

## 博士論文の内容の要旨

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(博士論文の内容の要旨)

Aging society, increase of medical expenses, lack of medical worker are, now, serious problem of the world. Facing those serious problems, people's health consciousness is also very high. In addition, in Japan, the maximum amount of medical expenses is renewed every year, and problems such as divergence between life expectancy and healthy life expectancy are also raised. The demands for being healthy is the highest level in ever before.

On the other hand, diabetes, a disease that can lead to death, is increasing worldwide. According to the WHO declaration, there were 422 million diabetics in 2014, compared to 108 million in 1980. There are also estimates that it will reach nearly 500 million by 2030. Diabetes has characteristic, once infect diabetes, patients have to measure own blood glucose several times a day, which called Self-monitoring Blood Glucose (SMBG). And the equipment used for SMBG has many problems. Most of them are products are called invasive types, which measure by inserting a needle into their finger and collecting blood. Therefore, patients suffer from pain, stress and fear of blood infections. And diabetes can be congenital. In this case, it is a protector who uses the device, and there is a lot of burden to prick my child many times every day.

Against contemporary problems, monitoring several vital signs can be one of reasonable solution. It can prevent various diseases, and reduce the number of persons visiting hospital. Our research group have been proposing the multiple vital sign sensor based on the FBG sensor which is optical fiber type strain sensor. By at attaching sensor on the wrist, it is possible to detect the pulse wave with high-resolution. And, it had been proved that the pulse rate, breathing rate, stress loading, blood pressure are able to calculated from the recorded pulse wave signal.

This dissertation reports the method of extracting blood glucose information from the pulse wave signal got from FBG sensor system. Moreover, it also stated about the basic study for install FBG sensor system to the various products, take advantage of fiber-shaped.

Chapter 1 lists the problems stated before, describe the goal that FBG sensor system can achieve. Chapter 2 and 3 report the method to pick up the information of blood glucose level from the pulse wave signal which recorded by FBG sensor system. In the former, the first step was taken with reference to the blood pressure measurement method with FBG sensor system. In the latter, the measurement result was good in the former, tried to pick up blood glucose information with different method for confirming the robustness and validity of the measurement. As a result, it was found that the blood glucose level could be calibrated with a small error. Chapter 4 attempted to introduce an FBG sensor system in a bed-environment. We found the possibility of capturing the pulse and breathing during sleep without disturbing sleep and without installing it on the human body. Chapter 5 described research on mounting FBG sensors on robots in order to construct a system that actively measures vital signs. Chapter 6 summarizes and summarizes them.