

## 4.8 特別招聘外国人研究員報告

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**Introduction**

I visited Yamaguchi University on kind invitation of Prof. Zhongwei Jiang, Department of Mechanical Engineering, in the frame of the Venture Business Laboratory with financial support of the Japanese Ministry of Education. This is my first visit to Yamaguchi University. The aim of the present visit was to join experience concerning the joint research on remote sensing and local control network, guidance for graduate students, delivering a seminar on remote sensing and local control network and guidance for academic staffs and engineers concerning research and education of Venture Business Laboratory.

**Research**

The main topic of our joint researches was the development of personal health diagnosis and monitoring system using sound information of heartbeating and breathing. We focused specially on two problems. The first is the design of data logger using the microprocessor. We used PIC16C73 8bit one chip microcontroller. It converts analog input signal to 8 bit digital data every  $100\mu s$ , and stores the data to the 128 Kbyte RAM. It is also connected to PC with the RS232C port. The stored data is read from the RAM and transmitted to PC. The second is the design of wireless data transmission. We used the TX5002 and RX5002 for wireless data transmission. The TX5002 hybrid transmitter is ideal for short-range wireless data applications where robust operation, small size, low power consumption and low cost are required. All critical radio frequency functions are contained in the

hybrid, simplifying and speeding design-in. The TX5002 includes provisions for both on-off keyed (OOK) and amplitude-shift keyed (ASK) modulation. When OOK modulation is chosen, the transmitter output turns completely off between "1" data pulses. When ASK modulation is chosen, a "1" pulse is represented by a higher transmitted power level, and a "0" is represented by a lower transmitted power level. OOK modulation provides compatibility with first generation ASH technology, and provides for power conservation. ASK modulation must be used for high data rates (data pulses less than  $200\mu s$ ). ASK modulation also reduces the effects of some types of interference and allows the transmitted pulses to be shaped to control modulation bandwidth. The RX5002 is an amplifier sequenced hybrid (ASH) receiver. It is specially designed for short range wireless control and data communication applications. The ASH receiver can be readily configured to support a wide range of data rates and protocol requirement. The receiver features virtually no RF emissions, making it easy to certify to short range radio regulations. In addition, we are also interested in the LONWORKS and SigLab spectrum analyzer and function generator. The LONWORKS NodeBuilder Development Tool consists on a set of tools for developing LONWORKS devices. The NodeBuilder tool is optimized for manufacturers creating LONWORKS devices. It is also an excellent companion to the LonBuilder Developer's Workbench for use by multi-developer LONWORKS development teams. Manufacturers making systems integrators, or users that need to debug multiple devices should use the LonBuilder Developer's Workbench. The most commonly used virtual instrument(VI) are the SigLab spectrum ana-

lyzer and function generator. The goals are learning the basic controls of the spectrum analyzer and function generator, making measurements showing SigLab's excellent dynamic range and spectral purity and extracting the just acquired data and post-process in MATLAB. I got the feeling that Prof. Jiang and his research group are very much interested in these topics as well as and that our cooperation will be continued.

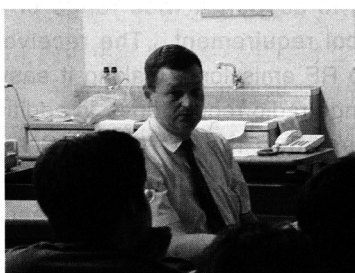
### Summary

I would like to express my deep thanks to Professor Zhongwei Jiang and his family for inviting me and the service they rendered me from the first day of my arrival up to my departure. I am also thankful to Dr. Seiji Shimizu and the students of Prof. Jiang's laboratory for the interest to the subject of my research and their help in carrying out our experiments. I am grateful to the President of Yamaguchi University and the Dean of the Faculty of Engineering and the Director of Venture Business Laboratory for accepting me as a visiting associate professor. This was a great chance for me to learn more about Japanese education and research. I enjoyed my stay and work at Yamaguchi University enormously. I hope the joint collaboration will continue in the future.

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### (2) Prof. Alexandru Mihail Morega

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### Introduction

Continuity is one of the conditions in the successful pursuit to solving challenging problems, and Professor Tatsuo Nishimura's kind invitation provided

for the support. The time spent during the visit to working and discussing both research and educational problems is invaluable to the success of our efforts in finding solutions to joint projects and also to the initiation of new research themes.

The background of our cooperation goes back to the period of 1995-1996 when - on Professor Nishimura's recommendation - I was accepted and acted as associate professor with the Department of Mechanical Engineering, Energy Division at Yamaguchi University in Ube. A further important stage of our joint research was the research grants conducted within the framework created by the bilateral governmental agreement Japan-Romania (1998-2000). Our collaboration continued through out this period and it is substantiated by the numerous papers published in peer refereed journals and proceedings to international conferences. This body of work reflects the progress in the areas of heat and mass enhancement in channel flows and double-diffusive convection - one of the most challenging problems in many areas such as material sciences, ocean sciences, magnetohydrodynamics, etc. - that continue to focus the attention of the scientific community.

### Research

The visit helped greatly to extend the investigations in the area of double diffusive convection, initiated and conducted by Professor Tatsuo NISHIMURA at Yamaguchi University. Double-diffusive convection plays an important role in electronic material processing such as crystal growth, solidification, laser melting, etc. and its knowledge and control are important in obtaining high quality materials. This class of phenomena poses strong nonlinear, coupled physical and mathematical problems, which are characterized by abrupt changes in the temperature and concentration fields. Its study is challenging in many ways for experimental models, and particularly difficult to integrate numerically. Our approach to this problem was both experimental and numerical - to this end we developed a high resolution, pseudospectral (collocation) Chebyshev solver.

When the working fluid (e.g. molten material) has electroconductive, electric or magnetic properties, an electromagnetic field may help control the flow, hence the transport properties of the system. Although a vast body of literature is devoted to mag-