

Attributes for Developing a Database for Construction Information Interface

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Abstract: Earthwork is an operation that provides space for structures, and it takes up a large portion of the construction costs in a construction project. In large-scale earthwork, numerous types of construction equipment are used in the operation. The types of equipment should be selected based on the field conditions and the construction methods. These construction vehicles are constantly changing positions during the earthwork operation. Therefore, the equipment operators require effective communication to ensure the efficiency of the earthwork operation. All equipment operators should exchange information with the other equipment operators. Information should be exchanged continuously to support decision making and increase productivity during the earthwork operation at the construction site. This paper investigates the attributes required for an information interface between construction vehicles during an earthwork operation. This paper 1) discusses the importance of an information interface for construction vehicles in order to increase productivity during an earthwork operation, 2) analyses the types of attributes that need to be communicated between construction vehicles, and 3) provides a database that has been built for attribute control. The database built for the information interface between construction vehicles will enhance communication between vehicle operators. Table I shows the typical attributes that should be shared between the excavator operator and the dump truck operator. This information needs to be shared among the operators, as it helps them to plan the earthwork operation in a more efficient manner. A database has been developed to store this information in an entity relation diagram. A user-interface display environment is also developed to provide this information to the operators in the construction vehicles. The proposed interface can help exchange information effectively and facilitate a common understanding during the earthwork operation. For example, the vehicle operators will be aware of the planned volume, excavated volume, transportation time, and transportation numbers. As a part of this study, mobile devices, such as mobile phones and google glasses, will be used as hands-on communication tools.

Keywords: Construction vehicles, Information interface, Earthwork attribute, Data modeling

TABLE I
 KEY ATTRIBUTES FOR CONSTRUCTION EQUIPMENT IN EARTHWORK CONSTRUCTION

Construction equipment	Work	Work type		
		Site information	Work amount information	Construction equipment information
Excavator	Excavation, loading	Planned excavation volume (m ³) Planned excavation range (m ²) Planned excavation height (m) Excavation volume (m ³)	Excavation volume (m ³) Accumulated excavating volume (m ³) Cycle time (sec) Number of excavations Excavation time Loading time Loading volume (m ³) Number of excavators	Bucket capacity (m ³) Boom length (mm) Arm length (mm) Maximum turning radius (mm) Maximum lifting height (mm) Maximum digging depth (mm) Turning speed (rpm) Bucket turning angle (°) Maximum driving speed (km/h) Maximum hauling capacity (ton)
Dump truck	Transportation	Planned transportation volume (m ³) Transportation position Number of transports Driving route Transportation volume (m ³)	Transportation volume (m ³) Transportation distance (m) Loading volume (m ³) Accumulated loading volume (m ³) Cycle time (min) Loading time (sec) Turnaround time (sec) Unloading time (sec) Waiting time (sec) Covering and dismantling time (sec)	Loading capacity (m ³) Average driving speed (km/h) Maximum driving speed (km/h) Maximum loading volume (kg) Dumping angle (°)

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