

Measurement in Social Life

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Abstract. The extraction of event that cannot be detected with conventional equipment can be considered to be a precise measurement in the wide sense. In this paper, the measurement in social life is introduced. It is divided into three fields (global environment, living conditions, and life support and welfare). In each field, the method is introduced. Especially, an intelligent sensing technology is important. It is not only a measurement system for extraction of physical value, but also a system that acquires the information which human perceives and requires. The information is obtained by processing a physical value, judging, and recognizing. It is also important to examine the correlation of a physical value and a psychological value for the extraction of the information. Some examples on the study are shown. A comfortable and safe life is expected to be achieved because the measurement technology in social life advances further.

Introduction

When various events are evaluated, an instrumentation technology is needed. The advancement of the technology is remarkable, as the science and technology develop. A new measurement method and the measurement instrument are developed one after another [1]. They greatly contribute to an industry development. In the field of a precise measurement, it aims at the precision enhancement such as the super-resolution micro-angle sensor, the super-precision shape measuring instrument, the super-precision circularity measuring instrument, and the micro edge shape measuring instruments.

However, the conventional precise instrumentation technology cannot be always useful for the measurement in a social life. For examples, a micro sensor is not needed for the inspection of the large crack of pipe laying underground that is one of the lifelines [2][3], and for the detection of distortion of shape of buildings, a distance sensor with micro order precision is not needed but image processing is useful. In addition, there are a lot of events that cannot be measured with conventional sensors, although they can be perceived by human in social life. The extraction of event that cannot be detected with conventional equipment can be considered to be a precise measurement in the wide sense.

In this paper, the measurement in social life is divided into three fields (global environment, living conditions, and life support and welfare). In each field, the method is introduced. A comfortable and safe life is expected to be achieved because the measurement technology in social life advances further.

Measurement for Global Environment

It has started from an environmental pollution issue. The relationship between environmental pollution and human life has been discussed for a long time. As for the influence given to the human body by the environmental gas, the part that has not been clarified still is abundant. Thus, environmental sensing is one of important measurement methods. Various sensing technologies have

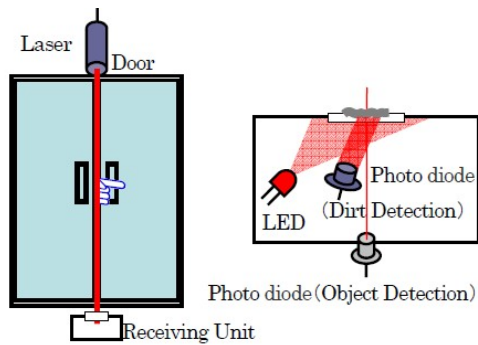


Fig. 1. System detecting accident placed between doors of train.

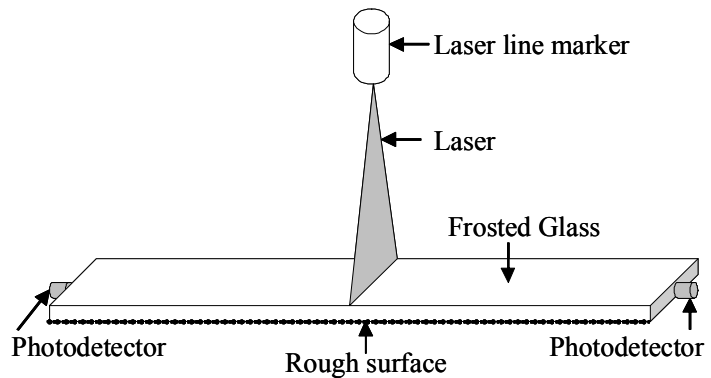


Fig. 2. Sensor detecting position of train stop.

been established now. A sensor network using information technology (IT) is one of the important technologies in the future. It is important for support of environment measurement. For example, environmental information is monitored with a mobile device, and the information is utilized by the other system [4]. There are a lot of researches on an atmospheric environmental measurement from the viewpoint of earth atmospheric sciences of global warming. It is measured from the high degree of 10 or more kilometers from surface of the earth. On the other hand, the source of various contaminants according to the human activity is within 10 km or less from a ground, so the measurement near the ground is also important [5]. In this case, the sensing network might be useful in an atmospheric measurement.

Measurement for Living Conditions

The measurement in living conditions such as an office, a home, a train and etc. is also important. Since the energy consumption in the factory is large, the decrease of the energy exhausted at the factory is an important problem in Japan. For examples, the optimization of temperature and humidity in clean room, turning off of unnecessary lighting, a proper setting of the indoor temperature, and etc. An intelligent sensing technology is necessary to solve these problems. It is not only a measurement system for extraction of physical value, but also a system that acquires the information which human perceives and requires. The information is obtained by processing physical value, judging, and recognizing. To turn off an unnecessary lighting, it is necessary not only to measure the luminance with the luminance sensor but also to judge when the light does not need. To set the best room temperature, it is necessary to consider the adaptation to the temperature of human. In addition, the best room temperature is different according to person's psychological conditions such as excitation and composure. Thus, it is important to examine the correlation of a physical value and a psychological value.

An automobile, a bus, and a train are effective so that human can move at high speed. However, they are not always comfortable and not safe. The measurement technology is effective here. For instance, a train accident often occurs. The train starts when a part of human body is placed between the doors. Figure 1 shows a system that detects the accident placed between the doors of train. It is composed of the transmittance type of light interception sensor and the dust detection sensor. Figure 2 shows a sensor that detects the position of train stop [6]. It is composed of frosted glass and laser light. Since the system is cheap, it is possible to install in various stations. Figure 3 is a new type of positional detection sensor [7]. It is useful for parking and the object detection of a car. The detection distance and the detection accuracy can be improved by placing two cheap sensors in parallel. Thus, new information can be detected by combining conventional sensors, and the detection accuracy equal with an expensive sensor can be obtained by a combination of cheap sensors.

Image processing is one of the representative intelligent sensing. The information that human requires can be extracted by processing the image obtained from the sensor. Figure 4 shows the example of recognizing the mark on the car [8].

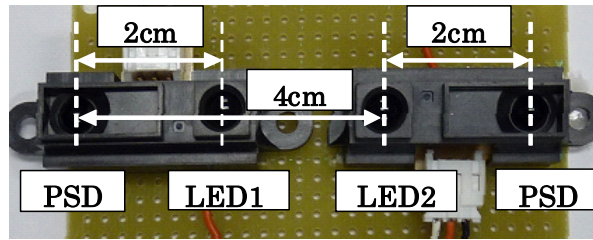
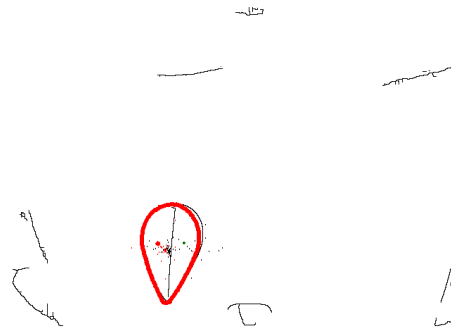


Fig. 3. Improved position detection sensor.



(a) Original image



(b) Extracted mark

Fig. 4. Recognition of mark on a car.



Fig. 5. Case for prevention of forgetting taking medicine.

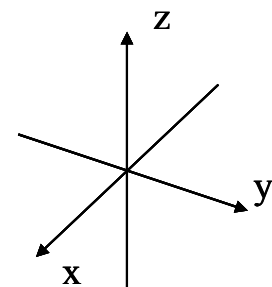


Fig. 6. Epilepsy detection sensor.

Measurement for Life Support and Welfare

In “Services and Supports for Persons with Disabilities Act” enacted in 2005, it is a purpose for a handicapped person to be independent, and to shift the life area from facilities to community. Even if it is an able-bodied person, the bodily functions decrease according as he gets older. Therefore, the measurement technology to support senior citizen and handicapped person is important.

Figure 5 shows a case for prevention of forgetting taking medicine [9]. The case can detect the presence of the medicine with an electric capacitance sensor, regardless of shape and size of medicine. Figure 6 shows an epilepsy detection sensor [10]. It can detect the trembling hand and the falling down of human with an acceleration sensor. Figure 7 shows a finger operation type mouse pointer [11]. The mouse operation agrees with the movement of the tip of a finger. The movement of the tip of a finger is detected by reading the change of color information. Figure 8 shows a remote control

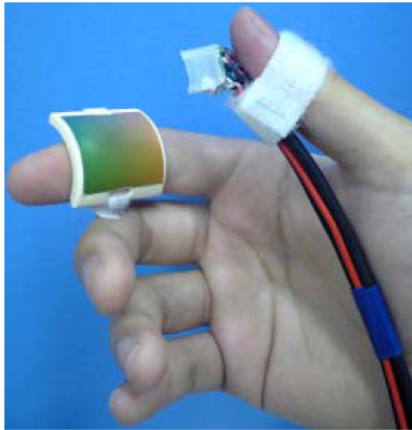


Fig. 7. Finger operation type mouse pointer.



Fig. 8. Remote control using tooth sound.

using tooth sound [12]. A variety of electronic equipment can be controlled by the tooth sound. The supersonic wave is utilized to detect the command with tooth sound.

It can detect important information by combining with the microcomputer and various sensors, although each sensor is not highly accurate.

Conclusions

In this paper, the measurement in social life is introduced. It is divided into three fields (global environment, living conditions, and life support and welfare). In each field, the method is introduced. Especially, an intelligent sensing technology is important. It is not only a measurement system for extraction of physical value, but also a system that acquires the information which human perceives and requires. The information is obtained by processing physical value, judging, and recognizing. It is also important to examine the correlation of a physical value and a psychological value for the extraction of the information which human needs. Some examples on the study are shown.

A comfortable and safe life is expected to be achieved because the instrumentation technology in social life advances further.

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