Proposal to the tourism industry of expansion with digital nurse in cutting-edge Smartcity

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Abstract

Globally, Smartcity is not considered an empirical experiment or theory as Japanese society always talks about it as a purely huge industry. The tourism industry is positioned as a very important sub-industry in that industrial system, and its efforts are progressing all over the world. From around 2008, various advanced technologies and IT systems called the City OS (operation system) have already been introduced into Smartcity all over the world. In Japan, discussions on the City OS have finally progressed in the last 1-2 years, but the gap between Japan and the world for 10 years is so large. The City OS in the EU has progressed and it is combined with digital twin technology for a digital nurse. In this proposal, I will focus on the mechanism called digital nurse, which was considered in collaboration with a EU team. The technology support for Smartcity in the EU is the most advanced from Smartcity, industry, and tourism. As a sub-industry of the latest international Smartcity, the expansion of the tourism industry by applying cutting-edge technology in the world is described in this paper.

Keywords

Smartcity, digital nurse, big data, medical tourism, digital twin

1. Smartcity as an industry

Think of Smartcities as an industry with many sub-industries in it. Each urban element, such as energy, transportation, safety and security, medical care, local administration, water, disaster prevention, and tourism, is a sub-industry of Smartcities. This paper is especially based on an idea discussed in Europe, etc. to connect medical care and tourism, while proceeding with projects in the EU and other Japanese projects, and introduces basic ideas and examples of cutting-edge efforts.
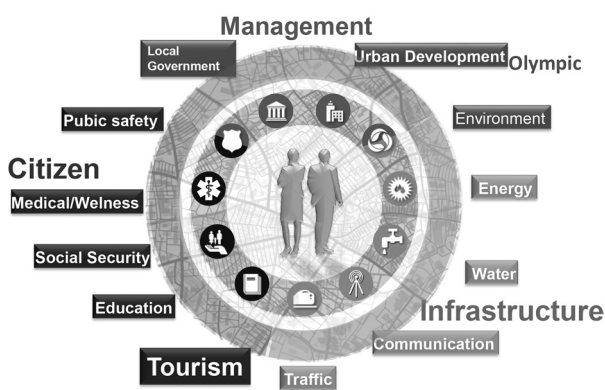

Figure 1: Smartcity sub-industries

2. Two pieces of information on medical practice

2.1 Prior information and current information

The actions performed when a person becomes ill are called medical activities. The most important information for doctors to perform medical treatment is the information that the patient has at that time. The information the patient has are the symptoms and how they came to this illness. However, this information that doctors obtain is often the information at or just before the illness.

Doctors generally do not have access to information about the patients' daily lives before complaining of physical discomfort. Information on daily life is not medical information of the patient. It is a wide range of information such as wake-up time, meal time, meal content, amount of exercise, lifestyle habits, commuting methods etc. From the doctor's point of view, the information on daily life of these patients is often very important in medical practice, not only the information at the moment of illness. Omitting the specific causal relationship between actual names of diseases, medical care, and daily life information, it is important to show the existence of daily life information for these patients.

There are two types of information required for medical treatment: information before the medical treatment begins and information that can be obtained after the medical treatment is performed. This information is considered as current information and prior information.
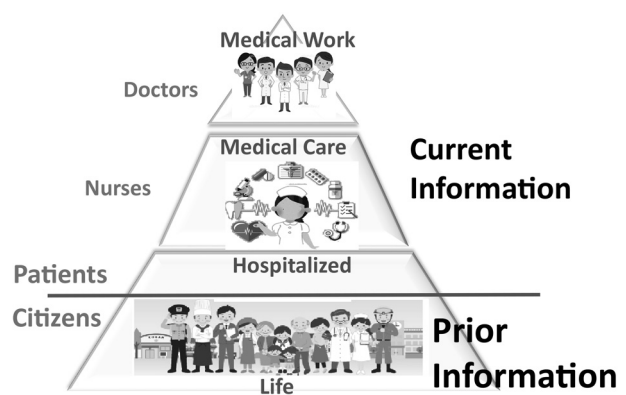

Figure 2: Two types of information

2.2 General difference information between doctors and nurses

After the patient is admitted to the hospital, in most cases,

each patient will have a nurse in charge. It is necessary to think about the duration of time that doctors and nurses spend with the patients and the information that they can obtain.

In medical practice, doctors obtain various information from nurses, patients, and their own investigation. However, most of the information is directly related to only medical care. On the other hand, the nurse in charge spends more time sharing with the patient than the doctor. The nurse has a lot of communication with the patient, and at the same time knows more about life information after hospitalization. For example, it is possible to obtain information about family structure and visitors. Information such as hobbies and work often comes naturally from talking about favorite foods. After hospitalization, the nurse actually has a great deal of patient information.

Medical work includes not only doctors performing treatments on patients, but also nurses giving detailed information to doctors and doctors making various decisions based on the information. An organization of the series of flow is as follows: after admission, patients continue to provide nurses with a variety of information on a daily basis; the nurse communicates the information to the doctor as needed; doctors perform medical treatment based on the information from nurses and direct information from patients. Here, the difference between the information obtained by doctors and nurses becomes clear.

2.3 Information that doctors need

The information held by doctors is often limited to that which is directly related to medical practice in the profession. However, although not for all illnesses and injuries, the information that doctors require includes not only current information but also information on the patients' daily lives up to that point. Unfortunately, information that nurses have is also not sufficient about daily life before hospitalization.

Of course, nurses can obtain daily information through communication with patients after hospitalization, but they do not obtain a wide variety of actual pre-hospital information. From this view, there are three types of information.

- Information used by doctors in medical practice.
- Information obtained by the nurse after the patient was hospitalized.
- Information on daily life of patients before hospitalization that even nurses cannot obtain, "Prior Information"

Ideally, doctors require complete knowledge of these three types of information.

2.4 What is prior information?

Considering the third of the above three types of information, information on daily life before hospitalization of patients that even nurses cannot obtain, pre-hospital daily life information related to a only particular illness may be obtained by doctors or nurses in the form of questions. However, the prior information is beyond the scope of that information. Doctors

should be able to choose and use the information they require by obtaining all the information about the patient's life before the admission. For example, it may be possible to obtain information from a patient about chest pain while commuting from about 7 days ago. The doctor may also obtain information about what pain the patient has while sleeping, and also information on whether the patient is exercising regularly. This information can be obtained in the form of a patient answering a doctor's question. In response to the doctor's question, "How many days ago did your chest start to hurt on your way to work?", The patient answered, "from about seven days ago," which is communicated to the doctor as information. Pain conversations and questions tell the doctor that the patient has pain while sleeping. Normal exercise habits are understood by asking the patient whether he/she is exercising on a daily basis.

Prior information is about all behaviors of a patient before admission, regardless of their illness. The patient's commuting speed has been slowing down for quite some time since they first felt chest pain seven days ago. The commuting route has changed in the last two years. Did the patient forget? The patient had a pain in the chest three months ago and took a rest on the way to work. Going back over the last two years, the patient has doubled sleep turnover during six months. The bedtime has been delayed by 2 hours in the last 6 months compared to the bedtime in the last 10 years. At the same time, the morning commute time is 30 minutes longer. The GPS location information of a mobile phone would provide information about commuting to another place for the last 6 months. Running early in the morning is a daily routine. This habit is more than 10 years old, but in the last 6 months the patient's running speed has dropped by a kilometer compared to the previous average. In addition, the stride length has become shorter, and the mileage within the same time is 5 % overall. To give an example, the prior information is the patient's big data with such a character.

There are the following differences between the patient's daily life information that doctors generally obtain by asking questions and the prior information that is mentioned above, that is, big data.

- Information obtained by doctors by asking questions → Patients' answers to the doctors' questions and responce to them
- Prior information (big data) → There is a huge amount of information, and doctors receive multifaceted answers based on their own hypotheses and intentions.

2.5 Existence of big data in medication

Considering medical treatment, the target patients will accumulate a lot of information as they continue their daily lives. At that stage, they may not even have become patients yet.

Information of ordinary living and data of life is stored as big data. When the general citizen turns into a patient, the vast amount of the information can become prior information.

3. Human natural activities are the prior information

3.1 Information that can be obtained from the sensor

What is the living information of citizens before becoming a patient? Mechanisms for collecting medical information directly from sensors have already been considered in Japan for more than 10 years in various forms. Devices such as vital sign monitors with built-in sensors attached under the beds in citizens' homes, connect a hotline with a medical institution with a special tablet, link electronic medical records and basic resident registration. However, these devices were already being developed all over the world in the early days of Smartcities before 2010. Since the development of Smartcities in Japan has been delayed for 10 years, it is introduced as super new mechanisms in this paper.

It is not possible to build international Smartcities with this old idea of equipping citizens with various sensors and communication devices to prepare for future medical care. This is simply just data acquisition as a special purpose for medical treatment. In fact, vital sign monitors with a built-in sensor under the bed were actually sold by several companies, such as Tanita, 10 years ago.

Figure 5: Tanita Sleepscan
Source: Tanita. https://www.tanita.co.jp/product/g/_TSL511WF2/.

There is no purpose in acquiring this data other than medical practice in case of a future emergency. At first glance, it seems to be cutting-edge, but from the perspective of big data and the concept of international Smartcities, its oldness and staleness are undeniable. Definitely, it is not even prior information.

3.2 Human prior information taken by sensorless sensing

What is prior information? It is the living information of citizens which has no specific purpose. It is all the information about the lives of citizens, furthermore, it is important not to have a specific goal such as "for medical practice" in acquiring
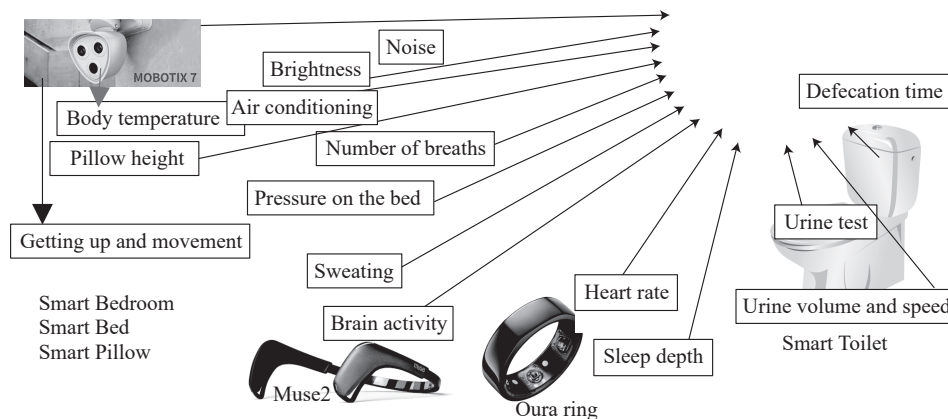

Figure 3: Data taken by sensors in sleeping
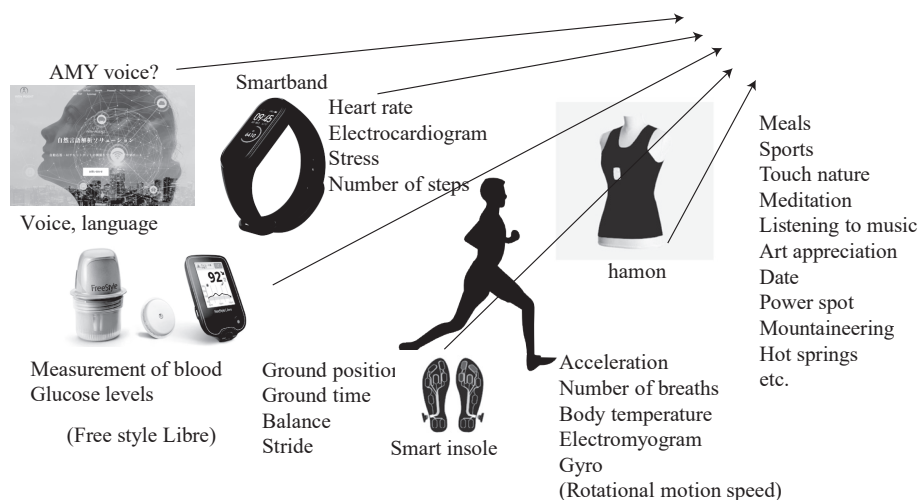Source: Suda, M., Suwa Chuo Hospital.

Figure 4: Data taken by sensors in activity
Source: Suda, M., Suwa Chuo Hospital.

the information.

Here is some information that one person can provide from waking up on one morning to waking up the next morning. This is information that can be acquired without attaching any image sensors, sound sensors, thermometers, hygrometers, and others to human bodies.

Wake up time
- Bedroom illuminance ← Can be inferred from switches and light bulbs without an illuminance sensor
- Bedroom volume ← Smartphone sound sensor is enough
- Time from alarm clock sound to getting out of bed ← Smartphone pedometer and room image processing
- Number of reciprocating motions of toothpaste ← Time to return after taking image processing and toothbrush
- Body temperature ← Non-contact body temperature sensor
- Pulse ← Can be measured by sound or smartphone vibration
- Respiratory rate ← Body movement can be measured by image processing
- Number of blinks ← Image analysis
- Steps to breakfast ← Images and GPS vibration meter
- Room temperature ← Japan Meteorological Agency information and indoor thermometer
- Humidity ← Public information and hygrometer
- Number of people living together ← Sound information analysis, infra-red information can be obtained
- Breakfast time ← About the table time measurement that does not move, etc.
- Breakfast surface temperature ← Indoor infra-red sensor
- Time to change clothes ← Time to move limbs without moving
- Time spent on the toilet ← Current of thermal light bulb and current data of washlet usage
- Commuting time ← Entrance door opening and closing time

- Steps to the station ← Smartphone pedometer
- Distance traveled ← GPS analysis
- Altitude change ← Can be calculated from barometric pressure change or map data
- Station location ← Smartphone GPS
- Boarding time on the train ← Calculated from the smartphone accelerometer and train schedule
- Train congestion ← Calculate the boarding rate from public information, timetables, and GPS identification of boarding vehicles
- Calories burned calculated from congestion ← Can be calculated from boarding rate and route
- If the commute is by car, further driving information ← Various data such as car data and GPS
- (Car commuting) Transmission reaction time with a specific signal used every day ← GPS that shows subtle changes in the body
- (Car commuting) Vertical and horizontal acceleration and runout while driving ← Guess physical condition from accelerator and steering wheel operation
- (Car commuting) Changes in daily fuel consumption ← Guessing physical condition on a specific day based on driving patterns
- Workplace arrival time ← Guess moral pattern by subtle changes in GPS time
- Number of steps during work ← Can be calculated by image processing or GPS
- Sunshine hours during work ← Guess UV rays from GPS etc., guess vitamin production
  Etc.

There is so much data, and it is not so difficult to obtain it. This is not information that comes from specific sensors attached to human bodies. The amount of information that can be
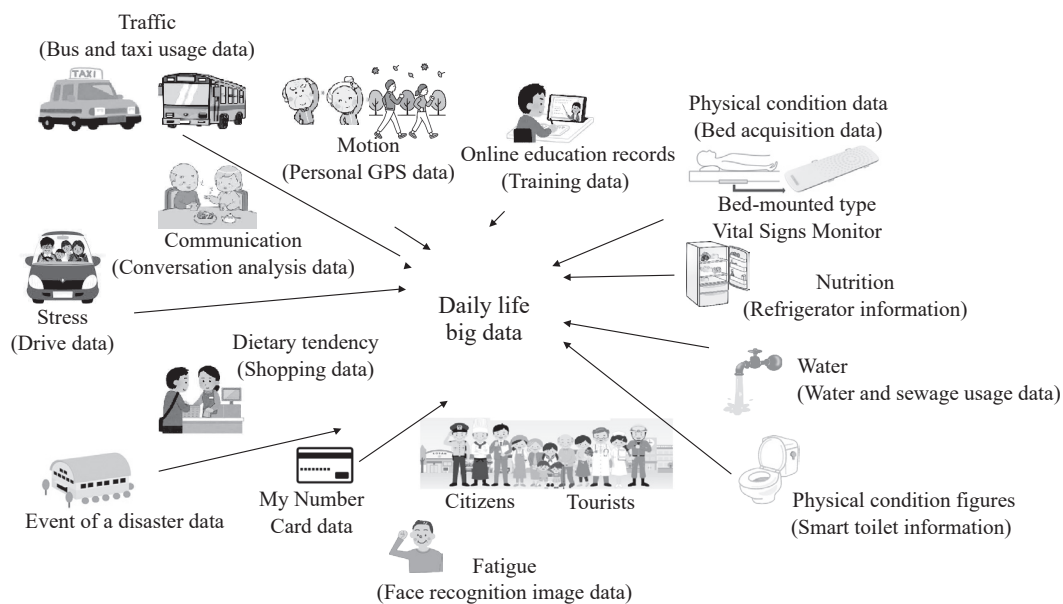

Figure 6: Big data of human life

obtained when commuting by car, which was mentioned at the end, is even more enormous. It is not just the drive records that cars automatically record. It is easy to know the speed of entry into a specific sharp curve that is passed every morning by combining GPS and driving records. If the person is not feeling well, they may be cautious about driving. Or they may be slow to decide and brake longer on that curve than usual. However, the person does not have sensors.

It was mentioned above that it was old to acquire data with vital sign acquisition sensors and use it for future medical practice. This is because data is acquired by a sensor for the specific purpose for medication. It is no longer necessary to attach sensors for a specific purpose to the body or connect it via communication. So why can this be achieved? What has progressed from 10 years ago?

3.3 The latest international data acquisition technology

Japan is a country with excellent automobiles and the electrical and electronic industry technologies that support them. Therefore, when considering the latest technology, the evolution of equipment should come up first. However, the basis of international state-of-the-art information acquisition technology is not due to equipment such as cameras and sensors.

The most advanced is the way information is received through data processing. Even images taken with a camera with very poor resolution can be sharpened and analyzed in detail if the number of images is large. This is due to the evolution of software and algorithm technology represented by AI. This is an advanced information data processing method. Similarly, advanced analysis of images and videos can tell about the degree of wandering of a person, and even inner changes in the person's feelings. However, the required camera level does not have to be ultra-high precision. The keen technology after the images and videos are taken is important.

This latest technology did not exist much in the early days of Smartcities 10 years ago. Therefore, at that time, efforts were made to attach sensors to the citizens to acquire information. Attaching sensors is already old but Smartcity projects are describing them as the state-of-the-art.

3.4 Complex data combinations are important

The previous section mentioned the data that can be obtained from the time a person wakes up to the time they arrive at their place of employment. Even thought about simply, it is possible to obtain this much information. Even if there are 100 types of acquired data inferred in this way, it is not possible take all of them. However, if the data can be easily obtained and does not cause much harm to the person, the feasibility is high. Suppose that only 10 % of 100 types of retrievable data, that is, 10 types, are acquired. Since these ten types are not data acquired for a specific purpose, they are not yet directly related to medical practice.

The doctor needs the data of the patient for the first time when the patient comes to the hospital. The data that the doctor needs at this point is defined by the doctor's thoughts. Originally, the doctor wants not only information on physical disorders but also information other than lifestyle-related behavior patterns and other symptoms of illness. Furthermore, this daily life information is required not only alone but also combined with multiple information. For example, if information about continuous weeks with excessive walking, over 35 °C temperature, and on crowded trains, it is possible to guess the basic lifestyle will cause a heat stroke.

Train congestion information, temperature, and walking time are not personal information or data that needs to be authorized. However, when multiple pieces of this general information are collected and analyzed, it turns into data that can be a very important clue for medical activities. This is how big data is used, and it is correct for big data to be used for medical practice when daily life information is considered as big data.

3.5 Japan's data utilization technology

It is an absolute requirement to acquire data in the daily life of a business, apart from defects such as products and their quality or failures. At both manufacturing and distribution sites, this has been carried out for a very long time. This is the basis of routine business in almost every industry. In particular, Japan has been a major leader in the world in fields such as quality control, cost control, and process control. This is the reason why postwar reconstruction has been pushed from mere processing trade to a major manufacturing power. In the case of Japan, especially after World War II, most of the products manufactured were destined for the United States. There is also the background that the demand for products by American consumers was strict, and the sincere Japanese national character responded to this.

3.6 EU way of thinking

EU Smartcity projects these days are completely different from this Japanese way of thinking. Their basic principle is to put the most important things first. In the event of a disaster, disaster recovery is of paramount importance to them. This is the same as the case when a person becomes sick, concentrate on curing the illness. For that purpose, it is necessary to collect sufficient data daily and prepare it so that it can be used at any time.

It can be realized how wasteful it is to identify what happens in a world where they do not know what will happen and to acquire data in a narrow range.

3.7 City operation system is 10 years old IT technology

Around 2010, a large number of urban operating systems that are City OS in Japan now, such as Smartcity monitors and intelligent operations centers, were implemented around the world. At that time, collecting the data from sensors and using it centrally were the main ideas, similar to the idea that Japan is currently thinking of now. However, after 10 years, data analysis technology has made great strides, and at the same time, AI
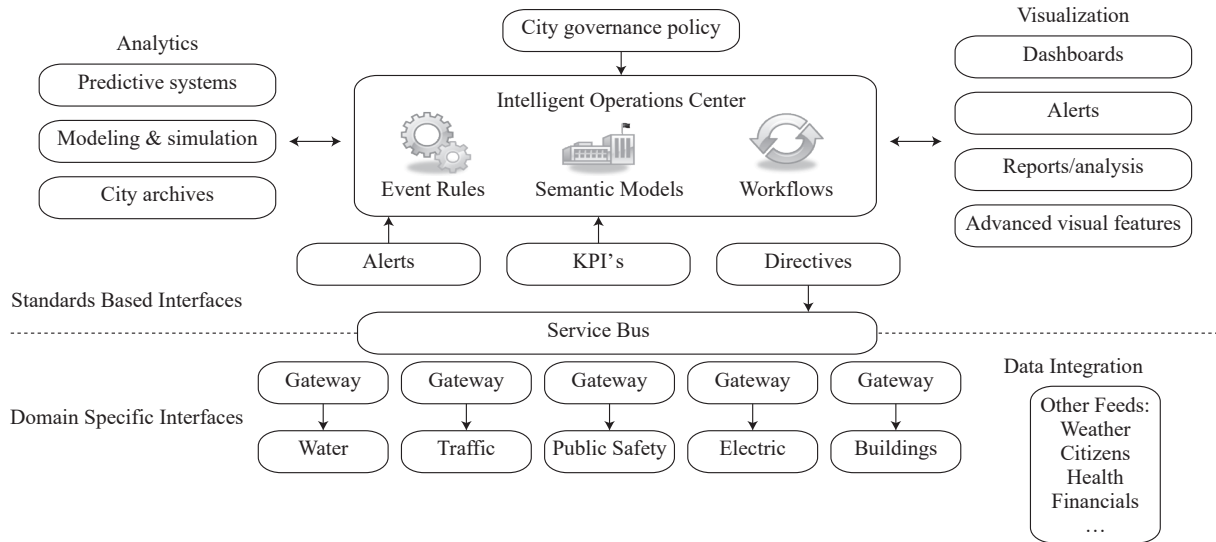
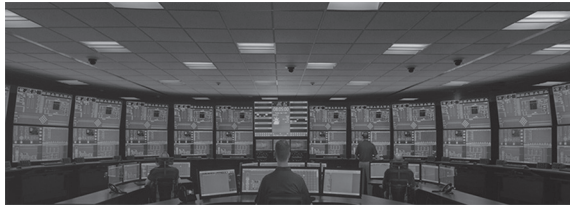Figure 7: The intelligent operations center architecture

Figure 8: Austria Smartcity monitor

technology has reached a level that can be programmed by the public. This is the acquisition of data, which is now considered mainly by European countries such as the EU. Methodologies such as attaching specific sensors to citizens have become one of the most unacceptable in some countries.

The latest technology that can be considered is to make deep considerations and responses by advanced analysis and data investigation of general daily information as described. This is the latest data utilization technology.

The cause of the delay in the Japanese system related to Smartcities is clear. In Japan, Smartcities have not yet been considered as industries or businesses, and 10 years have passed with the definition of proof-of-concept experiments based on cutting-edge IT, which some companies and municipalities are testing. Therefore, the cause is that the know-how of system construction in Japan's specialty industry is hardly utilized for city development.

4. Europe where city operation system has evolved into a digital twin in 10 years

4.1 Digital twins

The city operation system, which was introduced around the world for Smartcities 10 years ago, has undergone a major evolution in Europe today. One of the projects that took place in Europe in 2020 is a project called Digital Twin or Digital Nurse. Digital twin means twins in eternal virtual space. This term is a concept widely used in the systems at the manufacturing site and in the sales and distribution systems. There used to be the idea of AGENT technology as a system architecture. The agent creates a virtual reality such as actual humans, cars, manufacturing devices, and others in cyberspace, and it is possible to guess the actual movement while watching the movement.

4.2 The predecessor of the digital twin

This agent technology can be considered as the predecessor of the digital twin. Similar to traffic jam prediction, the agent simulates, creates a car, runs and finally predicts the movement in the virtual space. Of course, it does not actually manufacture real cars.

What is the difference between digital twins and agents? For instance, suppose a man named Taro Yamada physically lives in a city. The agent is the virtual human being created in virtual space for this man. The digital twin is a complete twin or clone of Taro Yamada. Of course, the actual human twins are two different persons. The digital twin is the basis of the idea of the actual person created in a virtual space. This is the basic concept of the project in Smartcity medical care in Europe. Consider that Taro Yamada caught a cold yesterday and now his body temperature has reached 38 °C. Since the digital twin is theoretically the person himself, the body temperature of the digital twin in virtual space becomes 38 °C. If the digital twin becomes 38 °C, as well as a real human, he can tell us the temperature of the real person. This is the digital twin in this project with such an algorithm.

If a population of 100,000 lives in that particular area, starting a digital twin project means that each and every one of the 100,000 people who actually live in the virtual space has a clone as the digital twin with a completely different independent personality.

4.3 Relationship between city operation systems and digital twins

Some urban operating systems introduced in Europe have evolved into digital twin systems over the course of 10 years. What do they have to link with the urban operation system? They have the function of collecting various movable data from the energy, water, transportation, medical care, safety, disaster recovery, education, administration, etc. and other existing entities in the city and storing them in the centrally located system. The enormous amount of data that has been stored will be analyzed as needed. The work instruction mechanism called a workflow is established to carry out the necessary works. In other words, based on the collected on-site data, the final dispatch orders of workers will also be created.

Due to the continuous accumulation of large amounts of data, this urban operating system has real data for a single city created in virtual space. It is positioned like a twin for a city. Information is constantly copied, collected, and stored in the city's operation system. Therefore, if a storm drain is filled with rain in one place in the city, the condition of the other 99 storm drains related to it can be instantly determined from the historical analysis results without human investigation of the site. If there are not any such systems, the status cannot be seized until a person physically goes and checks them. This is a traditional urban operating system represented by Smartcity monitors.

4.4 Digital twin and city operating system

The basic idea of a digital twin is very similar to this through constantly collecting and storing daily data from various perspectives. By creating the clone and looking at them, it is possible to obtain the same information as seeing the actual incidents. The only big difference is that not one virtual city is made for one real city with even 100,000 citizens. One for each citizen, a total of 100,000 virtual citizens will be created in the virtual space.

4.5 Structure of digital twin

The fundamental data of the digital twin is the basic data of its citizens. The basics are name, address, date of birth, etc. Then, what is the information that digital twins collect every day to keep the person in the virtual space? It is daily life information linked to the fundamental data.
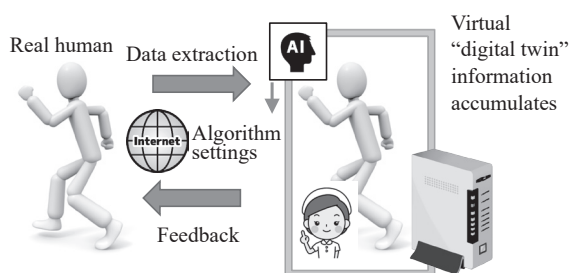

Figure 9: The idea of "digital twin" born from Smartcity monitoring

A person's name and date of birth do not change. However, information on various daily activities such as working styles and living styles mentioned above changes and is updated every second. The digital twin keeps acquiring the information of the person every day and always keeps being the person. It should be noted that digital twins do not exist only for the purposes related to citizens and medical care, and in some cases, defects are simulated in the case of making digital twins for machine tools in manufacturing industries. The information that the digital twin needs to obtain in order to remain the person that exists in the virtual space is very similar to the citizen's daily life information. This is the prior information mentioned previously in this paper.

In a European project, this algorithm was completed with a huge team of 12 European and several Japanese doctors, information processing specialists, Smartcity specialists and more.

5. Two types of prior information, integrating tourist and living information strategy

5.1 A health tourism idea considered 8 years ago

This is a health tourism planning document created on the premise of a resort in Okinawa. This was made about eight years ago in 2013. The basic idea is to obtain a variety of data while enjoying sightseeing without being conscious of medical treatment and examinations and to use the data there and in the future. In this document, it mentions that sensors will be attached so as not to burden the guests who come to the resort. The main devices are list-type sports instruments distributed at the reception. It is a very fashionable wristband that can be worn when running, hiking and playing golf. The sensor under the bed is made by Tanita, and users do not notice its existence. This is because it is installed under a thick mattress of more than 20 cm. Wristbands are fashionable for users who enjoy sports. As a sensor, a lot of information such as pulse, position information, and body temperature can be obtained. In addition, the device under the mattress can obtain the user's heart rate, body movement information during sleeping such as turning over and other activities such as going to the bathroom.

5.2 Data fusion considered from around this time

The most advanced part of data processing by this sensor is the algorithm of composite data. It is possible to know a pulse with a wristband, but usually not the blood pressure. However, it is possible to infer changes in blood pressure from patterns of changes in an individual's pulse using an algorithm from IBM Research. Complex calories burned can be found by analyzing the distance traveled and basic data such as body weight in addition to the difference in temperature, body temperature, and time. Multiplying that data by the heart-rate makes it possible to calculate the exercise load. Fatigue and burden can also be inferred from data such as daytime exercise and data such as turning over and sleeping time during sleep. If you add the contents of the meal from the accounting information at the restaurant are added to the information that combines the tem-
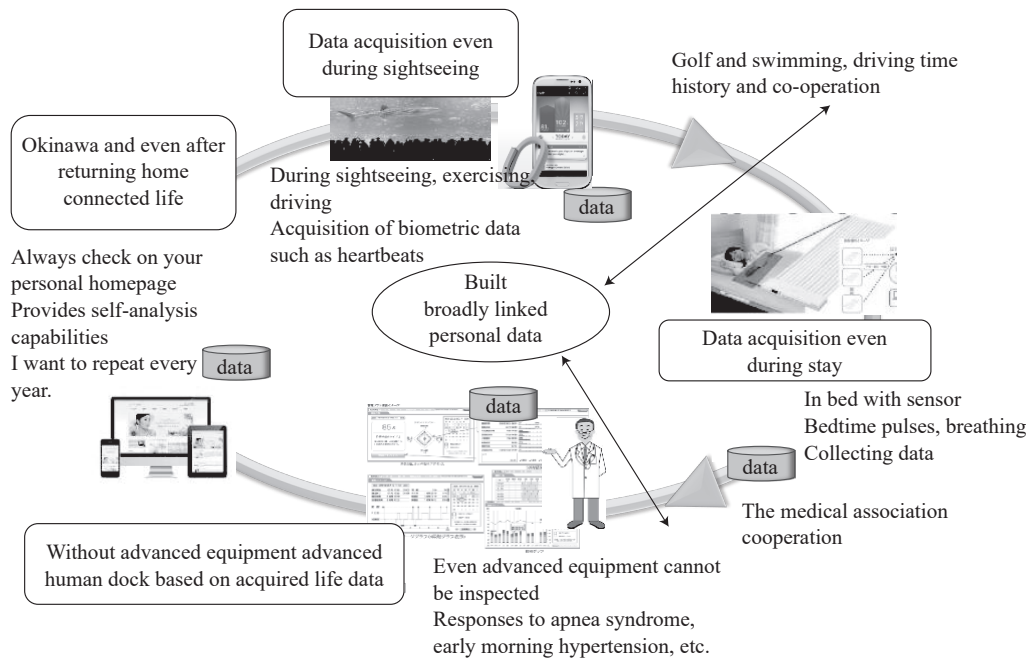
Figure 10: Data medical tourism

perature change and various information during the person's stay, the relationship between the meal and the body will also be known. For example, two people who ate the same food and did the same exercise have different fatigue. Also, if a person eats the same food and does the same exercise for two days in a row, it is possible to see the change in their physical condition.

5.3 Fusion of complex data and deep psycho-analysis

With this system, users can visit the resort and spend their days happily, and on the final day, health information is recorded and stored in the individual database for each guest. Users will return back home after sightseeing, but the database has already been created that includes personal health data, fun golf scores, mountain walking trajectory information, and food photo information with meal names. The user will take this memory and think to go to the same resort again.

The big problem on the resort side of Okinawa was the average length of stay. The current average is 2 nights and 3 days, but considering profitability, it is hoped to increase this to 3 nights and 4 days. So, the idea of health and sports advice on the additional last day of their stay at the resort was proposed, and the value of extending a night by adding an advice service based on data and advice was recommended.

5.4 Deep strategies hidden in the medical check

Elderly people are interested in health advice and will continue to visit a resort again in good health. Young people want to know the results of their body conditions and sports. These are the focal points by age. Furthermore, if there are any problems with a person's physical condition, they can add two options. One is, of course, emergency treatment and the second one is standard medical treatment. For this reason, the idea is

to affiliate with nearby general hospitals and medical associations for this tour. The other is a medical checkup at a resort. There is a medical checkup while staying at the resort.

5.5 Prior information during sightseeing and daily life

Considering prior information while looking at this example, is the information of daily life different from the information when staying at a tourist spot? It is the daily life and the life in a tourist spot of same person. Yet there is no difference in living information. Of course, the location and environment are different, so they should be considered as factors. The altitude, the climate, the stress, the diet is different, and so on, but the person is the same. Data can be aggregated and analyzed with understanding these differences.

5.6 Controllable information acquisition during sightseeing

The biggest difference between daily life information and tourist life information is whether the acquired information can be controlled. The type of pre-acquisition information in daily life is decided by the person's will and consultation. Therefore, information can be obtained in a wide variety of ways, but there is no big difference depending on the individual or region. Tourist life information can be planned, controlled, analyzed, and designed by the tourism service provider. In other words, the tourism servicer side can make a difference from other companies. They can be used for differentiation as part of the business. Furthermore, it is easy to provide it as a service. It is important for companies and service providers involved in tourism to seriously consider this point.

5.7 Strong added value of tourist life information

A wide variety of big data can be acquired in both daily life

and sightseeing. However, tourist daily life information can add strong value on the service provider side.

It is almost impossible for the tourism industry to relate directly to medical information or hospitalization information. However, tourist life information, which is part of the daily life information for medical treatment, has a completely different value.

5.8 Sightseeing life information and digital nurse

It is possible for the tourism industry to provide advice at tourist destinations and resort areas to some extent. The concierge advises tourist destinations and restaurants. The receptionist can do accounting and take care of the room arrangement. However, there is no occupation to be in charge of dealing with health and physical information in tourist areas even. The tourist cannot think of a person in charge who can safely deposit their various data. That is where nurses or digital nurses come in.

5.9 Sensitive information such as health is difficult to pass to humans

It is true that travelers are reluctant to write and hand over health data to living humans. However, what if it is a digital nurse in virtual space? It would be possible for the tourism industry to acquire various data and provide services with the latest algorithms and technologies and enter a high value-added business zone. The indispensable human resources at that time are digital nurses who are virtual human resources.

In the previous cases, the data was often sent via sensors, however as mentioned above, it is now possible to perform a large amount of complex analysis from many forms of simple data such as camera images and microphone sounds. Using these latest technologies, users can obtain a lot of data such as sports and physical fitness, physical condition and diet, exercise advice after returning home, basic information for future medical care, etc. On the final day, without being aware of the existence of sensors, it will be provided.

5.10 A personal nurse who stays close to you even after returning home

The person in charge, the digital nurse, will not disappear even after returning home from the resort to daily life. They will stay with the person for a year. In other words, the tourist company will be providing a service that dispatches personal nurses continuously. How would tourists feel if there were personal nurses dispatched by the hotels for a long time? No doubt some will go back to the same resort with the nurse the following year.

6. Prior information acquisition in the tourism industry
6.1 Big data acquisition during sightseeing changed by digital nurses

What would happen if travelers enjoyed sightseeing and had a digital nurse after returning home? The digital nurse dispatch service as a tourism industry is primarily aimed at revisiting customers. However, the customer service that the tourism industry can provide is broader. The business perspective changes when we consider the flow of travel customers, such as life before sightseeing, concern after sightseeing, and connection to life after returning home.

Sightseeing and daily life are both human activities, so they are on the same line. However, the current tourism industry treats tourism and daily life separately. The tourism industry is unaware that it can relate to a consistent continuity in terms of customers. Comparing this with the medical case mentioned at the beginning, the act after becoming sick and being diagnosed by a doctor is separated from the daily life and information. If there is a digital nurse, it is possible to present the enormous amount of acquired daily life data to the doctor for the medical practice and the doctor can use it without any limitation.

What if it is possible to include tourist life data in the huge amount of daily life data? Information on various conditions such as sporting information at the resort area, travel information, relaxation, and climate differences can be added. Information on movement includes abnormal stress information such as driving a car, traffic jam, high speed, long-distance train, Shinkansen movement at 300 km/h, and low-pressure movement by airplane taken during traveling can be specially provided.

Above all, it is possible to manage normal daily life information and tourist living condition information together. Since it is the information of one person, this summary is also important, but the tourism industry can realize this.

6.2 Reversal idea, municipality digital nurse and tourism industry promotion

If the municipality can provide digital nurses to the residents living there, it will be possible to acquire information on the daily lives of the citizens and provide information services when implementing medical treatment. However, this makes it difficult to integrate with information in tourism life. Therefore, it is necessary to change the way of thinking. It is important for municipalities to provide digital nurses to the citizens who live there to support medical practice, but that way does not change anything.

As assistance for the tourism industry in the municipality, it is necessary to provide the digital nurses to the tourists from
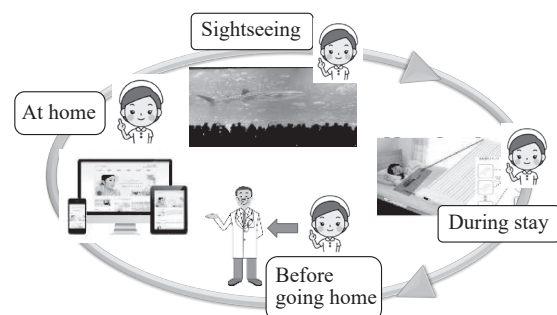

Figure 11: Digital nurse and tourism

outside. Every municipality has various tourist bases as it is. Municipalities, especially economic promotion division and chambers of commerce, can work together to supply unique information acquisition services to the tourists from outside regions. This is also a big reason why tourist destinations, the tourism industry and municipalities must cooperate.

6.3 Individual entities structure the tourism sites

Although it is possible to obtain individual information, such as the time and condition of boarding a boat and the distance traveled by bus individually, it is extremely difficult for these companies to share information on the activities of a specific person from the perspective of the Personal Information Protection Law. In addition, the information obtained from cameras and microphones on the street is confidential information and cannot be dealt with by companies. The same applies to public information from different management entities such as national roads, prefectural roads, city roads, and farm roads. Even rivers have many different management bodies, from first-class rivers to private streams.
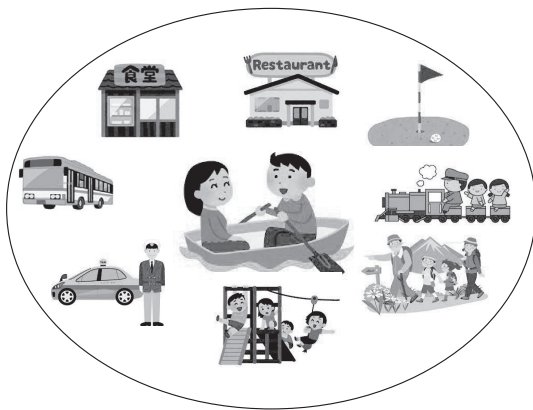

Figure 12: Inside a municipality no data linkage

6.4 The great power of local governments in tourism information strategies

With that in mind, it is the local governments that can collectively provide combined and linked information on those areas and various types of management capabilities. If the individual travelers can also opt-in, that is agreeing, various information to individuals with their consent can be sent. There is no problem in linking information on an individual basis and using it personally.

6.5 Simple example of data acquisition consolidation

For example, in the case when a tourist gets on a bus, the record is sent to an individual smartphone. The traveler can also receive time and actual route information when getting off. The bus company will give the person that information and only they can receive the boarding record. Next to the bus, at a restaurant, the details of the meal are sent based on the account-

ing information. The restaurant can only provide information about meals and customers, but tourists can receive continuous information of the bus ride and the food at the restaurant.

6.6 Municipal digital nurse's big mission

The information generated by services like these can be constantly stored by local government digital nurses. For example, any name such as "ABC City Digital Nurse", "ABC City Digital Tour Operator", or "ABC Town Digital Concierge" can be used, but the moment a person enters the city, tourist life information will be accumulated in the digital nurse. If the local government wants to implement a point service, both collaboration is possible. The big mission of this digital nurse is also to combine the tourist life information with the daily life of the individual traveler. Information before coming to the tourist spot and tourist life information can also be combined.

6.7 Future smartphones and digital nurses

The information acquisition system during sightseeing can also be used for mountain climbing recording. The digital nurse always records GPS information, troubles, and schedule changes during the person's mountain climbing. The digital nurse can make a call even if the person cannot reply, answer, or contact anywhere. Furthermore, by giving the information to the tourist after the sightseeing is over, it is possible to expect the tourist's return.

It is no exaggeration to say that many people now rely on smartphones for their lives. It seems that smartphones are already becoming the early-stage digital nurses. People used to remember their phone numbers. Now they must ask their smartphone. Letters, phone calls, documents, books, etc. are information stored in the smartphone. GPS location information is always recorded regardless of the owner's consciousness. Tourism services using digital nurses have the potential to dramatically expand the scope of the tourism industry business in this way.
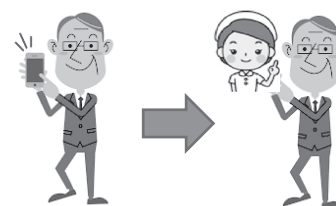

Figure 13: Smartphone and digital nurse

6.8 Tourism data contributes significantly to medical care

In this way, the digital nurse service provided by the local government gives a large-scaled service that is good for the lives of travelers. Naturally, the service also makes a great contribution to the medical and health care of the individual traveler.

The case of the resort in Okinawa mentioned above seems to have a merit for only that resort, however if it becomes a

service joined with the local government in the area, the scale would be greatly expanded. The number of new tourists visiting for the purpose of a newly born value will increase.

6.9 Tourism industry and digital nurses in the Covid-19 disaster

As can easily be imagined, it would be a great help if the tourism industry under the Covid-19 situation had the services of this digital nurse. Local governments can support personal movement information and activity information and provide them in detail. Close contact, travel routes, presence or absence of dinner, and other information not used by local governments, but individual travelers can record information in perfect form. Even if the traveler forgets about the dinner or a finished meeting, they can easily be retrieved from the accounting information. It is legally correct because only the person uses this information privately. If this information can be obtained and the digital nurse has information on behavior in tourist areas, it will be possible to pass sufficient information to doctors in the event of illness, which means saving human lives.

At present, both the government and local governments let individuals acquire such information and companies try to use it. Therefore, the citizens are cautious, and the project does not proceed well. In Covid-19, there are direct benefits to the citizens, and the activities must be carried out without any problems or delay. Rather than the idea of inputting data or attaching sensors, the most important mechanism is to organize easily available information aggregation and return great benefits to individuals continuously.

7. Proposal for tourism industry with Smartcity technology to succeed in the world

7.1 Strategy to ordinary and extraordinary tourism as an important part of human life

In Covid-19, in addition to the daily life up to that point, wearing a mask and vaccination are required during sightseeing trips. Previously, it was called everyday and extraordinary, and tourism was divided as a completely different experience from everyday life.

Disasters represented by Covid-19 are not necessarily limited to illness. Many disasters such as the Great East Japan Earthquake, floods, and landslides are occurring not only in Japan but all over the world. In addition, international crises such as the Afghanistan issue and the North Korean issue are occurring all over the globe. From the perspective of Japanese people, the Middle Eastern countries were somehow considered dangerous. Unless it is a specific country such as Iraq or Afghanistan, it can be thought that it would be a target for sightseeing without worrying about it as a Japanese person. However, as the international situation has become more complicated, related terrorism has begun to occur on a large scale even in Turkey, a tourist country that is popular with Japanese people because of its low risk level of the Ministry of Foreign Affairs.

At the same time as the dangers of terrorism, a worldwide pandemic is combined. As with the dangers of terrorism, the chances of becoming sick during tourism are high at the world level. With that in mind, the key to future tourism strategies is not to consider tourism as extraordinary affair but it should be included in the daily human life. This can be thought of as the next-generation tourism industry strategy that can respond firmly to the current situation of Japan and the world. It is also possible to think of this in a positive direction. One is a strategy that allows tourists to act and experience as citizens there. There have been many hands-on trips since ancient times. However, there are not many strategies to experience the life of a citizen with the protection and support of the local government at the destination.

In the case of experiencing sports in the resort area, it is considered to be sightseeing from the time of being at home to the care during and after the sports. The municipality can enjoy special services such as access to public facilities, educational opportunities, medical opportunities, etc. by imposing a special residence tax on tourists. It is possible to expand the strategy to such a range. If this can be extended overseas, it is possible to achieve a travel style in which the destination municipality accepts the visitor as a special citizen without a tour conductor. At that time, the local government may provide the local government digital nurse.

7.2 Apply Smartcity technology that erases the language barrier

Automatic translators for tourism have come to be widely used in various forms. However, most of the mechanisms are such that if you include Japanese, they will speak only one language such as English. What if there were four people and each could speak and talk freely in their mother tongues? In fact, this mechanism already exists in Japan. With a mechanism called SmaLingual, a demonstration experiment was started in October 2021 in a university lecture.

Lectures were given in Japanese, but on the smartphone of the student listening in the classroom, Japanese and the student's native language are displayed and it is possible to hear
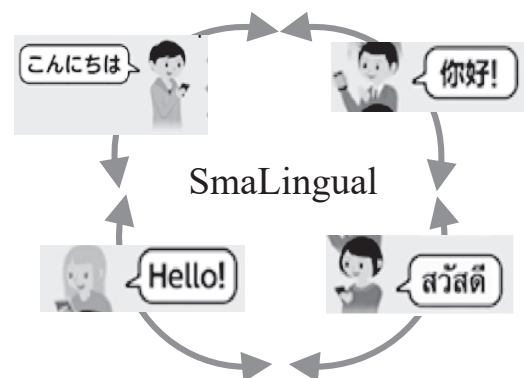

Figure 14: Multi-language communication with SmaLingual
Source: Smart Culture Gateway. https://smart-culture-gw.jp/plan/smalingual/.

a voice. Students attending classes remotely from home using Zoom will see and hear their voice in their native language.

For example, a Vietnamese student at home can hear a Japanese person's voice in Vietnamese, and when they ask a question in Vietnamese, the question can be heard in the classroom in Japanese. Another Chinese student at home can listen to classes in Chinese and ask questions in Chinese at the same time. Currently, this mechanism is being tested in 14 languages.

What is interesting about this mechanism is not the translation function. IBM's industrial AI Watson analyzes the language spoken by humans, removing the word "Ah, well ...." and correcting inaudible words. The cleaned words are sent to the translation software rapidly. This mechanism works on both smartphones and Zoom, and will support more than 100 languages next year. Hearing or being displayed in the native language means that even the deaf and visually impaired can hear and see in the native language. It is clear that this mechanism will spread at an explosive speed in a society aiming for a Smartcity. It is a technology that is highly expected in the strategy of integrating tourism with town development and daily life. This may considerably eliminate language barriers in the near future.

8. Epilogue

A Smartcity means a good city, not a city with IT and high-tech. Furthermore, a Smartcity is an industry that continuously earns profits through business and contributes to the community. Therefore, it is an absolute requirement that the business of Smartcity should be sustainable, and that local industries and citizens should participate widely.

The Smartcity is an industry, and one of its sub-industries is the tourism industry. As mentioned above, there is also a traditional tourism industry that transports tourists to tourist destinations, but the local government of the destination accepts tourists as citizens and takes care of them as human beings, and even after returning home, they are politely cared for as tourist citizens. It can be thought that the tourism industry, which continues to provide care, is a major strategy in the current global crisis. State-of-the-art tourism industry in the state-of-the-art Smartcity industry should be exactly that, and this paper explains various examples to give hints on how to realize it.

It is important to accurately understand the meaning of English business terms such as Smartcities and digital twins that are misunderstood in Japan. Furthermore, the realization method and strategy should not be considered only in Japan. Sadly, Japan is no longer at the forefront of the world in economy and technology. Furthermore, looking at the land and population, it is not a large market in the world. However, it is important to make Japan stronger by being aware of its goodness, which is team-work and wisdom, and this should apply to cutting-edge technology and cutting-edge operations.