

## The Research of the Ubiquitous Interface Using Acceleration Sensor

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### 1 Abstract

In order to realize Ubiquitous society, various computer technology is searched for. In the hardware technology, the human interface that is like anyone can use a computer as his thing is indispensable. In Ubiquitous society, it is thought that the technology which can perform the input of natural information so that it may write paper with a pencil has been needed.

Rich information is included in body operation of man, and it is considered the leading means of an interface. and about a general position and posture measurement, there are high speed and acceleration with the value information and the relevance. In this research, it is studying about the Ubiquitous interface using an acceleration sensor.

### 2 The requirements for a Ubiquitous interface

For a Ubiquitous human interface, a beginner can also use immediately. He has not seldom conscious that "It is using the computer". If it becomes Ubiquitous society, when anyone uses, it will be thought always anywhere that low power consumption nature, portability, and the easy nature of operation are required for a Ubiquitous interface.

### 3 About Magic Wand

#### 3.1 Gesture and an input

The gesture does not only appear on everyday conversation in naturally, it is a method of the communication which is happened on the foreigners who can not freely communicate or the aphasic. If this gesture can understand with a machine, it is possible for it to become an input means. The gesture recognition is now tried using the 3-dimensional acceleration sensor.

#### 3.2 Magic Wand

Magic Wand used by this research is a gesture detection system carrying two 2 axis acceleration sensors (ADXL202). By having and moving to a hand, a motion of a hand can be

taken out as acceleration data of three axes.



Fig. 1 Magic Wand

The acceleration sensor and the one chip microcomputer of internal flash memory internal are carried in the substrate, the data of the taken acceleration is outputted serially. By the PC side of an output, 3-dimensional display and record of a numerical value, graph, and a locus can be done for the sent data. the circuit diagram is such as Fig. 2.

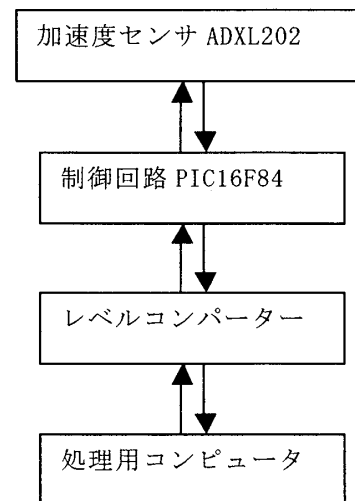


Fig. 2

The ADXL202E is a low-cost, low-power, complete 2-axis accelerometer with a measurement range of  $\pm 2$  g. It is Low Power  $< 0.6$  mA and is on a single 5mm x 5mm x 2 mm IC chip. It is thought that it is satisfied with the requirements for a Ubiquitous interface.

#### 3.3 An acceleration sensor and a command input

The size of a gesture is expressed in the distance which the sensor moved. In acceleration or the value of acceleration change, it differs from the value which operated. Or if the movement direction changes, output data also differs. It is visible in a direction changing at the

time of reverse circular motion and circular motion as Fig. 3 wrote. Therefore, if the direction of operation changes, it will appear by the acceleration sensor.

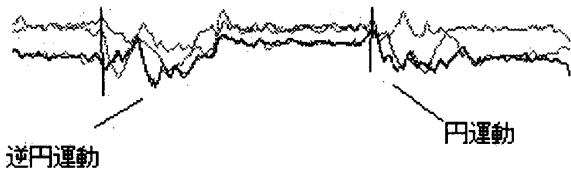


Fig.3

Although the measurement values which were able to be expressed in Fig4 were movement downward, next the same movement, when it consists of on being ordinary early first, they are values of the acceleration sensor at the time of moving slowly greatly at the end. When it is seen, it turns out that acceleration does not depend on a size but it is dependent only on speed.

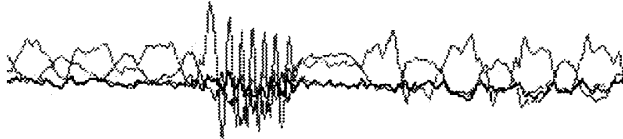


Fig.4

And if it finds the integral about the time of one operation and the size is the same, it turns out that neither fast operation nor ordinary operation changes, but it becomes a big value in big operation.

Operation (gesture) may be recognized as an amount of loci of the change of acceleration based on the above measurement. The possibility of realization has a high thing like a mouse inputted simply.

### 3.4 Signal control flow

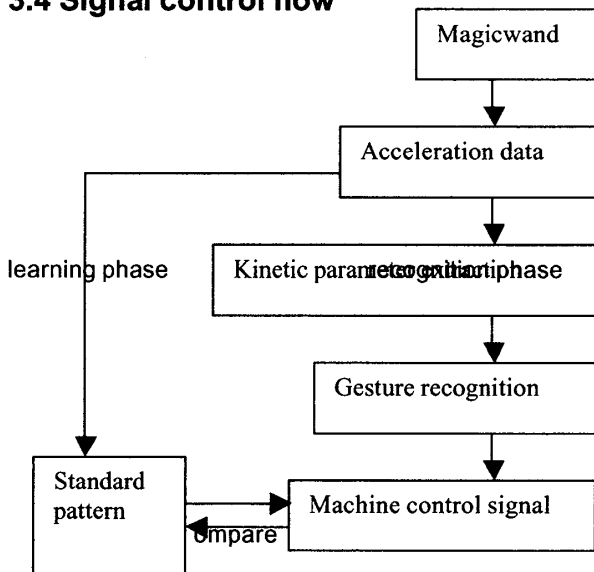


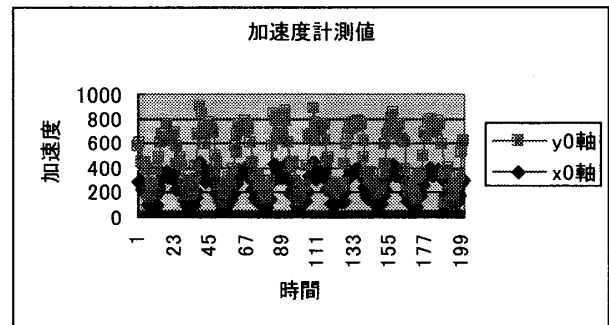
Fig.5

As the Fig5:the signal control flowing. Fourier, wave let, etc. change the data which took acceleration data and was taken from Magicwand, and a characteristic parameter is extracted. The extracted parameter is the same compared with a standard parameter -- when they are the same, we thought that it came out of a personal computer control signal.

### 4 Selection of a pattern

In this research, we can thought the gesture that well used by everyday life are composed of the operation of simple substances, such as length, width, slant, and a triangle, or combination of these some.

The following figure is the measurement value of x0 axis and y0 axis of acceleration.



Research the data what are taken from Magicwand. It will be thought required to analyze with each axis about acceleration after now.

### 5 Conclusion

As mentioned above, Magicwand considered selection of a possibility that it can use for a Ubiquitous interface, and a pattern. From now on, I thought that an interface would actually be made using the data of the taken acceleration sensor.

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