implemented and integrated i nto a prototype researching system and a commercial softcopy system. Results indicate that the automatic highway/road/corrido r feature extraction is an efficient way for map production and GIS database generation.