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作品名稱
智慧型仿生機器蛇
Intelligent Bionic Snake Robot

隊伍名稱
無限可能 / Infinite Possibility

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作品摘要

生命一直是最令人重視與珍視的，但人卻無可避免的要從事危險的工作。無論是救災、戰爭或者是危險區域探索，皆需要「人」親自參與，每個人就代表一個生命及家庭，在越來越重視人的年代，智慧型機器人於是誕生，代替人來從事危險的工作。本研究即是以此觀點來研發具隱蔽性又兼具仿生的智慧型仿生機器蛇，它能仿效真蛇於任何地形中隨意行動，甚至能攀爬水管或樹木，並使用多種感測器，偵測所需的環境資訊。機器蛇擁有10個可動自由度，可實現靈活的行動，另外結合多種SENSOR與示教再現（te-aching/playback）的方式，來完成機器蛇所有的工作任務。此外為了增加機器蛇的自由彈性，採用鋰電池與電池保護電路組，提供機器蛇整體的動力，工作時間可長達2個小時，並可依據客戶需求，使用不同的SENSOR，完成機器蛇不同的應用與目的。

智慧型仿生機器蛇的體型與其他機器人相比，較為細長且小巧，適合在困難或特殊的地形中行走，因此可應用在各式各樣的環境與用途。在外觀設計上，為了方便機器蛇的馬達散熱與執行動作，使用了我們自行製作的黑色套件，讓整體看起來簡約大方，在夜晚時也不易被發現，可使用於軍事、警方用途。另外，為了實現偵查功能，機器蛇頭部加裝無線攝影機，能將機器蛇所看到的畫面即時傳回電腦，讓操作人員能了解機器蛇所行經的環境與路況，此應用可結合在救災、水管下水道探測、核能廠偵測、特殊地形探索甚至是軍事用途。為了強化機器蛇的救災功能，加裝了溫度感測器、距離感測器，以方便偵測災難現場的實況。最後為了使仿生機器蛇的操控更具彈性，結合CM-700控制器、Zigbee的無線通訊與ZIG110介面卡，讓機器蛇能使用無線方式操控，使機器蛇可以自由行動不受任何限制，並且在尾端加裝電池以供應機器蛇所需要的電力。
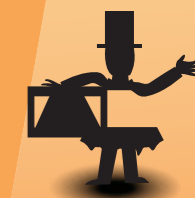

Fig.1 > 智慧型仿生機器蛇

Abstract

Life is valued and cherished, but humans must engage in hazardous work sometimes. Whether it is disaster relief, war, or hazardous exploration, humans are all sometimes involved in dangerous activities, causing concern for their loved-ones. However, intelligent robots have been gradually replacing people engaged in dangerous work in the 21st century. In this study, we research and design an intelligent bionic snake robot with the ability to perform dangerous investigations. The snake robot can imitate the flexible movements of a real snake in any complex terrain, even climbing pipes or trees. The snake robot can also use a variety of sensors to detect the necessary environmental information. The snake robot has 10 degrees of freedom which allows flexible action, and a teacher production approach (teaching/playback) is used to complete all the tasks using a variety of sensors. In addition, in order to increase the freedom of flexibility of the snake robot, a lithium battery set with a protection circuit is installed inside the snake robot to supply overall power needs for two working hours. Next, on customer demand, the structure and sensors of the snake robot can be changed as needed for different applications and purposes.

Compared with normal robots, the intelligent bionic robot snake is more slender and compact, is suitable for negotiating difficult or special terrain, and can be used in a wide range of environments and purposes. In order to facilitate the motor cooling of the snake robot and allow nimble actions, a black kit of our own production is used, so that the overall look is simple and elegant, is not easily detected at night, and can be used for sensitive missions of the military and police. In addition, in order to achieve the detection function, the head of the snake robot is fitted with wireless cameras which can transmit real-time images to the operator's computer to allow immediate understanding of the environmental information and real circumstances at the target destination. The snake robot can use for disaster relief, big pipe or sewer inspections, examination of nuclear power plants, special environment explorations, or military reconnaissance. In order to strengthen the disaster relief capabilities of the snake robot, temperature sensors and distance sensors are installed to detect detailed information about the disaster site. Finally, in order to enhance the operational ability of the snake robot, a CM-700 controller, Zigbee wireless communication package, and ZIG110 adapter are combined, so that the snake robot can be controlled wirelessly to achieve any mission within the life of the battery set.

指導教授

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1990年畢業於中央電機系後直升中央資電所碩士班，一年後直攻博士並於1995畢業於中央電機所。畢業後陸續任職於工研院電通所、吳鳳工專電子系、建國科技大學電子系，2008年轉任現職虎尾大電子系副教授迄今，同時主持虎尾科技大學智慧型機器人系統實驗室。

研究領域

目前於虎科大主持智慧型機器人系統實驗室，研究專長為智慧型機器人、鋰電池電源管理、模糊理論與應用、控制理論與應用、影像處理。