

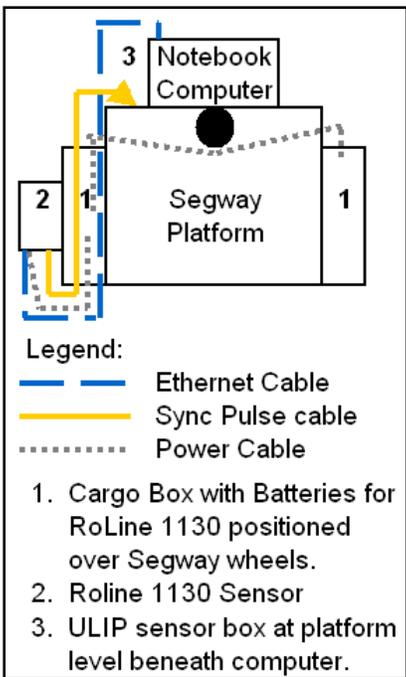


Starodub's Ultra-Light Inertial Profiler ULIPr (RoLine Laser Line Scan Version)

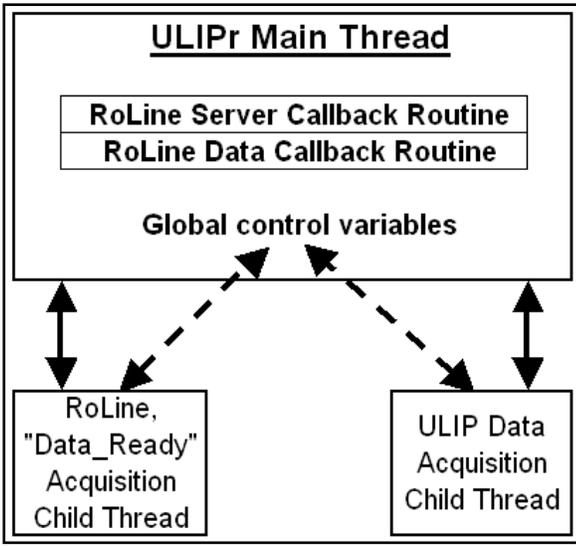


ULIP is a Segway™ Personal Transporter equipped with sensors and a computer for measuring a number of travel surface features. Depending on software and hardware options, ULIP can measure ride quality (as defined by the IRI standard), macro-texture (single longitudinal laser line), and Americans with Disabilities Act Application Guidelines measurements of sidewalks.

The ULIPr version of the Ultra-Light Inertial Profiler is designed to capture a three-dimensional representation of the travel surface (approximately 100 mm wide) at a resolution sufficient for three-dimensional texture and feature analysis. The “r” in ULIPr is for the RoLine 1130 laser line scan sensor used to acquire the travel surface information. The photograph shows the RoLine sensor as the yellow sensor in the lower-right of the photograph. The laser line scan is visible on the travel surface directly below the RoLine sensor. The ULIP sensor box analog sensors are sampled at 10,000 Hz (160,000 bytes/sec). The RoLine sensor has a sampling rate of 3,000 Hz (1,836,000 bytes/sec). The ULIPr was designed for the Federal Highway Administrations Office of Pavement Technology’s continuing work on surface texture and friction, and tire-pavement noise interaction.



As a result of how the ULIP sensor box and RoLine acquire data and the amount of data acquired, it was necessary to use a multi-threading approach to data acquisition. During ULIPr data acquisition, three program threads are running simultaneously. One child program thread acquires the data being streamed from the RoLine sensor while another child program thread acquires the ULIP sensor box data. In the main program thread, a callback function responds to the RoLine sensor calls.



Using the RoLine laser line scan measurements and the ULIP determined travel distance, a three dimensional surface with 1 mm longitudinal and transverse resolution can be constructed for advanced texture analysis. The image below shows a 72 mm by one-meter long laser height measurement of asphalt pavement.

