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作品名稱 **超級守門員**
Super Goalkeeper

隊伍名稱 **機器人時代 Robot Times**
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作品摘要

本作品設計實現一台具有23個自由度的人形機器人，並且讓其在機器人足球賽中具有守門員的功能。所設計實現之人形機器人的機構主要有5大部分：1.頭部(2個自由度)、2.身體、3.手部(8個自由度)、4.腰部(1個自由度)、以及5.腳部(12個自由度)。在動作的設計實現上，本作品主要讓人形機器人具有雙足行走、踢球、撲球與拿球的動作。在守門員功能的設計實現，本作品主要讓人形機器人具有2大功能：1.機器人的定位、以及2.球之狀態的判斷與分析。在機器人的定位上，本作品讓機器人守門員可以自主判斷自己與球是否在禁區內，並且依據各種不同的狀態做出適當的反應。譬如當球在禁區內，則守門員執行用手部去碰觸球的動作。若球不在禁區內，則守門員不執行用手部去碰觸球的動作以避免犯規。在球之狀態的判斷與分析上，本作品讓機器人守門員可以自主判斷與分析球的狀態，並且依據各種不同的狀態做出適當的反應。譬如當對方球員將球踢向我方球門時，則守門員執行接撲球動作。若球停止在禁區附近，則守門員執行將球踢離的動作。

ABSTRACT

A humanoid robot which has 23 degree of freedoms (DOFs) is designed and implemented by using servo motors. This humanoid robot has 2 DOF for the head, 8 DOF for two arms, 1 DOF for the waist, and 12 DOF for two legs. This humanoid robot is designed and implemented to be a goalkeeper robot in the robot soccer game so that it can walk, kick the ball, catch the ball, and hold the ball. Two functions are designed and implemented for the goalkeeper: (1) robot localization, and (2) ball estimation. In the robot localization, the goalkeeper robot has the ability to determine whether the ball is in the forbidden zone and do an appropriate action based on the state autonomously. For example, when the robot and the ball are both in the forbidden zone, the goalkeeper can use the hand to touch the ball. If the ball is not in the forbidden zone, the goalkeeper do not perform the action of the hand touch the ball to avoid the foul. In the ball estimation, the goalkeeper robot has the ability to estimate and analysis the ball state autonomously and make an appropriate action based on a variety of different states. For example, when an opposing player kicked the ball to our goal, then the goalkeeper performs the action of catching and diving. If the ball stops in the forbidden zone, the goalkeeper decides to kick the ball away from the goal.

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作品名稱 **假酒剋星－智慧攜帶式電子鼻整合晶片**
A Smart Portable Electronic Nose SoC for Fake Wine Identification

隊伍名稱 **神奇鼻子大智慧 Miraculous nose with great intelligence**
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作品摘要

市面上假酒的氾濫影響消費者的健康至鉅，但除非是有經驗的專家，一般人是不容易分辨的。假酒一般來說就是摻入工業酒精(甲醇)的酒，如果飲用可能會導致嘔吐、暈眩等症狀，更嚴重者會失明、腦出血，甚至是死亡。無論對商家或是個人消費者，都需要一個客觀、可靠、並且簡單的裝置或儀器，以作為判斷的依據。為了解決假酒問題，某家南韓公司甚至想開發專門的RFID晶片做為防偽手段。在本企劃中，我們提出一個判斷假酒的客觀方法，就是利用人工嗅覺的方式，也就是所謂的「電子鼻」。

電子鼻用途廣泛，可用來偵測假酒、腐壞食品、摻有機溶劑的劣質油品等，但是直到目前為止，所使用的電子鼻儀器都是在個人電腦或筆記型電腦上加裝氣體收集器與檢測器裝置，體積極為龐大，使用上很不方便，更談不上攜帶或家庭使用，其中的關鍵便在於缺乏有效的氣體收集、感測、辨識機制，以及其與電路系統之整合。本企劃鎖定醇類，使用聚合物材料以及新穎中孔碳/高分子奈米複合材料，結合MEMS製程、IC晶片設計、以及嵌入式軟體，擬開發出第一個能夠測量假酒的電子鼻系統晶片，用酒類來進行測試，以驗證低功耗可攜式電子鼻系統雛型之可行性。

ABSTRACT

Fake wine, mixed with methanol, has a huge effect upon the health of consumers. Drinking it would lead to vomiting and dizzying, moreover, blinding, cerebral hemorrhage and death. As the requirements for health management keep increasing nowadays, there is a need for an objective, reliable, and simple device to be used as a reference when people purchase wine. Here, we propose an objective way to detect fake wine, utilizing artificial olfaction, in other words, electronic nose. Until now, the electronic nose instruments used in these researches are desktop or laptop adding with air collector and detector device. The key is the lack of integration of efficient air collecting, sensing, recognition algorithm, device, and the circuit system. We use polymers and novel mesoporous carbon/polymer nanocomposite materials, integrated circuit design, and embedded software to develop the electronic nose SoC to detect fake wine and implement the feasibility of the low-power portable electronic nose prototype as shown in Fig. 1. The system block diagram and chip of the electronic nose are shown in Fig. 2 and Fig. 3, respectively. The front end of E-Nose system contains the sensor array. In this array, no single sensor responds to a special odor, instead a collective response of the entire array generates a particular pattern for the odor of interest. The response of sensor array will generate a distinct pattern, like a fingerprint. The sensor array sends the detected pattern through an interface circuit and analog to digital converter to the microprocessor of the system for signal processing. When the system enters the recognition mode, a gas enters the electronic nose system, and the microprocessor compares the sensor chip response pattern with existing patterns stored in the memory to identify the gas. The recognition results are exported by the microprocessor.