出國報告（出國類別：其他）

IEEE 中華民國系統學會 ICSSE 2017 國際研討會

服務機關：國立虎尾科技大學電子系
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派赴國家：越南
出國期間：106 年 7 月 20 日至 106 年 7 月 26 日
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摘要

2017 年國際系統科學與工程會議（The International Conference on System Science and Engineering 2017, ICSSE 2017）是 2017 年 7 月 21 日至 23 日在胡志明市舉行的國際會議，為中華民國系統學會所主辦的重要國際研討會，此研討會每次舉辦皆吸引大量之“系統科學與工程”學有專精之國際專家學者與會，共同探討與分享最新的系統科學與工程的方法與研究心得，藉以學習新知以及與國際學者交流。

本人此次參加 2017 年國際系統科學與工程會議，除了發表“The Telepresence Robot for Teaching English”研討會論文外，也擔任一場 session (BS05- Mechatronics Engineering) 的 chairman。本次發表的作品 The Telepresence Robot for Teaching English，開發一遠端英語教學代理機器人，讓合格的 ESP 教師、中小學老師，甚至是居住國外的外國老師，能透過網路操控代理人機器人來教導學生；並透過 VR 與各種感測器，獲得遠端環境的臨場感 (Telepresence) 與回饋 (Feedback)，讓教師更能投入教學的情境中 (Teaching Scenario)。本遠端英語教學代理機器人教學實驗的規劃與設計，不僅能解決英文教師短缺的困境，也能藉著機器人活潑的教學方式，提升學生學習英語的動機與成效。

目次

二、目的

參加 2017 年國際系統科學與工程會議（The International Conference on System Science and Engineering 2017, ICSSE 2017），發表論文 The Telepresence Robot for Teaching English，並與各國參與此研討會的專家學者彼此認識並交換研究心得。另外也擔任研討會其中一場 session (BS05- Mechatronics Engineering)的 chairman，主持會議進行。

三、參加會議經過

1. 106年07月20日早上至桃園國際機場，登機前往越南胡志明市，參加ICSSE 2017研討會。
2. 106年07月20日下午抵達越南胡志明市機場，搭乘巴士住飯店，準備07月21日參加研討會。下午與晚上研究由飯店前往Ho Chi Minh City University of Technology and Education的路徑與方式，再與論文共同發表碩士學生討論與修改即將報告的PPT，做最後的確認，並演練口頭報告方式與問答技巧。
3. 106年07月21日早上08:30點到大會會場Ho Chi Minh City University of Technology and Education註冊。
4. 106年7月21日09:00am - 09:20am參加Opening Ceremony。
5. 106年7月21日09:20am - 10:20am參加第一場Keynote Speech: Data Mining and Machine Learning for Analysis of Network Traffic by Prof. Ljiljana Trajkovic。演講摘要如下：Collection and analysis of data from deployed networks is essential for understanding modern communication networks. Data mining and statistical analysis of network data are often employed to determine traffic loads, analyze patterns of users' behavior, and predict future network traffic while various machine learning techniques proved valuable for predicting anomalous traffic behavior. In described case studies, traffic traces collected from various deployed networks and the Internet are used to characterize and model network traffic, analyze Internet topologies, and classify network anomalies.

圖一 大會會場Ho Chi Minh City University of Technology and Education

圖二 Ho Chi Minh City University of Technology and Education研討會會場註冊

圖三 研討會的Opening Ceremony

圖四 第一場Keynote Speech

6. 106年7月21日10:20am - 10:40am的Morning Tea時間與各國參與此研討會的專家學者彼此認識並交換研究心得。
7. 106年7月21日上午10:40am - 12:00am聽取本會議之研討會論文發表Topic: Intelligent Healthcare System，並參與討論。包含(1) SS01-Design Strategies to Improve Self-feeding Device - FeedBot for Parkinson Patients, Nguyen Truong Thinh, Tran Tan Thanh and La Hoang Thang. (2) SS04-Camera-based Heart Rate Measurement Using Continuous Wavelet Transform, Bing-Fei Wu, Po-Wei Huang, Tsong-Yang Tsou, Tzu-Min Lin and Meng-Liang Chung. (3) SS15-Edge Detection Based On Fuzzy C Means In Medical Image Processing System, Mong Hien Nguyen, Thanh Binh Nguyen and Quoc Viet Ngo. (4) SS06-Adaptive Exploration Strategies for Reinforcement Learning, Kao-Shing Hwang, Chi-Wei Hsieh and Wei-Cheng Jiang

8. 106年7月21日中午午餐時間與各國參與此研討會的專家學者聚餐，彼此認識並交換研究心得。
9. 106年7月21日下午01:30pm - 03:30pm本人與論文共同發表研究生胡成浩、柯存穗發表論文“The Telepresence Robot for Teaching English”。發表最新的教學機器人英語教學方法，同時也播放實際教學影片。本session參與的國內外學者相當踴躍，本報告獲得良好的迴響，並有多位學者提出問題，進行正向的學術交流，因此受益良多。會中國際學者提出此研究成果非常良好，應擴大推廣。本人預計藉由舉辦工作坊或演講，將把此計畫推廣於各種學制應用，包含大學、高中、國中小等。

圖五 論文發表

10. 106年7月21日下午01:30pm - 03:30pm除了發表論文外，也聽取本會議之研討會論文發表 Topic: BS-5 Mechatronics Engineering，並參與討論。(1) 37-Using ANFIS to Predict Picking Position of the Fruits Sorting System, Tuong Phuoc Tho and Nguyen Truong Thinh. (3) 54-Analytical Design of PID Controller for Enhancing Ride Comfort of Active Vehicle Suspension System, Truong Nguyen Luan Vu, Do Van Dung, Nguyen Van Trang and Phan Tan Hai. (4) 72-Adaptive PID Tracking Control Based Radial Basic Function Networks for a 2-DOF Parallel Manipulator, Van-Truong Nguyen, Chyi-Yeu Lin, Shun-Feng Su and Quoc-Viet Tran. (5) 78-Optimizing The Structure Of Rbf Neural Network-Based Controller For Omnidirectional Mobile Robot Control, Tung Thanh Pham, Dang Hoang Le, Chi-Ngon Nguyen, Tu Dinh Nguyen and Cuong Chi Tran. (6) 85-Dynamic Programming based Control for Perturbed Discrete Time Nonlinear Systems, Van Hung Pham, Hoai Nam Nguyen and Doan Phuoc Nguyen
11. 106年7月21日下午03:30pm - 03:45pm於Afternoon Tea時間與國際參與此研討會的專家學者彼此認識並交換研究心得。
12. 106 年 7 月 21 日 下 午 03:45pm - 05:25pm 擔 任 Chairman 主 持 Topic: BS-5 Mechatronics Engineering。論文包含：(1) 91-Design of a Compliant Bio-Inspired Camera-Positioning Mechanism for Autonomous Mobile Robots, Ngoc-Phuong Hoang and Huy-Tuan Pham. (2) 101-Experimental Investigation of Speed Control of Hydraulic Motor Using Proportional Valve, Hai Tran Ngoc, CungLe and Anh Dung Ngo. (3) 125-An Extended Navigation Framework for Autonomous Mobile Robot in Dynamic Environments using Reinforcement Learning Algorithm, Nguyen Van Dinh, Nguyen Hong Viet, Lan Anh Nguyen, Hong Toan Dinh, Nguyen Tran Hiep, Pham Trung Dung, Trung-Dung Ngo and Xuan-Tung Truong. (4) 140-Fault Detection and Isolation for Robot Manipulators Using Statistics, Cao Thanh Trung, Hoang Minh Son, Dao Phuong Nam, Tran Nhat Long, Do Tien Toi, Phan Anh Viet. (5) 208-Advanced Control Methods for Two-Wheeled Mobile Robots, Khanh G. Tran, Phuoc D. Nguyen and Nam H. Nguyen.
13. 106年7月22日09:20am - 10:20am參加第二場Keynote Speech: Unknown input methods based observer and controller synthesis for uncertain nonlinear system by Prof. Wen-June Wang。演講摘要如下：Observer and controller design for a nonlinear system has been studied in the automatic control field for decades. However, if the nonlinear system is affected by the disturbance or/and uncertainty, this design work becomes much more difficult. In this talk, we will introduce the observer or/and controller synthesis for the uncertain nonlinear system which is represented as the T-S fuzzy system model, polynomial system model, and polynomial fuzzy system model, respectively. In these models, the exact form and the upper bound of the uncertainty can be unknown. Based on the unknown input method, the effect of the uncertainty or disturbance will be eliminated. Simultaneously, the observer can be synthesized with some conditions being satisfied. Furthermore, we also introduce the observer based controller synthesis for the uncertain polynomial system. In the study, the un-measurable states are estimated and the stability of the system is guaranteed. To deal with the above problems, the non-common quadratic Lyapunov function, Linear Matrix Inequality (LMI) technique, and Sum-of-Square (SOS) technique are used to derive the sufficient conditions for the observer and controller synthesis for the uncertain nonlinear system.

14. 106年7月22日10:20am - 10:40am的Morning Tea時間與各國參與此研討會的專家學者彼此認識並交換研究心得。
15. 106年7月22日上午10:40am - 12:00am聽取本會議之研討會論文發表Topic: BS-7 Automation Engineering ，並參與討論。包含(1) 23-An Approach Robust Nonlinear Model Predictive Control with State-dependent Disturbances via Linear Matrix Inequalities, Nguyen Thanh Binh, Nguyen Anh Tung, Dao Phuong Nam, Cao Thanh Trung. (2) 29-Asymptotic Stability of the Whole Tractor-Trailer Control System, Pham Van Hau, Dao Phuong Nam, Nguyen Thu Ha, Pham Tam Thanh, Hoang The Hai, Hoang Duc Hanh. (3) 33-Output feedback Controller using High-Gain Observer in Multi-Motor Drive Systems, Phuong Nam Dao, Tuan Thanh Pham and Xuan Tinh Tran. (4) 45-Input Constrained Hover Control with Receding Horizon LQR for Disturbed TRMS, Dinh Van Nghiep, Nguyen Nhu Hien, Nguyen Thu Ha and Nguyen Doan Phuoc
16. 106年7月22日中午午餐時間與各國參與此研討會的專家學者聚餐，彼此認識並交換研究心得。
17. 106年7月22日下午01:30pm - 03:30pm聽取本會議之研討會論文發表Topic: BS-7 Automation Engineering，並參與討論。(1) 46-Adaptive Backstepping Hierarchical Sliding Mode Control for Uncertain 3D Overhead Crane Systems, Hai Le Xuan, Thai Nguyen Van, Anh Le Viet, Nga Vu Thi Thuy and Minh Phan Xuan. (2) 47-Robust H-infinity Backstepping Control Design of a Wheeled Inverted Pendulum System, Binh Nguyen, Hung Nguyen Manh, Tung Nguyen, Phuong Nam Dao and Thanh Long Nguyen. (3) 51-Hybrid Control for Swing up and Balancing Pendubot System: An Experimental Result, Vinh Toan Tran, Thu Ha Tran and Vi Do Tran. (4) 79-Design and simulate a Fuzzy autopilot for an Unmanned Surface Vessel, Nhat Minh Do, Phung Hung Nguyen, Duy Anh Nguyen. (5) 86-Application of BPNN Algorithm to Learning High Dimensional Features for Solving Induction Motor Defect Problems, Shang-Chih Lin and Yen-Nun Huang. (6) 89-A Non-Geometric Method for Inverse Kinematics Solution of a Delta-Structure Ship Motion Simulator and its Trajectory Control, Chau Giang Nguyen, Nhat Minh Do, Tri Cong Phung, Duy Anh Nguyen
18. 106年7月22日下午03:30pm - 03:45pm於Afternoon Tea時間與國際參與此研討會的專家學者彼此認識並交換研究心得。
19. 106年7月22日下午03:45pm - 05:25pm聽取本會議之研討會論文發表Topic: BS-7 Automation Engineering，並參與討論。論文包含：(1) 114-Complementary Authenticator Design for Ground Control Station to Identify Unmanned Aerial Vehicles Based on Channel-tap Power, Trong Nghia Le, Lan Anh Nguyen Thi, Trong Khanh Nghiem, Hong Viet Nguyen, Dang Khoa Truong, Tran Hiep Nguyen, Van Cong Hoang, and Minh Dong Pham. (2) 115-Active Disturbance Rejection Control Design for Integrated Guidance and Control Missile based SMC and Extended State Observer, Hong Toan Dinh, Dang Khoa Truong, Tran Hiep Nguyen, Xuan Tung Truong and Cong Dinh Nguyen. (3) 118-Sliding Mode Control of a Three Phase Induction Motor based on RBF Network, Vinh Quan Nguyen, Minh Tam Nguyen ,Van Nho Nguyen and Hoai Nghia Duong. (4) 172-Experimental Comparison of Complementary Filter and Kalman Filter Design for Low-Cost Sensor in Quadcopter, H.-Q.-T. Ngo, T.-P. Nguyen, V.-N.-S. Huynh, T.-S. Le and

C.-T. Nguyen. (5) 199-Adaptive Tracking Control Based On CMAC for nonlinear Systems, Van-Phuong Ta, Xuan-Kien Dang and Thanh-Quyen Ngo

20. 106年7月22日晚上06:00pm - 08:00pm參加Gala Banquet dinner與各國參與此研討會的專家學者聚餐，彼此認識並交換研究心得。
21. 106年7月23日參加大會主辦的Ho Chi Minh City tour。
22. 106年7月24~26日參訪越南胡志明市與河內的文教機構與歷史古蹟。
23. 106年7月26日下午從越南河內國際機場搭機返國。

四、與會心得

1. 本人此次發表之論文主要的主題：“The Telepresence Robot for Teaching English”，摘要內容為In the paper, the main purpose of creating the telepresence robot is to let some scholars, instructors, professors can operate the robot from one place to another. They can operate the robot to teach classes and deliver a speech. For other users, the sick students and boss in the company can both maneuver the robot through using the wearable device we made. This gadget is full of sensors, such as flexible sensors, Gyro sensors and Speed sensors. The transmitter and receiver are using the RF modules which have 800 meters to send data and receive data at the band of 2.4G. The hardware structure of robot is combined with aluminum-bar which has harder construct than acrylic and motors we choose is AI-motors.
2. 此次研討會參加數場專家演講，聆聽各國學者的演講受益良多。
3. 透過此次研討會的發表，可確認自己的研究成果，並藉由討論獲得研究內容與方向的改進意見與未來研究的一些建議。
4. 參與國際研討會可與各國學者交流，拓展研究視野，並可進一步尋求國際合作的可能性。
5. 藉由參與國際研討會可拓展本國與本校的國際知名度。

五、發表論文全文或摘要

The Telepresence Robot for Teaching English

*Cheng-Hao Hu, Rong-Jyue Wang, Tsuen-Suei Ke

***Abstract*— In the paper, the main purpose of creating the telepresence robot is to let some scholars, instructors, professors can operate the robot from one place to another. They can operate the robot to teach classes and deliver a speech. For other users, the sick students and boss in the company can both maneuver the robot through using the wearable device we made. This gadget is full of sensors, such as flexible sensors, Gyro sensors and Speed sensors. The transmitter and receiver are using the RF modules which have 800 meters to send data and receive data at the band of 2.4G. The hardware structure of robot is combined with aluminum-bar which has harder construct than acrylic and motors we choose is AI-motors**

Keywords—telepresence robot, RF module, AI-motors, Gyro sensors.

INTRODUCTION

Recently, the development of telepresence robots has been fashionable since the operators can run the robot from remote place. For some people, such as reporter, renowned teacher and investigator, it's easy to do their job by controlling the remote robot just like a substitute. The problem is that the longer distance, the longer transmission. The wireless communication is key part for telepresence robot. In the paper, using the RF module receives ad transmits data which is able to communicate at the speed of 100 meters. [1] To calculate Gyro sensors' alternation and revise the value every time got from the RF receiver module is using four MCUs and four RF modules. Through value analysis, we can get more precise value. It can make sure we send the correct data to every motor and imitate human's motion without doubt. The wearable gadgets we use are three gyro sensors, two flexible sensors to imitate the motion of shoulder, elbow, wrist. [2] The receiver board is figure1 and RF module is figure 2.

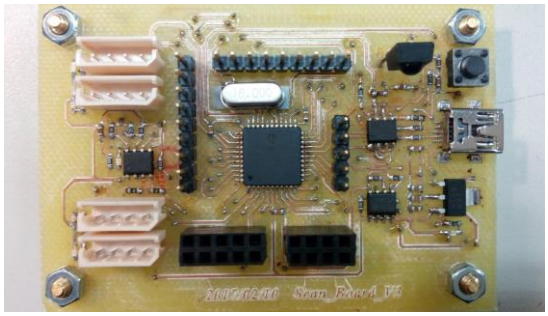

Figure 1. Receiver controller

Figure 2. RF module

METHODS AND RESULTS

A. Body structure design

All the body structure is made of aluminum-bar, and based on the human ratio to create appropriate size, height and width. Each arm has 5 AI-motors which is 5 axis, waist has one AI-motor, head has two AI-motors and two AI-motors for the wheels so that the robot can imitate the human's action well.

Figure 3. Telepresence robot

B. Handling the receiving data

When the receiver got the data, it won't send to the AI-motors directly. This data will be computed in the MCU chip coding by us. Just make sure the data sent to the receiver is proper and correct. The way of handing the receiving data is offset adjustment and three-dimension vector alternation.

C. Communication between chips to chips

The wearable gadgets including two kinds of sensors, which are Gyro sensor and flexible sensor is both controlled by the signal called I2C and ADC. When Gyro sensor which is according to user's operation is through I2C, it will keep sending data to MCU at the speed of 10Kbits. The flexible sensor can detect the bending part in human body such as elbow and wrist. Because the value got from flexible sensor is analog, using the ADC to convert it into digital is suitable.

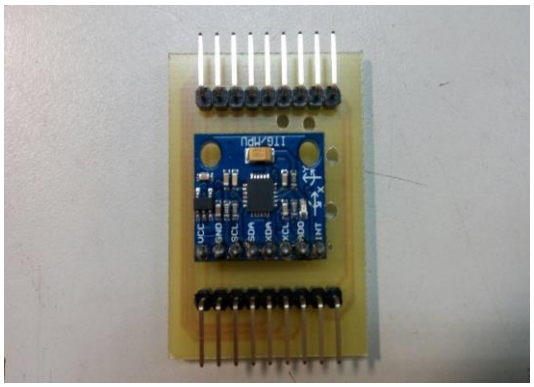

Figure 4. Gyro sensor

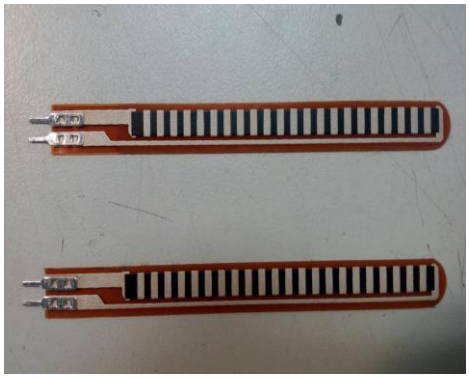

Figure 5. Flexible sensor

D. system construction

a. In order to transmit the signal, we are using 8-bits MCU produced by Microchip as the main control unit; Pic18F4550. And the wireless module [5]; NRF24L01 is up to 1000 meters distance long. The hardware switching is used to adjust which chips needs to upload and function, so there are four chips at the same board which can allow every parts of body such as head, left-hand, right-hand and feet can start at the same time. We also have a chip of TTL-to-USB to debug on computers. The system transmission diagram is below.

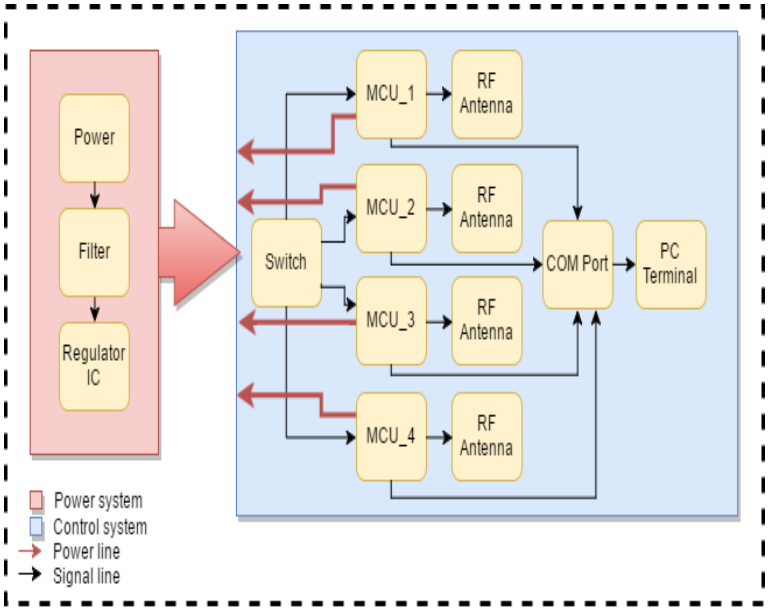

Figure 6. hardware connection

b. In order to control AI-motors, which is the RS485 communication used the chip of MAX485 to drive the motors. The MCU would send the UART signal to some passive parts and MAX485 on the board. It depends on the amount of AI-motors that decides the value of output resistors of MAX485. The AI-motors driver diagram is below

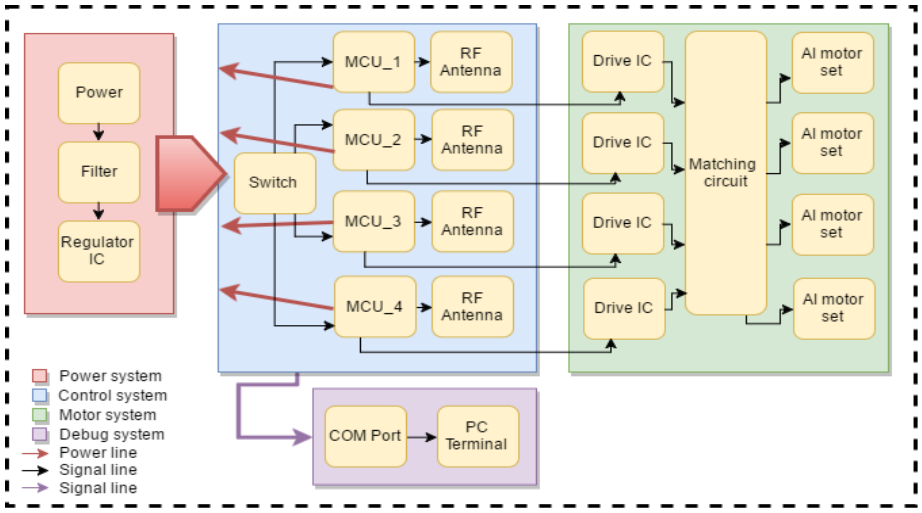

Figure 7.AI-motors driver

Experimental result

According to external paper indicated that using the basic interactive action to teach students in the class is no more attractive to them. We come up with a method that controls the robot by wearable devices from another place. [6] We cooperated with some graduated students who are major in Children English Education to teach four-graded students with robot. After that, the feedback from students always showed positive comments. Some said that "the robot is another kind of teaching and educating instead of traditional teaching method"; [7] some said that "using robot to teach class can make students more interested in learning English and enhance their concentration". During the six weeks of teaching experiment in elementary school, sometimes the robot can't receive the data rapidly causing by

environment and distance, but its rate of error is acceptable and sensible.

Figure 8. Class scene

Figure 9. Teaching PPT

The function of telepresence is to control the robot from remote distance. Through wireless transmission and some sensors, the robot is able to raise its hands, nod its head, shake its head, walk forward, turn left and turn right. And the wearable devices contain the sensor of bending, the sensor of pressure and the sensor of MPU605. The picture below is user's wearable device and robot.

Figure 10. user’s wearable device

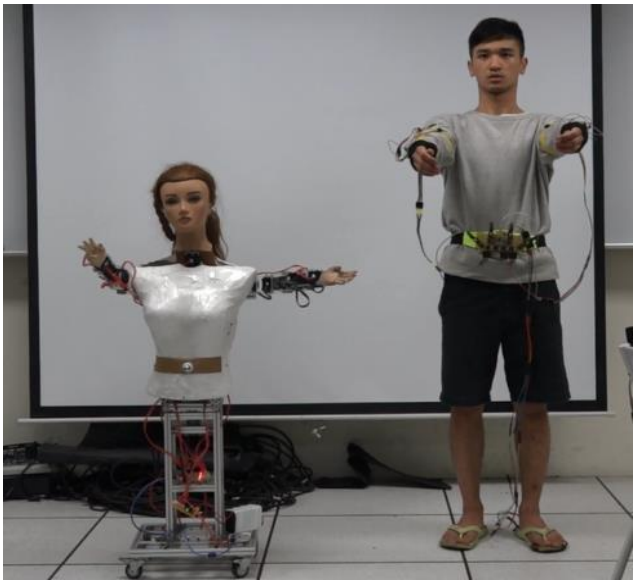

Figure 11. user raising hands

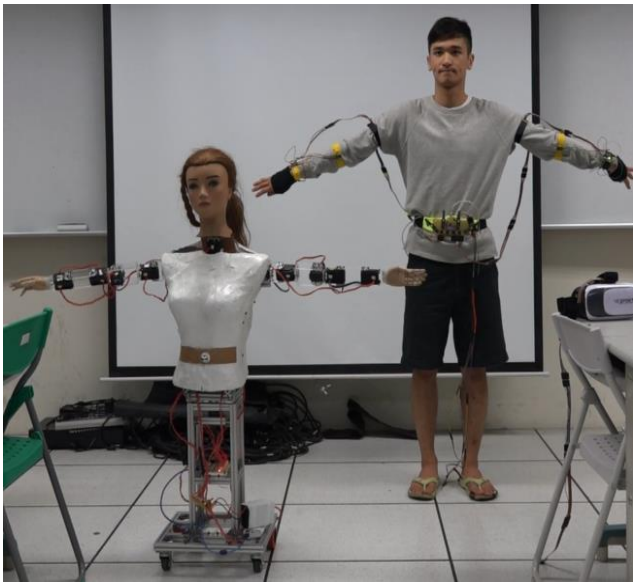

Figure 12. user open hands

Figure 13. move left-hand side

Conclusion

To sum up, the robot introduced in the article indicated that (1) the body structure is made of aluminum-bar; (2) There are some sensors assembled in the robot, such as Gyro sensors, and Flexible sensors; (3) the communication between robot and user is using RF module which has 2.4G band width and 1.05. Mb/s; (4) the main controller was using MCU to receive and transmit value. In the future, the telepresence robot can transmit data through WI-FI. It makes the data run on the internet and has longer transmission distance. The telepresence robot can not only be used in teaching but working, which means it's operated by remote users to finish the job. Finally, the robot is used to take classes as a teacher in elementary school and the user control it through wearable gadget. It is better than using the AI robot which controlled by program.

REFERENCES

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六、建議

1. 本次參與會議收穫良多，建議科技部可多補助國內教授參與國際學術研討會，以強化國內相關研究的能量與國際交流。
2. 國際研討會的舉辦可拓展國際知名度，強化國內研究風氣，並可促進觀光產業，建議國內可在重要的旅遊景點辦理國際研討會。

七、攜回資料名稱及內容

研討會論文摘要與全文 USB。