Foodified self

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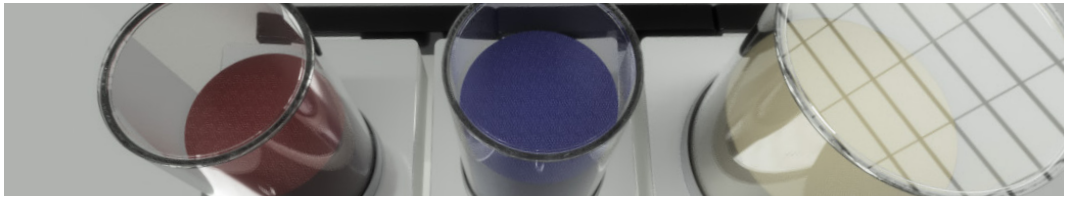

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Abstract

This product design research is devoted to the usage of biometric data, especially blood sugar rate(BS), for food selection in daily life.
Biometric data is normally applied in medical field to raise the quality of medical diagnosis and treatment etc. By the development of sensing and wireless technology, the opportunity of collecting and analyzing time-based biometric data has lowered the threshold of the usage in individual life. This technological trend makes the data utility wider. The report of Mobile World Congress(MWC) 2018 demonstrates how large the market of biometric products and technologies has become. More specifically, a non-invasive blood sugar sensor has been developed and it is going to be introduced into consumer electronics more and more in the years to come. In this research, we suggest how to design a product of everyday usage maximally taking individual's blood sugar level into account.

General research on blood sugar level

The blood sugar level(BS) / blood glucose level is the amount of glucose present in the blood of humans and other animals. The body scrupulously regulates the BS level as a part of metabolic homeostasis. In humans, glucose is the primary source of energy. The BS levels are usually lowest in the morning, before the first meal of the day, and rise after meals for few hours. BS levels outside the normal range may be an indicator of a medical condition. The high level is referred to as hyperglycemia (Cause of Diabetes mellitus). In contrast, low levels are referred to as hypoglycemia.

Here are symptoms may be associated with hyperglycemia and hypoglycemia.

Symptoms of hyperglycemia

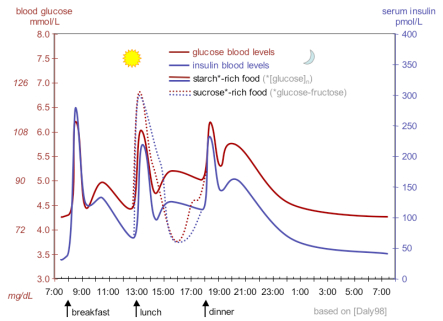
- Polyphagia
- Polydipsia
- Polyuria
- Fatigue
- Restlessness
- Stupor

etc.

Symptoms of hypoglycemia

- Anxiety, nervousness
- Coldness
- Hunge
- Headache
- Inertia (listlessness)
- Poor concentration

etc.

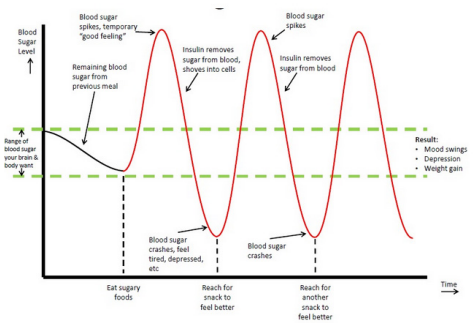


The fluctuation of blood sugar levels

Impact of blood sugar levels to emotions

Recent research shows that the blood sugar levels and everyday emotions are connected. Abnormally high or low blood sugar levels affect emotions. Especially low blood sugar levels which is hypoglycemia may cause feelings of anxiety and confusion. This illness may also make it hard to complete routine tasks and may lead to abnormal behavior. The high state of blood sugar(hyperglycemia), on the other hand, cause fatigue. More or less, this situation happens to the healthy person as well.(Non diabetes)

Emotions can also affect blood sugar levels. Stress leads to the release of hormones(e.g. Cortisol and Epinephrine). Both of those hormones can raise the blood sugar level.



The Blood Sugar Rollercoaster Sugary food deliveres temporal good feeling. It also makes you tired, dipressed afterwards, due to the blood sugar crash.

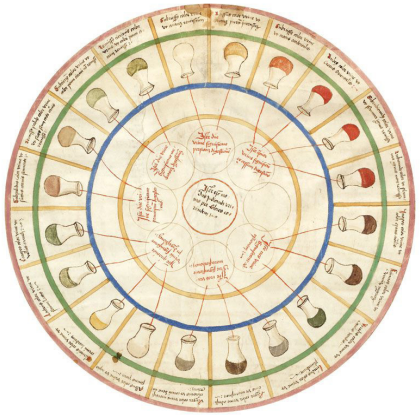
Depression people who are diagnosed with diabetes are 3 times more likely to be diagnosed with depression than people without it.

Technical development of blood sugar level sensing device

The medical examination of urine to facilitate the diagnosis of disease or disorder which is called uroscopy is the original non-invasive glucose monitor(A.C. 1506). Since the 1970s, the blood sugar levels measurement were able to be conducted at home. However, the non-invasive monitor is an incredibly difficult problem and, thus, one has to draw blood.

In the early 2000s, Cygnus Inc. developed a device called GlucoWatch. It tried to get to blister-filling liquid under the skin without a needle. The problem was that the device was painful to use. (It caused bad rash under the watch) Moreover, it took three hours to warm up before it could take a measurement.

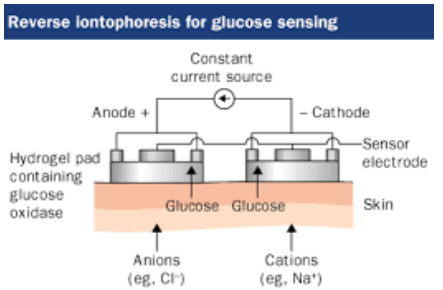
Currently several consumer electronic companies are trying to develop non-invasive blood sugar levels sensor. At least in the US, about 30 million American diabetes are waiting for the sales announcement.



Uroscopy The original non-invasive glucose monitor. This urine wheel helped doctors diagnose diseases like diabetes by smelling, testing, and looking at pee. Bublished in 1506.

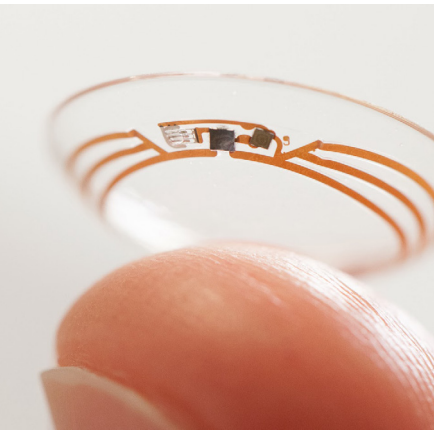
Glucose meter The home meters began in the late ’60s and early ’70s.

GlucoWatch Biotechnology company, Cygnus Inc, non-invasive glucose monitor was launched in early 2002.



Functional structure of GlucoWatch It used a low electrical current to draw glucose right out of the body.

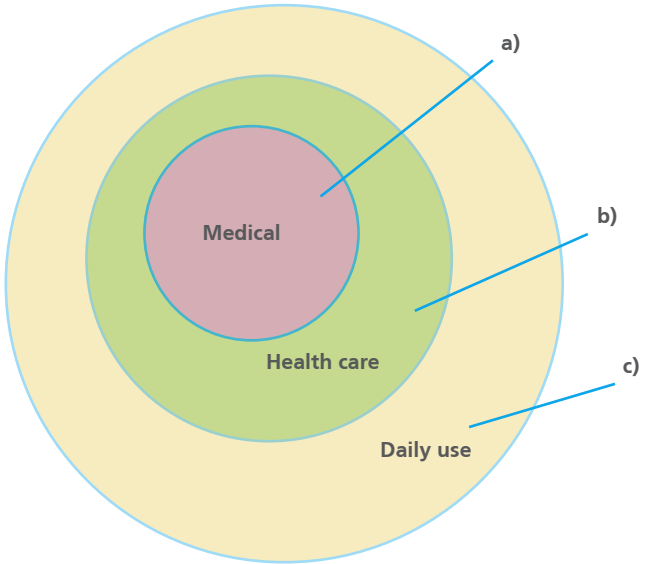
Modern wearable devices Consumer electronic company, Fitbit has invested $6 million in glucose-monitoring startup (reported by CNBC on 5 Jan 2018)



Google contact lens google tried to develop a contact lens to detect glucose in tears. In 2014, the project’s gone quiet.

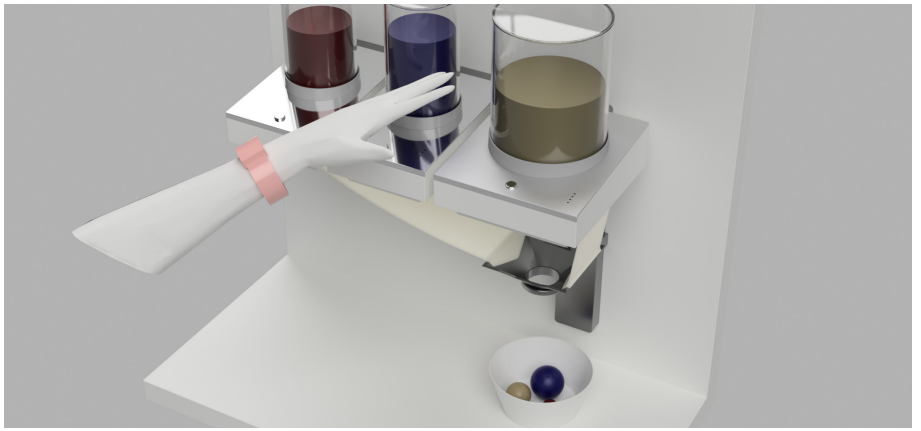
Product concept

As in the research result of blood sugar levels, it is known that the data heavily touches upon usual life human behaviour in a context of future society where people have blood sugar levels sensing device in consumer electrical devices. This project deals with the development for daily life usage of blood sugar level data in the case of a Food Dispenser.



How it works

The dispenser collects the user's personal blood sugar level. Then, it calculates the amount of sugar / mix of several nutrition types, according to the purpose and preference of the user. Once the calculation is done, the food is going to be provided.



User case stories

This dispenser may have a varied target group. Each of them are in a different position in terms of the necessity of blood sugar level restraint.

a) Diabetics
b) People who care about health as priority
c) People who have no time to eat healthy

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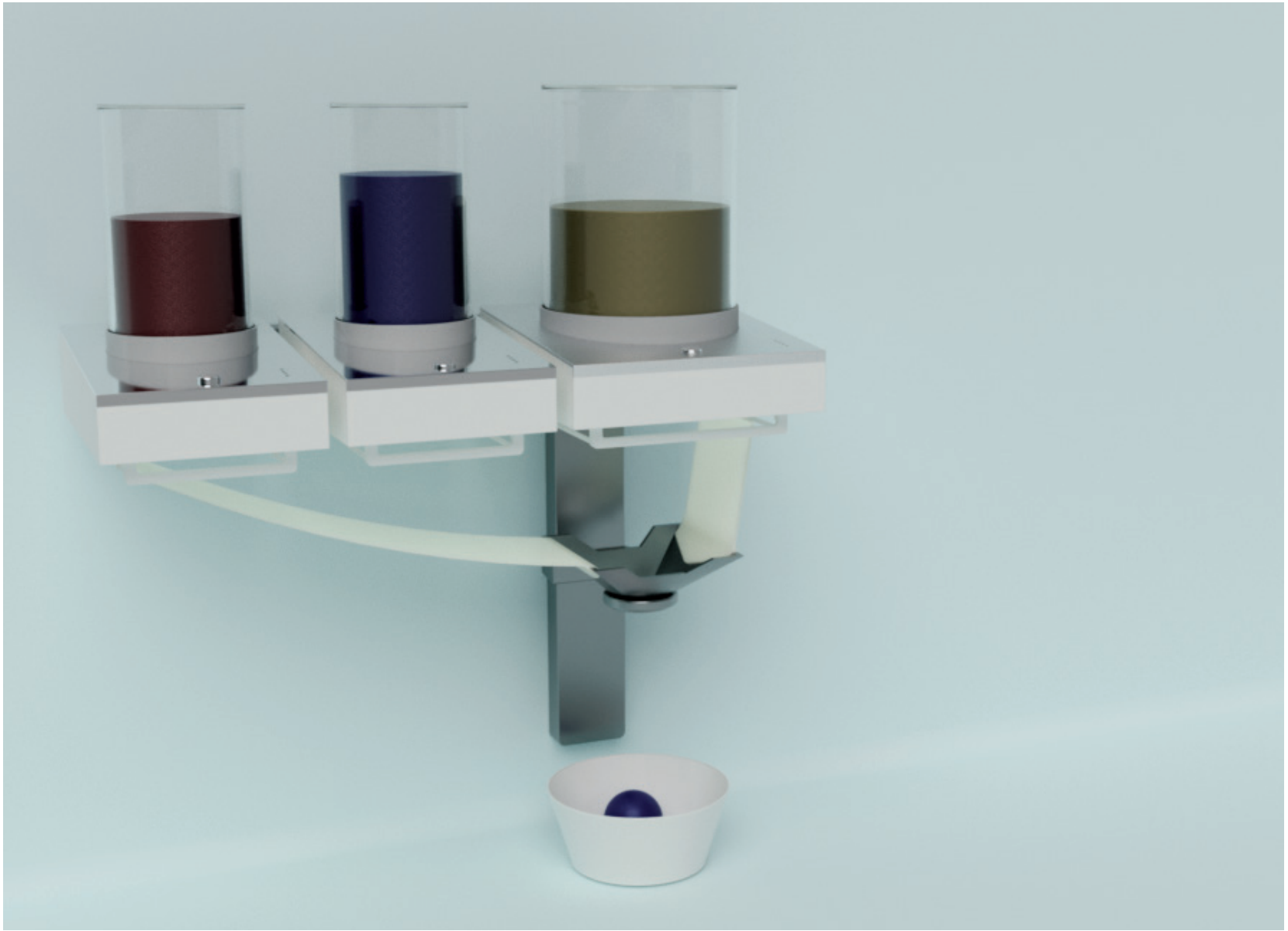
a) is a person who is already in the field of medical and thus needs to strictly limit the amount of sugar.
b) is a healthy person who cares their own body.
c) is a person who is busy and thus prefers not to spend time on food choices.



Design prototype

This is a food dispenser, each container has a meal with different nutrients. Users buy their favorite meal and put them in a container.

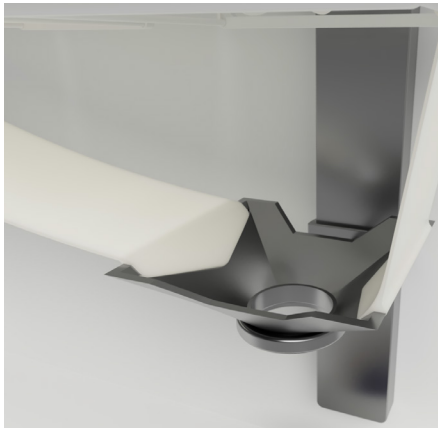
(e.g. cereals;
Users put different types of cereals.)

Users send their blood sugar levels into the dispenser and it maximully regurates a biometrically good food out of the data.

Exploded view

1. BS data collection The collected user blood sugar data by future wearable device is sent to the dispenser.

2. BS data analyzing The dispenser analyzes the BS data to regulate the BS upward curve.



3. Food generation The dispenser generate the food out of the BS data analysis.

4. Food output User receives the food which is biometrically good for them.

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