Alternative Approach to the Machine Vision System Operating for Solving Industrial Control Issue

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Abstract : The paper considers an approach to a machine vision operating system combined with using a grid of light markers. This approach is used to solve several scientific and technical problems, such as measuring the capability of an apron feeder delivering coal from a lining return port to a conveyor in the technology of mining high coal releasing to a conveyor and prototyping an autonomous vehicle obstacle detection system. Primary verification of a method of calculating bulk material volume using three-dimensional modeling and validation in laboratory conditions with relative errors calculation were carried out. A method of calculating the capability of an apron feeder based on a machine vision system and a simplifying technology of a three-dimensional modelled examined measuring area with machine vision was offered. The proposed method allows measuring the volume of rock mass moved by an apron feeder using machine vision. This approach solves the volume control issue of coal produced by a feeder while working off high coal by lava complexes with release to a conveyor with accuracy applied for practical application. The developed mathematical apparatus for measuring feeder productivity in kg/s uses only basic mathematical functions such as addition, subtraction, multiplication, and division. Thus, this fact simplifies software development, and this fact expands the variety of microcontrollers and microcomputers suitable for performing tasks of calculating feeder capability. A feature of an obstacle detection issue is to correct distortions of the laser grid, which simplifies their detection. The paper presents algorithms for video camera image processing and autonomous vehicle model control based on obstacle detection machine vision systems. A sample fragment of obstacle detection at the moment of distortion with the laser grid is demonstrated.

Keywords : machine vision, machine vision operating system, light markers, measuring capability, obstacle detection system, autonomous transport