











Fig. 5 (a) List of housings, and (b) the state of the housing

**4. Conclusion**

We proposed multi-agent cloud system called *HAMS(Housing Automatic Management System)* for monitoring and controlling the housings installed all over the city through Ethernet or 3G/LTE mobile communication. The housing can be monitored on the client PC and the smart phone, which make it possible to handle the emergency situations in housing immediately.

Our multi-agent cloud system is installed in several cities such as JinJu City, Namhae City and Hapcheon City of Gyeongsang Namdo Province in Korea as so on. Our system has been installed from last year and about 100 embedded systems are installed at each city.

We are developing the monitoring system for other application areas, especially the area for monitoring the marine product.

**Acknowledgement**

This work was supported by LINC, GyeongSang National University.

*References:*

[1] Statistics, “Installation and operation of CCTV under public institution in Korea,” *Documents from Statistics, Korea*, 2015.  
 [2] Yeong -Yil Yang, Young-Sik Park, Hyun-Jong Lee, Young-Ho Choi, and Jong-Chul Lee, “Multi-Channel Housing Monitoring System,”

*NAUN Int’l Journal of Computers and Communication*, Vol 10, 2016.  
 [3] D. H. Kim, Y. S. Park, S. G. Kwon, and Y. Y. Yang, “Implementation of Surveillance and Combat Robot Using Smart Phone,” *Journal of Institute of Electronics Engineers of Korea*, vol. SC-48, No. 5, pp. 462–467, Sept. 2011.  
 [4] Kaiguo Li, Zhiliang Kang, Wuweu Ding, and Shen Mao, “Design of Appliance Control System Based on TCP/IP Protocol,” *Journal of Measurement and Control Technology*, vol. 30, No. 7, pp. 41–45, 2011.  
 [5] Wenbing Wan, Xuerui Li, and Yonghua Shi, “Design and Research of Smart Switch Control System Based on Zig,” *Journal of Embedded System*, vol. 32, No. 3, pp. 57–79, 2010.  
 [6] Tengfei Ahang, Qinxiao Li, and Funin Ma, “Remote Control System of Smart Appliances Based on Wireless Sensor Networks,” *25th Chinese Control and Decision Conference (CICC)*, pp. 3704–3709, 2013.  
 [7] Kenneth L. Calvert and Michael J. Donahoo, *TCP/IP Sockets in Java, Second Edition: Practical Guide for Programmers 2<sup>nd</sup> Edition*, 2008.  
 [8] Fiach Reid, *Network Programming in .NET: C# & Visual Basic .NET 1<sup>st</sup> Edition*, 2004.  
 [9] Johannes Eickhold, *Serial Communication in Java with Raspberry Pi and RXTX*, 2012.