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Variable extraction cost modelling on high resolution terrain models

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A large and increasing volume of timber is extracted by forwarder, both in Europe and abroad. Most productivity functions for forwarding are derived from linear models and the distance dependent component is based on a constant drive speed. However, there are situations where a model which could calculate variable travel speeds according to actual terrain hinderances would provide a more accurate cost prognosis. A model was developed which calculates the pitch and roll a forwarder is exposed to anywhere on a surface as a function of the underlying terrain. Model parameters were obtained by fitting digital inclinometers on the bogey axles of a forwarder. Location, heading and travel speed was monitored by GPS. The parameters were then calibrated from the a high resolution LiDAR derived terrain model. The resulting driving speed model can be used in predicting realistic extraction costs for a surface with highly variable terrain conditions. Given that LiDAR terrain models are becoming more commonplace, this model has potential to provide detailed assessments of extraction cost at stand, regional or even national levels.