Study of unmanned ground vehicle dynamic route simulation and control

廖建智、張ㄧ屏

E-mail: 321500@mail.dyu.edu.tw

ABSTRACT

The purpose of this study is to integrate the dynamic simulation methodologies for Unmanned Ground Vehicles, (UGV). The object-orient program was used to establish the UGV tracked vehicle traction and resistance in both drive motion and turning maneuver. According to different input road surface characteristic parameters, the UGV performance can be simulated by the method developed in this study and the effects of control and vehicle design parameters on performance parameters can also be validated and evaluated. The modules developed for tracked UGV including different sub-modules such as acceleration module, grade ability module, and dynamic path routing module which can predict the designed tracked UGV driving and handling performance. Different surface characteristic parameters and vehicle design parameters were compared to find the better tracked UGV performance to satisfy the specifications including the acceleration time, grade-ability and dynamic turning radius. Dynamic path routing modules were tested for different sine steer and double lane change conditions for different vehicle speeds. The results shown very good response characteristic which can reduce the time and expanse for tracked UGV development. Range radar for collision avoidance and other sensors including the vehicle speed, GPS vehicle location, 3-axis accelerometers and CCD camera images were sampled for different vehicle driving conditions with data fusion acquisition system. The data collected for different driving acceleration, and deceleration conditions can be used for future UGV and Adaptive Cruise Control, (ACC) system validation data base. The radar measurement data and the analysis process developed for discriminating preceding vehicles involve many technologies which will be needed for research and development later UGV controller.

Keywords : Tracked UGV Dynamic Drive and Turning Simulation, UGV Acceleration and Grade-ability Analysis, Dynamic Route Planning, UGV Sensor Fusion

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