The Wireless System for Marine Sensor Networks

Masashi Yoshida, *Salesian Polytechnic*
Harumasa Hojo, *SensorComm Co., Ltd.*
Akio Yasuda, *Tokyo University of Marine Science and Technology*

INTRODUCTION

The marine application using a wireless system is demanded for the environmental monitoring or the security. We executed a research project of "Marine ubiquitous sensor network especially at harbor and shore area" which put "contribution to industrial activation of harbor area" that utilized GNSS based on these backgrounds in mind[1]. Then, we tried the experiment and evaluation about a wireless network by a weak wireless module, in order to build the sensor network which made the small buoy the node in this Paper.

DSSS INTERFERENCE PROPERTIES

We have been studying "Extremely weak power radio" that is defined as lower radio power than electric field 500μV/m at 3 m by Japanese radio regulation[2]. Then, we measured the receiving rate and the receiving sensitivity when adding the white noise and colored noise in the closed communication channel using the commercial DSSS-wireless module. Fig.1 shows a block diagram of this experiment. The attenuator, the coupler, and the white noise generator were connected between the transmitter and the receiver. The receiving rate to CNR of a receiver is shown in Fig.2. This figure shows that the transmission signal buried in the white noise of the high-level was decoded. The difference of the processing gain was close to the theoretical value, and the maximum receiving sensitivity of this module was -125dBm. We also measured BER to a receiving rate, and the receiving rate in the case of colored noise. Next, we estimated the communication range from the result of a measurement, and measured in the same way in the environment which circumscription opened.

K-GPS POSITIONING BY A SMALL ANTENNA

In addition, we examined the GPS receiver and antenna which are mounted in a sensor node. The K-GPS (Kinematic GPS) positioning by the small GPS receiver of single frequency was performed on the conditions that it is near on a sea surface. From the result, the Fix rate was calculated by post-processing. Fig. 3 shows the effectiveness of a radio wave absorbent.As a result of using a small ground plane and a radio wave absorbent for a small commercial antenna, the Fix rate has improved from 1% to 40%.

CONCLUDING REMARKS AND FUTURE WORK

As a next phase, we are evaluating the Performance outdoors now. Furthermore, the test which transmits the position data of a buoy using a GPS receiver from a water-surface is planned.

On the other hand, we are also examining continuously the DSSS system which used for the cord synchronous or the carrier-wave synchronous the PPS signal outputted from a GPS receiver.

REFERENCES

[1] H.Hojo, A.Yasuda, C.Fan, M.Yoshida, Y.Koike, M.Minami, "Experiments for utilizing GNSS in a shore area Sensor Network", Proceedings of IAIN/GNSS 2006, Vol2 D4-6, 2006, pp117

[2] M.Yoshida, C.Fan, H.Harumasa, A.Yasuda (2006) "DS-SS Modulated Extremely Low Power Radio Communication Synchronized by PPS Signal of a GPS Receiver", The Transactions of IEICE B-II, Vol. J89-B-II, No.7, pp1242-1251.

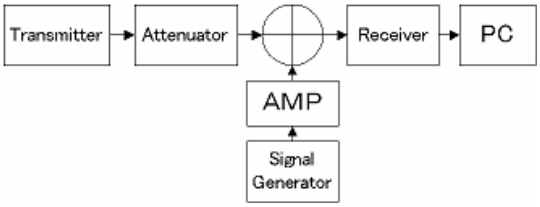

Figure 1. A block diagram

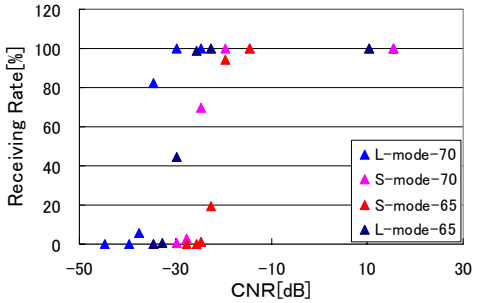

Figure 2. The receiving rate to CNR of a receiver

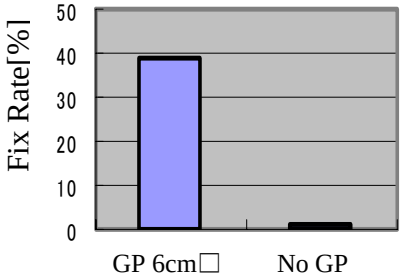

Figure 3. Radio-wave-absorbent characteristic