New collision avoidance system promises to increase mining safety

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Mining sites are considered as some of the most dangerous workplaces in the world. The operation of large machines with limited visibility poses a constant threat to both miners and their machines, to the point where, in the USA, it is responsible for 22 % of all coal mining related fatalities. Industry and government officials increasingly agree that CAS could help curb this trend, and some legislative changes are already paving the way for their wider adoption in the US, India or South Africa.

To help the sector comply with upcoming regulations, the FEATUREFACE project has developed a new concept of CAS that uses

various technologies to exceed the accuracy and reliability of available systems. This initiative was funded under the European Commission's Research Fund for Coal and Steel (RFCS).

'The emergence of new legal regulations concerning mining-safety made it clear that this is an area which will play an important part in mechatronics development in the future,' project leader Dr. Clemens Hesch recalls about the decision to go ahead with the project. 'So with our expertise in signal processing we developed the necessary algorithms and technologies to enable safe working conditions in noisy environments.'

The FEATUREFACE technology builds on current CAS – which are mostly based on electro-magnetism – by coupling it with sensors utilising the different propagation speeds of radio-signals and sound to precisely determine the position of obstacles. Tests performed on actual machines demonstrated the accuracy and reliability of the concept, as miners could be localised precisely in the vicinity of a machine. When a miner approached in a dangerous way, the machine was immediately shut down.

'The potentially hazardous mining machine emits audible sound signals over a number of loudspeakers and a radio trigger signal. A small microphone placed on the miner's helmet detects these signals, calculates the run time (which is proportional to the distance) from the various loudspeakers and gets a precise overview of the position of all workers,' Dr. Hesch explains. The prototype can provide a 2D-localisation of miners within a range of 10 m with an accuracy of 10 cm, as well as determine a miner's distance within a range of 50 m.

Making this work in a real life scenario was undoubtedly the most difficult part of the process, as the high level of background noise found in mines and the movement of the involved parties – which causes

Doppler shifts – can render the signals illegible. LCM, one of the project partners, was able to overcome this issue with special signal processing algorithms which even allow the level of the measurement signals to be under that of ambient noise.

The next step for the FEATUREFACE consortium will be to obtain the ATEX-certification required for operation in coal mines along various safety certificates. Thanks to the diversity of consortium partners, which includes sensor developers, producers of mining machines and operators of mines, commercialisation is virtually guaranteed: Dr. Hesch says mining machine manufacturers will include the final system exclusively in their machines within the next one to two years.

More information: For further information, please visit FEATUREFACE: www.imr.rwth-aachen.de/index.p … /featureface_en.html

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