BOOK OF ABSTRACT

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Contents

Object Retracting Motion Planning for Dual Arm Robots

Takao MUROMAKI*
*Corresponding author: t.muromaki@maizuru-ct.ac.jp

Abstract: In this investigation, generation of object retracting motion for dual arm robot consisting of four links is discussed. In particular, a situation in which an object is moved over a frictional floor is considered. The objective is to find the retracting motion with the lowest required torque. First, the equation of motion for dual arm robot is derived. In the dynamic equation, the simplified linear friction model (classical model) is introduced. As a calculation of forward dynamics, the augmented formulation introducing Lagrange multipliers is applied. Then, an optimization problem is formulated to minimize the maximum torque at each joint. The design variables are the time history of joint torque. The time histories of torque are expressed in two ways: Fourier series and Chebyshev polynomial. The optimization problem is solved with an algorithm based on the Differential Evolution. As a result of the optimization, two torque patterns are obtained. One is the motion of pulling the object straight back in its initial position. The other is the motion of rotating the object to face vertically and then folding the arms while retracting the object. The latter motion reduces the maximum torque to about 60%.

Key words: Motion planning, Multibody dynamics, Friction, Differential Evolution

Practice of the Comprehensive Studies in Elementary and Junior High Schools

Yasuhito INOUE*, Ayaka KATO, Mio KOSAKE, Yasuhiko NAKAGAWA,
Masayo SHIBATA, Shunji SUZUKI, Kodai FUKUI, Natsuki KOBAYASHI,
Tsunekazu TOKIOKA and Shinichiro ONO
*Corresponding author: yinoue@maizuru-ct.ac.jp

Abstract: We have practiced classes on programming to elementary and junior high school students. Maizuru City was selected as an "SDGs Future City" by the Cabinet Office in 2019, and Elementary and junior high school students in Maizuru City are learning about the SDGs in the Comprehensive Studies more and more. The Maizuru Programming Contest was held jointly with the local government and companies as a place to present the student's learning achievements. In this report, we describe a case study of the Comprehensive Studies that we practiced in cooperation with Oura Elementary School, Wakaura Junior High School, and Takahama Junior High School in the fiscal year 2022.

Key words: Comprehensive Studies, SDGs, Programming Contest

Investigation of The Remains of Jajima Gasoline Storage

Satoshi MOHRI*, Masashi MAKINO, Yuriko IMAMURA,
Hiroki MANABE, Tatsuki HORII, Kenta MATSUZAKI, Mutsumi NAGAMINE,
Mirai TANIGUCHI and Ryuki NAGAO
*Corresponding author: s.mouri@maizuru-ct.ac.jp

Abstract: We investigated the remains of Jajima Gasoline Storage. The Jajima Gasoline Storage is remains of four tunnels. The investigation consisted of a hearing investigation with local resident, and an investigation involving landing on an Jajima island. In addition, we carried a drone survey in the tunnel.

From the result of the investigation, we were able to grasp part of the history, structure, structural performance and durability of the tunneled gasoline storage. In addition, it was confirmed that the combination of drones and advanced surveying technology (e.g., LiDAR) was effective in investigating war remains.

Key words: Maizuru, Navy, War remains, Historical research, Survey of remains, Drone, LiDAR