A Study for Security using Meta-Index Extracted from Life-logging Application for The Fourth Industry Revolution

Jang-Mook Kang\textsuperscript{1} and Sung-Jun Kim\textsuperscript{2}  
\textsuperscript{1}Professor, Dept. of Bigdata Industrial security, Namseoul University, Daehak-ro, Seonghwan-eup, Seobuk-gu, Cheonan-city, Chungcheongnam, Republic of Korea  
\textsuperscript{2}Professor, Dept. of Bigdata Industrial security, Namseoul University, Daehak-ro, Seonghwan-eup, Seobuk-gu, Cheonan-city, Chungcheongnam, Republic of Korea

Abstract

Background/Objectives: The fourth industrial revolution began. On the other hand, there is a great ambiguity in the term of the Fourth Industrial Revolution. This ambiguous concept is understood by pursuing the interests of each.

Methods/Statistical Analysis: Research methods are based on literature review. The security problems expected in the fourth industrial environment were analyzed by scenario technique. It works on objects that exist in the real world such as things Internet, robots. Therefore, the information of the virtual space and the object of the real world correspond in real time. At the same time, the Fourth Industrial Revolution calls for various security solutions. To do this, scenario analysis is required for big data collected in daily life.

Findings: Studies have indicated that security vulnerabilities due to the fourth industrial revolution may increase.
The security vulnerabilities are described through specific scenarios. This is because personal information threatens every corner of everyday life. This article explains the characteristics of the Fourth Industrial Revolution and deals with the security issues that the background technology inevitably brings. Especially, we analyze life logging problem in daily life and personal information infringement due to big data utilization.

**Improvements/Applications:** The fourth industry is a technology area that will steadily advance. Therefore, this study is expected to require additional research in the future as the concept and characteristics of the 4th industry change.

**Key Words:** Security, The Fourth Industry Revolution, Big Data, Meta-Index, Life-Logging Data.

### 1 INTRODUCTION

The Fourth Industrial Revolution was first mentioned in the 'World Economic Forum' held in Davos, Switzerland on January 20, earlier this year. The World Economic Forum explains that "the Fourth Industrial Revolution" is a "technological revolution that fuses the boundaries of the digital and bio industries and physics based on the Third Industrial Revolution." After the Davos Forum, the fourth industry in Korea has spread like a fashion. Many experts have introduced concepts, meanings, development strategies, and impacts on industry in the Fourth Industrial Revolution. Nevertheless, the Fourth Industrial Revolution still does not have a clear concept of its concept and development direction. Even in the era of the Fourth Industrial Revolution, the debate on information security policy is becoming more obscure (Newsquare, 2016).

This article refers to the characteristics of the Fourth Industrial Revolution and analyzes the problem of information security. The following quotation is used to describe the specific techniques required for the above studies. Diffusion of Smart devices has influenced not only application market but also people’s cognition, attitude, and action. Absence of Smart phone makes people feel uneasy and inconvenient. In January 2011 Apple App-store recorded
10 billion downloads after 2 and half years since App-store opened their business (Ministry of Science and ICT Committee of Future Preparation, 2017). Like this a smart-phone has been developed from a mean of communication to a device which assists every part of life.

Recently mobile businesses have spotlighted with Mobile Platform as the center and the mobile application's yearly number of downloads shows rapid growth. Garnet, Inc. says that in 2013 the yearly downloads number of Mobile app-store will increase to 102 billion which rescored 64 billion in 2012 (paul Ionescu, 2015). Mobile Platform has the function as the informational platform which is very essential to a service but also influences introduction, supply, application, and feedback.

As well ABI Research presented that the value of mobile app market of the world would exceed 27 billion USD in 2013 (1 Chanakya Kumar and 2 Pjeev Paulus, 2014). Based on the above technical analysis and market prospects, the fourth industrial revolution is very likely to infringe on privacy. Though it enjoys the technology permeated by the impression of the individual, the threat of privacy infringement is behind it.

2 THE FOURTH INDUSTRIAL REVOLUTION AND DAILY LOG DATA

A. New Coming for Data Age with the fourth industrial revolution

The data age has arrived. The Fourth Industrial Revolution lifts real world data into virtual space. For example, a citizen's smart-phone converts latitude and longitude values to GPS information and sends them to the server. A citizen wearing a wearable device switches to sweat, gait, stride, speed, body temperature, humidity, and ambient temperature changes to the server. Depending on the network configuration, this server can be a cloud or a server for a unit of application.

The fourth industrial revolution collects and analyzes various types of data such as big data, unstructured data, sensing data, bio data, location data, and log data. To use this data efficiently, it is necessary to decide what data to use as metadata. In the
past, it seemed like the person’s name, age, address, and resident registration number were used as metadata.

Personal lifestyle is completed with life friendly services. There are various life related applications which are using location (www. Pinterest.com), profiled based information (www. Linkedin.com), traffic information (www. Googlemaps.com) and game based social network information (www. Foursquare.com), also they have functions like reading news (www. Flipboard.com), searching restaurant (www. yelp.com), shopping with barcode or QR (Quick Response) code and AR (augmented reality).

The appearance of these applications encourage excessive consumption besides affect where, why, and what people decide and choose. In other words, smart-phone users search their POI (point of interest) habitually where there is free Wi-Fi (mac address and GPS) and GPS. Despite information invasion, personal taste, location, time, media play list and friend list (Social Network Service) in smart-phone are need to be shared in every single process (platform) for using services. The habitual searching behavior in mobile circumstance is a representative involuntary life-logging behavior. For example, the image retrieval and sharing service, Flickr (www.flickr.com), its service is not keyword-based retrieval but content-based image retrieval.

Content-based image retrieval means semantic search that images are used as a Meta-tag, and users’ tags are provided with the result (Knowledge module, Observation module, Data storage module using content-based image retrieval) (1 Watson et al., 2004).

B. Framework for content-based image retrieval

In the era of the 4th Industrial Revolution, the methods and subjects of information protection will be changed depending on what metadata is used. The above data is transformed into content at the application level. Content refers to information used by city citizens, community neighbors, and family members. And the actual service is built around this content.

Content-based image retrieval means semantic search that images are used as a Meta-tag, and users’ tags are provided with the result (Knowledge module, Observation module, Data storage module using content-based image retrieval) (NexNet, 2014).
Above Figure 1 is Framework for content-based image retrieval. Like this, the new retrieval method and related application can be proposed with Image using Meta-tag.

In this study the Meta-tag will be deducted which can help Life logging service using movie (www.snapchat.com), text (www.twitter.com), GPS and finding room (www.airbnb.com), finding taxi (www.uber.com, www.left.com), Sound above images (www.lastfm.com) also, related service will be designed with this. Especially as the channel and market is getting expanded between personal or between individual and business through SNS (Social Network Service) like Tweetter, Metoday (www.metoday.com), Facebook (www.facebook.com) and Kakaotalk (www.kakao.com) as SNS is developed to a service which is dealing with sensitive information like education, religion and politics.

To implement life logging platform with these services, M2M asset API (application programming interface) is needed as below. First, Ideal for Micro-Controllers, Smart Modems, etc. Second, JSON (java-script object notation) over HTTPS based API. Third, Easy to prototype, develop, and debug. Fourth, some programming
required to integrate API with application. Life-logging service which is connected with SNS provides various information through OPEN-API (W3C, 2017).

In this study, it is analyzed what Meta-tag can be used effectively among these information and the contents under 5 generation system. Thus life-logging service is in the middle of evolution in various ways like being activated by personal pupil or finger touching habit. Therefore the successful application launching is expected with the designs or service scenario using life logging concept. These all is break privacy.

3 VARIOUS CONTENTS FOR LIFE LOGGING SYSTEM

A. M2M(MACHINE TO MACHINE) for life logging system

Machine to machine (M2M) refers to technologies that allow both wireless and wired systems to communicate with other devices of the same type (W3C, 2017). When smart-phone is routinized, M2M information is used to various applications in smart-phone. For example, the new service is introduced which interworks the location information and video information of CCTV with smart-phone application. To prevent living violence, the video information of CCTV is linked to nearby police office. Like this, M2M is getting to offer the Raw Data from various filed (Robotstxt.org, 2017).

To analyze Raw Data of CCTV and use it to life-logging service practically, the sensing value of CCTV has to be passed in real-time. That is sensing value of CCTV is default information of life-logging service to prevent the living violence. Violence in daily life includes sexual violence, abuse, and child abuse. Above CCTV various sensing value like GPS, gravity and etc can be used in many field, and these values are used to understand the user’s context (environment information).

Therefore, it’s important to determine to gather environmental information surrounding parent and child in learning site like living rooms by what criteria. Below Figure 2 is presented the hierarchy of semantic web to analyze the user’s context information. The sensing values which are collected through M2M technology are...
changed to context information of users under the process of URI, Unicode, XML, RDF, RDF-S, OWL, RIF, SPARQL and etc.

Below Figure 2 shows that web hierarchy deducts the user’s context information. Especially the types of M2M information in education field are as below, the location information of chairs and desks, the educational information of board, CCTV information for student security and the learning material information.

Fig. 2: Semantic web hierarchical layers structure of W3C (Robot-stxt, 2017)

These kinds of M2M information are processed to second-order information through the smart-phone application like location information of child, learning progress information, participation information of child, relation information between parents. The special role(parent and child) of time, and also space(Wikipedia, 2017), in describing hypermedia content and hypermedia structure seems to justify the representation of these concepts as primitives of standardized hypermedia annotation vocabularies that could be built on top of languages such as RDF-S and DAML+OIL(1 Gangadhar et al., 2017)

The present, these kinds of information are used only at each ap-
plication which gets the M2M information. However in this study, M2M information is uploaded at certain server and used as a platform. In this case, the educational applications are more systematic to use and access the M2M information.

B. Possible scenarios Life-logging DESIGN AND META-TAG

We can design everyday life in the home. In the morning, parents awaken their children. Parents and children eat together and share stories that day. Parents bring their children to school. My wife works at home or goes to work with her husband. What happens in the morning in a typical home is like the above. The above scenarios can be collected through smart phones, each of which has a father, mother, and child.

In addition, information can be gathered easily through home-installed CCTV. If you transfer this information to the cloud network and analyze it again, you can get more advanced information. This information facilitates life, that is, life logging. At the same time, it threatens the privacy between parents and children in daily life. These whole processes could be understood the relation between server and client as below Figure 3.

Fig. 3: Architectural overview(Wikipedia, 2017)
Like above Figure 3 parent can query about the necessary information and feedback at server. At that time, the specified index values in server make students have the effective answers. The scenario examples are as below. My parents ask me what my child’s homework and what they are learning at school in the morning. These questions can be analyzed through applications such as the iPhone’s Shree. Your child may also tell you what information the teacher will forward to you at school. Minorly, you can also discuss breakfast menu to eat together. All of these processes can be stored in IoTs such as smart phones, CCTVs with microphones, and smart TVs.

The conversation and behavior that may be in the morning described above will generally be similar in all households. Similar content shows a single stereotyped pattern. This pattern is an important clue. This clue is a series of processes, such as opening up the clothes of the children when all the families open their eyes and preparing the preparations for the day. Divide this common process into a detailed process. To protect personal information that may be vulnerable to fragmented processes. Meta tags are essential information for this.

That is, the most effective index value could be found by combining the sensing values (GPS, gravity, mac address) from mobile phone. Also through the mac address, parent’s ID can be confirmed and according to the level of the children’s learning and performance the suitable information could be provided. If so what can be the main Meta-tag in the possible scenario and in the mobile system design as a life logging.

C. Meta-tag from Life-logging Service

Recently, home living room is a place for communication between family members. In this place, the frequency of conversations with direct voice is decreasing. The conversation between husband and wife, wife and child is made up of SNS like cacao talk. The above conversation is recorded and stored. The stored data can be analyzed at any time. How can data stored for personalization services be utilized at this time? This can be done by utilizing metadata. Therefore there will be lots of data which is originated and processed from various scenarios like talking objects, processes in
the living room. At this time, Meta-tag is important in the aspect of that what Meta-tag can be provided as the core date of living. More effective services will be possible with combining M2M values with information in the field of communication like son’s inquiries. The following Table 1 is the Meta-tag which is derived by each key service.

<table>
<thead>
<tr>
<th>Service</th>
<th>Linked Serviced</th>
<th>Resources</th>
<th>Priority</th>
<th>Meta-tag</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movie</td>
<td>Youtube</td>
<td>Video, id=1</td>
<td>1</td>
<td>Playlist</td>
<td>2</td>
</tr>
<tr>
<td>Text</td>
<td>Twitter</td>
<td>Text, id=2</td>
<td>2</td>
<td>Book</td>
<td>1</td>
</tr>
<tr>
<td>GPS</td>
<td>Foursquare</td>
<td>Actuator, id=3</td>
<td>1</td>
<td>Teacher Behavior</td>
<td>3</td>
</tr>
<tr>
<td>Maps</td>
<td>Google Maps</td>
<td>Light, id=4</td>
<td>0</td>
<td>Book</td>
<td>1</td>
</tr>
<tr>
<td>Sound</td>
<td>Last fm</td>
<td>Mediaplay, id=5</td>
<td>0</td>
<td>Media List</td>
<td>0</td>
</tr>
<tr>
<td>CCTV</td>
<td>N/A</td>
<td>Video, id=6</td>
<td>1</td>
<td>Teacher Behavior</td>
<td>2</td>
</tr>
</tbody>
</table>

Like above, Table 1 shows an example of application description for life logging under social collaboration environment more in-detail information of service, Linked Service, Resources, Priority, Meta Index and Weight. Like this, Meta-tag is acting as a main factor to decide the weight and priority.

D. Meta-tag Derived by scenarios for protect to personal information

Life logging platform is possible to be conducted by various types. The living room is a place where families gather. In this place, communication takes place between the families. Suppose that Parent A watches the drama of sad content in the living room. Pace A heartbeat was slowly detected through wearable equipment.
worn by parent A. Parent A is in a state of feeling sad feeling now watching the drama.

In this case, the child B in the family appears in the living room. To the child B, the parent A is in the sad feelings of the present and can ask to be quiet. These notifications pop up on your child’s smartphone. In order to process such information, smart TV of household, wearable equipment of parent A, and smartphone of child B should transmit and receive information together.

At the same time, the current feelings shared by parents A and B and whether they watch any TV shows are important personal information. Particularly, it is a serious privacy threat that parent A sees a sad drama and knows whether the present emotion is glad or sad.

![Fig.4: Conceptual diagram of Meta-tag, big data, cloud, M2M in Educational environment](image)

Above the figure 4 shows the main factors that determine the conversation and emotions between parent and child.

Here, the main factor is the meta value of data processing. In particular, meta values are an important criterion in recommending dialogue topics between parents and children. When parent A is determined to be in a state of sad emotion, what would child B need to get out of the topic of the conversation? Or is it better to
wait quietly until the parent A comes out of herself with feelings of sadness?

Thus, in the future, we can recommend the analysis of child B’s behavior and the subject of speech. This personalized service is made possible by M2M-based data processing and analysis. At the same time, processing these information is a serious privacy threat.

In Figure 5 above, child B grasps the parent’s emotional state. Parental feelings are analyzed by smart TV program list, play record, and sensed values from parents’ wearable equipment. What response would be desirable for the child B to the sad feelings of the parents obtained through the big data analysis? To answer such a personalized question, the Big Data Analyzer associated with the home refers to emotional expressions on the SNS of parent A.

In addition, based on this, the child B advises the parent A on which topic the conversation should lead. At the same time, it is recommended that you wait silently for the desired behavior of your child B. In order for such services to be processed seamlessly, personal information must be collected and analyzed. At this time, there is a risk of the theft in the process of transmitting the processed personal information to the server through the Internet. In addition, it is also an important threat that an actor who provides
a company or service provides illegal use of personal information.

E. Advanced Security, Privacy, Authentication in Meta-Index

Security is a convenience and trade-off relationship. As personalization services evolve, the threat of privacy breaches will increase. Especially, when the sensing value increases in the cloud centered on the object Internet, the atypical data becomes the object of the big data. A huge amount of these data flows into the cloud in real time. And all this data is reprocessed for your personalization service. The case of personalization service is analyzed in the previous chapter. In the previous chapter, we examined the information processing between parents and children in the scenario described by scenario.

At the same time, it described the anticipated threat of privacy intrusion in each detail process. To implement this in detail, it is necessary to understand various hardware, software and middleware such as the following. The following diagram illustrates the main components of the WebLogic Server authentication and authorization security services 11. The following figure illustrates authentication on the Web. However, this can be considered as an extension of the mobile smartphone application.

Unlike the web, variables for various behaviors such as GPS, lighting, gait, etc. are collected in the mobile environment. We need to process these data with consistent commitments. At the same time, reasonable security procedures for these data are required.

Fig. 6: Web logic for life-logging policy(1 Gangadhar Konduri et al., 2017)
The above diagram can be extended to apply to the lifelogging platform. In this case, security protocols and policy procedures are required for data to be processed in the life or daily life. This will be discussed in more detail in the next study.

Fig. 7: Functional Design Process (Dennis Basara, 1999)

The following figure can apply security policy around each detail function. Security is handled around granular functions. The following figure shows the architecture to be considered for security. The functional design process is also an opportunity for the signal processing architect(s) to assess the complexity of the required processing. The goal is to take the functional algorithms and translate these into preliminary implementation form. Initially, we size and establish a criteria to select the architecture, as shown in Figure 7.

Privacy can be protected through authentication. Also, unlike privacy, personal information that enables individuals to be identified can be handled by not only authentication but also data transmission, i.e., security enhancement at the network end. When applying the above, various security factors such as network, database, software, authentication, authorization, and integrity should be considered. Therefore, security policy should be implemented consistently and uniformly in algorithm development, DFD, and various development processes as shown in the above figure.
4 CONCLUSIONS

This article points out the privacy issues that will arise during the fourth industrial revolution era. Individuals live in various contexts. Users live in a variety of environments such as: Go to school, study, drink tea, drive, eat dinner or work. At this time, the personalization service based on the 4th Industrial Revolution is a threat of personal information as much as convenience. And the detailed technology is diversified into things Internet, cloud, big data, and artificial intelligence.

Fig. 8: Towards Intelligent Environments based on IoT and Service(NexNet, 2014)

Until now, Big Data has had a lot of personal information infringement in a technical situation. Or privacy breaches that are anticipated in a cloud-based society. However, in the era of the Fourth Industrial Revolution, a total privacy protection policy covering all the above technologies is required. Figure 2 above illustrates the Fourth Industrial Revolution, focusing on the Internet and services of things.

This article argues that it is effective to analyze the scope of viewing information protection in the fourth industrial revolution era and to analyze it in a scenario way of tracking the individual’s daily life. In the future, it will be necessary to research personal information protection technologies and policies that are optimized for specific domains (individual situation based).


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