

S. Tsukamoto, H. Hoshino, T. Tamura. Study on indoor activity monitoring by using electric field sensor. *Gerontechnology* 2008; 7(2):226. Recent studies have revealed that the physical and mental conditions of elderly people are reflected in their behaviour. This behavioral pattern changes when they are unhealthy. Moreover, it is considered that the irregularity can be evaluated from the information regarding the usage of electric household appliances<sup>1,2</sup>. However, there is still no solid evidence since the number of experiments is not enough. Thus far, we have developed an easily/temporarily installable monitoring system with an electric field sensor<sup>3</sup>. The sensor unit detects the usage of domestic appliances by measuring the electric field strength surrounding them, since the operations of most modern-day electric appliances are based on the electromagnetic phenomena. This system employs a wireless data communication device for transmitting the obtained data such that the sensor unit can be used by simply attaching it to an appliance. **Methods** To confirm the validity of the proposed system, we have installed the proposed monitoring system into an ordinary house. One healthy volunteer (female, 55 years old) participated in this evaluation. Prior to the experiment, we obtained verbal consent from the subject. Three sensor units and one data logger were installed into the subject's residence. Sensor units were placed onto an electric fan heater, television set, and microwave oven. The threshold values for on/off distinction of the power state of the target appliances were set as:  $(V_{low} + (V_{high} - V_{low}) / 3)$ ; in which  $V_{low}$  is lowest sensor output and  $V_{high}$  is the highest. The power state of the target appliances were recorded every minute, and the usage statistics were obtained for four weeks. **Results and discussion** Figure 1 shows the obtained usage statistics. From this result, we can estimate that the subject usually wakes up around 6 am, and then turns on the fan heater and television set. This consistent with the inquiry obtained from the subject. The higher correlation (0.86) between these two usage statistics (fan heater and television set) also suggests that the usage of home domestic appliances reflect the subject's indoor activity. The usage rate of the microwave oven is very low than the other appliances, because the microwave oven is usually automatically turns off in a few minutes. That is, even if the subject usually uses the microwave oven for preparing meals, unless the timing of turning on the microwave oven is the same (in minute accuracy, in this experiment), the on-timings scatter. If we include such a short-time usage appliances for the later analysis, we may have to introduce a method such as a decoding of PDM (pulse density modulation) signals.

### References

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Figure1 Usage statistics of home electric appliances