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| **Title:** | A binary hyper redundant elephant trunk like robot controlled by microcontroller and plc-wincc | | |
| **Author(s) Name:** | Mahadi Hasan, Rewat Bunchan, Bohez, Ashraful Islam | | |
| **Contact Email(s):** | mahadi@aiub.edu | | |
| **Published Journal Name:** | International Conference on Mechanical Engineering 2011 | | |
| **Type of Publication:** | International Conference | | |
| **Volume:** |  | Issue |  |
| **Publisher:** | Department of Mechanical Engineering, BUET | | |
| **Publication Date:** | Dec 18-20, 2011 | | |
| **ISSN:** |  | | |
| **DOI:** |  | | |
| **URL:** | <https://me.buet.ac.bd/icme/icme2011/protoc.htm#Related> | | |
| **Other Related Info.:** | Page ICME 11-RT-037 | | |
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| **Abstract:** |  |
| The word hyper-redundant refers to the robot manipulators that have a large or infinite degrees of kinematic redundancy. These robots resemble in shape and operation to snakes, elephant trunks, or tentacles and thus termed bio-inspired. Binary actuation, here in this study pneumatic cylinder, was the mechanical analogy to digital electronics, where actuators flip between two discrete states on and off. For applications where high repeatability, low cost, no necessity for feedback control and reasonable accuracy are required, hyper-redundant binary manipulators based on parallel platform are potential candidates. Here, in this study two different algorithms have been applied to control the robot, a 5-module binary robot built with the aim of demonstrating the potentials of hyper-redundant binary manipulator based on parallel mechanism. The Microcontroller, based on Genetic Algorithm (GA for solving inverse kinematics problem of the binary mechanism) along with a connecting board to the solenoid valves, was found to be a successful controller of the Elephant Trunk like Robot with some ineluctable drawbacks analyzed in detail. Afterword PLC controller was implemented where WINCC acted as the Human Machine Interface (HMI) and considered as a primary solver of the limitations appeared by the Microcontroller with remaining few constraints itself too. A 3-D model of the robot has been drawn in Solid Work and analyzed the motion of the robot with the help of COSMOS Motion Analysis in Solid Work 2010. The program for controlling 30 solenoid valves of 5 module robot (each module 6 cylinders) with 30 inputs and 30 outputs was written in PLC. Visual graphics for both manual and automatic mode control were drawn in WINCC. And finally a substantial comparison between two controllers was made. | |