Evaluation of material characteristics of textile proximity sensor for medication adherence evaluation system

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***Abstract*— we evaluated a suitable material between the sensor part and shield part of the textile proximity sensor made for the evaluation of medication adherence. The materials were tested for medical textile bandage, urethane, and latex. As a result, it was confirmed that medical textile bandage was the optimum material. Based on the results of this study, we will implement a system for evaluating medication adherence.**

I. INTRODUCTION

The most common and effective way to cure a disease is to take medication. Drugs are recommended to be taken in compliance with quantitative amounts and times. In most cases, however, taking medication without paying attention to these trivial and important parts. Even problems of drug abuse and misuse often occur. To solve these problems, researches have been conducted on a system for medication adherence using various sensors that load cell sensor [1], inertial sensor [2], ingestible sensor [3], textile proximity sensor [4]. In this paper, we evaluated the most suitable materials among the materials used in the textile proximity sensor for the evaluation of medication adherence. We fabricated each sensor and evaluated it through experiments.

II. METHOD & RESULT

Conductive fibers are coated with a conductive material on the fibers to allow the electricity to flow well, and they are easy to manufacture and have a simple advantage. In this study, a textile proximity sensor was fabricated using conductive fiber model W-290-PCN(Ajin Electron, Busan, Korea). Sensor consists of a sensor part, a shield part and an intermediate material. We fabricated and tested the sensor using urethane, latex, and medical textile bandage to find the optimal sensor among the three materials.

To evaluate the material, data was measured for each sensor, which varied with the quantity of pills present in the pill case. The data generated by the textile proximity sensor was converted to a digital value by FDC 1004 chip through Capacitance to Digital Converter(CDC). After that, we confirmed at c# application through data communication. Multimineral(Enerheim, Germany) 15T was used for the data acquisition. The data were taken assuming that the data were taken one by one until the time from 0T to 15T. Experiments were performed 5 times for each sensor. To obtain the data according to the quantity of pills, a moving average filter was applied to remove noise, and 100 data out of the data of each pill was extracted to derive an average value.

TABLE I. TEXTILE PROXIMITY SENSOR MEAN DATA WHEN DECRESING PILL QUANTITY

Pill quantity	Material		
	Medical textile bandage	Urethane	Latex
15 => 14	22.5	-42.8	-3.5
14 => 13	12.8	8.8	20.2
13 => 12	30.1	15.15	45.0
12 => 11	33.3	35.5	9.7
11 => 10	57.1	56.0	56.5
10 => 9	58.8	68.5	61.5
9 => 8	110.0	105.6	83.3
8 => 7	158.8	116.4	138.6
7 => 6	222.7	188.6	159.0
6 => 5	315.0	268.7	221.5
5 => 4	466.1	296.0	309.0
4 => 3	814.4	496.4	503.4
3 => 2	1471.7	873.9	830.0
2 => 1	2802.7	1497.9	1468.4
1 => 0	4385.5	3019.4	2912.1

As a result of the experiment, it was shown that the sensor made by medical textile bandage was the most effective when it was tested with medical textile bandage, urethane, and latex. Compared with urethane and latex, the data of medical textile bandages are sensitive, which is the most suitable for evaluating the quantity of pills. In the future, we will implement the medication adherence evaluation system based on this experiment.

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