

A DEVELOPMENT OF STEWART PLATFORM BASED PIPE MANIPULATOR

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Abstract

The concrete pipe laying works are conducted in most of the construction sites. Several automated systems for the pipe laying works have been developed in advanced countries to improve productivity, safety, and quality, and to gain potential savings in costs. They mainly focused upon easy handling and clamping system for the pipes. The major objective of this research is to develop the stewart platform based teleoperated pipe manipulator prototype and to evaluate technical feasibility and productivity analysis of the system.

Keywords: concrete pipes, pipe installation, stewart platform, pipe manipulator, robot, construction automation

1 INTRODUCTION

Hume concrete pipes are commonly used for rainwater and sewage draining works in domestic and overseas construction. Workers are usually exposed to fatal accidents because they need to enter into the trench in order to install pipes. Increasing labor costs makes it hard to keep economic efficiency. However, the construction methods for pipe laying have not been improved over the years. For example, a hume concrete pipe of 800 mm in diameter weighs about 1.2 ton or more. There is potential danger, which is being caught in between materials or being hit by them during handling such heavy materials. The conventional construction method requires simple repetitive works, and quality of finished work is influenced by the experience and skill of workers. A new technical approach, the automated or teleoperated system, could be a challenging way to resolve the above issues.

The major objective of this research is to develop the stewart platform based teleoperated pipe manipulator prototype and to evaluate technical feasibility and productivity analysis of the system.

The major contents and procedure of the research are as follows:

- literature review on pipe installation and robotics
- investigation of pipe installation operation and productivity analysis
- configuration, design, and fabrication of the prototype
- field tests of the prototype
- feasible performance evaluation of the prototype

2. CURRENT OUTCOMES ON THE TOPIC

Several researches concerning the pipe laying works have been conducted in advanced countries to improve productivity and quality as well as safety, and to gain potential savings in costs. They mainly focused upon easy handling and clamping system for the pipes. The conventional pipe installation process is analyzed in order to identify the potential problems from safety and productivity point of view.

2.1 Current Research and Development