Image-based recognition of withdrawn coal and automatic control of drawing opening in LTCC face

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ABSTRACT (USE 'HEADING 1' STYLE)

300 word abstract here…(Use 'Body Text' style)

This paper summarizes the theoretical research and engineering practice of image-based recognition of withdrawn coal and automatic control of drawing opening in longwall top-coal caving (LTCC) face in the past few decades, which can be divided into four stages: manual stage, semi-automatic stage, automatic stage, intelligent stage. The advantages and disadvantages of mainstream technology or method for withdrawn coal recognition were analyzed, mainly including sound-based recognition, vibration-based recognition, image-based recognition, sensor-based recognition. Two kinds of methods used for controlling drawing opening were discussed, i.e. memory-based and degrees of freedom-based method. The following key issues related to image-based recognition of withdrawn coal and automatic control of drawing opening were proposed and discussed: influence mechanism of illuminance on coal-rock image features, coal-rock image processing and recognition model establishment, drawing mechemics of top-coal and packing machemics of withdrawn coal, blocks reconstruction and volume estimation, automatic equipment development, optimization of mining and caving technology, et al. The results show that the intelligent control of drawing opening in China has developed rapidly in the past few years, but it is still in its primary phases. In-depth theoretical research and extensive cross-integration with new generation of information technology can further guide the improvement of LTCC intelligent control of drawing opening and expand its application. With the rapid development of computer vision in artificial intelligence (AI), withdrawn coal recognition using image processing is the shape of things to come, which is the key to improving coal quality and reducing coal loss. Compared with other methods, image-based withdrawn coal recognition method is efficient, reliable and robust. Image-based intelligent control equipment with independent data capability can improve the reliability and efficiency of equipment, and greatly reduce construction and maintenance costs. Edge computing and edge AI are important directions of mining engineering development in the future.