Bachelor or Master Project in the ASPARi research unit

Company and Location	University of Twente, Enschede
Type of project	Bachelor or Master depending on the scope and depth of the envisaged project
Title of topic	Developing Finite Element Models for monitoring pavement performance
Project background / context	The ASPARi unit at the Department of Construction Management and Engineering is currently studying the application of Fibre Optic Sensors (FOS) in asphalt to monitor certain process parameters. The FOS technology based on integrated photonics offers specific benefits including thermal mapping, damage detection and shape- and distributed sensing. Several challenges have been highlighted during previous pilot testing including the range of temperature detection capabilities, the loading/pressure sensing capabilities, preventing damage to the sensor and disturbing the asphalt layer during the installation process. The latter highlights the high-risk challenge of installing the sensor into the asphalt layer in a non-invasive manner (without disturbing the asphalt) so that temperature-, pressure-, shape detection and other parameters are accurately measured during the life cycle of the asphalt pavement. In short, sensors needs to be embedded in a manner conducive for highly accurate structural condition monitoring of the process. Four fibre optic lines were recently installed in an asphalt layer on the University of Twente's Boerderijweg. The sensors will be used to monitor and model strain (loading of vehicles) and the temperature of the asphalt layer during use. The focus of this proposed project is on developing pavement performance models so that the benefits of thermal mapping, damage detection, shape- and distributed sensing can be realised for constructed asphalt layers. Accurately monitoring key process parameters after construction using the appropriate sensor technology should provide more insight into the behaviour of the asphalt layer during its service life (especially during critical periods e.g. freeze-thaw cycles). This critical data can be used to develop strategies for extending the service life (durability) of asphalt pavements. Experience of working with and a willingness to learn Finite Element Modelling Software is recommended.
Research method	The actual scope and method relevant for this project will be defined in discussion with the supervisor(s).
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Start date	April 2018