

A Method of Drilling a Ground Using a Robotic Arm

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Abstract : Underground tunnel face bolting and pipe umbrella reinforcement are one of the most challenging tasks in construction whether industrial or not, and infrastructures such as roads or pipelines. It is one of the first sectors of economic activity in the world. Through a variety of soil and rock, a cyclic Conventional Tunneling Method (CTM) remains the best one for projects with highly variable ground conditions or shapes. CTM is the only alternative for the renovation of existing tunnels and creating emergency exit. During the drilling process, a wide variety of non-desired vibrations may arise, and a method using a robot arm is proposed. The main kinds of drilling through vibration here is the bit-bouncing phenomenon (resonant axial vibration). Hence, assisting the task by a robot arm may play an important role on drilling performances and security. We propose to control the axial-vibration phenomenon along the drillstring at a practical resonant frequency, and embed a Resonant Sonic Drilling Head (RSDH) as a robot end effector for drilling. Many questionable industry drilling criteria and stability are discussed in this paper.

Keywords : drilling, resonant vibration, robot arm, control

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