

Development of applications for open data for Japanese laws and regulations

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Abstract. Japan’s e-legislation system, e-LAWS, began operating in 2016. This allows the drafting and publication of laws and regulations to be done electronically, whereas previously they were done on paper. One of the most important technologies supporting e-LAWS is the Japanese Legal Standard XML Schema, which is tailored to Japanese laws and regulations. The launch of e-LAWS has made it possible to share Japanese laws and regulations as open data. Our purpose in this study is to provide Akoma Ntoso applications for Japanese law data. As a result of our project in progress, we have confirmed that some applications work with the Japanese law data. This is expected to facilitate not only the use of Japanese law data by everyone, but also sharing with legal data around the world.

Keywords: Legal XML, e-LAWS, Akoma Ntoso

1. Introduction

In October 2016, the Ministry of Internal Affairs and Communications (MIC) took the initiative in launching the “e-Legislative Affairs Work Support System (e-LAWS).” This enabled the previously paper-based process of drafting and publishing laws and regulations to be done electronically. The operation of e-LAWS has an epoch-making significance for Japan; “accurate law data will become more accessible.” e-LAWS is Japan’s first database of laws and regulations for which the government itself has taken responsibility for ensuring and certifying accuracy. All of the more than 8,500 laws and regulations (as of July 2022) can now be easily searched, viewed, and used on the Internet.¹

One of the most important technologies supporting e-LAWS is the Japanese Legal Standard XML Schema (JLS), which is tailored to Japanese laws and regulations. An XML Schema describes the structure of an XML document, aiming to define the legal building blocks such as the elements and attributes that can appear in the document, the number of (and order of) child elements, and so on. In many cases, XML standards are defined by XML Schemas. XML Schema is an XML-based (and more powerful) alternative to DTD.

¹ Statement by MIC on the occasion of the full-scale operation of the Legal Affairs Work Support System (e-LAWS) (Sep 30, 2016) https://www.soumu.go.jp/menu_news/s-news/01gyokan01_02000052.html (in Japanese)

Legal standard XML schemas have been developed all over the world and have a long history. In Japan, the development has been led by Nagoya University, which first realized the XMLization of legal databases with the Japanese Law Translation Database System in 2009 (Toyama et al., 2011; Toyama et al., 2012), and JLS is its successor.

The launch of e-LAWS has made it possible to share Japanese laws and regulations as open data. However, many of the applications that handle them were still in the development stage. The legal data in downloadable XML format is also expected to be widely available for secondary use. It is the applications that adds value to the data. We expect that high-quality, good applications will be developed in the future, but this will be costly in terms of both money and time. Even if such applications are developed, there is a possibility that their performance and user interface functions may be poor. In order to prevent such a situation, we argue that it is important to prepare as many applications as possible in the initial stage. In this way, good applications will survive, and those that do not will be weeded out. Even those that are eliminated will have good functions that can be used in other applications.

In contrast, there are many legal standard schemas in the world, and various services have already been developed (Lupo et al., 2007). We focus on Akoma Ntoso (Palmirani and Vitali, 2011) because it has been adopted by many countries and organizations, and various applications are available as open source. By making these applications available for Japanese legal data, it would be possible to have a large number of applications available. This may lead to the possibility that some of the applications may be used in Japan, and that important functions obtained from these applications may be considered for inclusion in Japanese applications.

Therefore, the purpose of this study is to share software resources worldwide and provide applications for Japanese law data. To achieve this, we will develop converters and management databases for both Japanese and world's legal standard schemas, and provide existing applications for use with Japanese legal data. This is expected to facilitate not only the use of Japanese law data by everyone, but also the dissemination of Japanese legal information (Kawachi et al., 2015) and sharing with legal data around the world.

This paper is organized as follows: Section 2 describes the legal XML standards in Japan and around the world. Section 3 presents the applications that make use of them. Based on these, Section 4 describes our ongoing project on how to provide a sufficient number of

applications for Japanese law data, and Section 5 describes the current progress. We conclude in Section 6.

2. Legal XML Standards

2.1. JAPANESE LEGAL STANDARD XML SCHEMA (JLS)

Japanese laws and regulations have a history of strictly adhering to the rules of writing through the administrative work of drafting the text of laws and regulations, known as legislative affairs. For example, the numbering system of articles, the position of article numbers and headings, and the use of different legal terms are strictly enforced. In addition, Japanese laws and regulations have a stylistic beauty that has been cultivated through the use of paper. Since many of the bills are reviewed by the Cabinet Legislation Bureau, it is necessary to reproduce the beauty of style in accordance with the format of legal documents.

JLS was developed by examining the formatting of various laws and regulations and defining the logical structure of XML documents. This made it possible to digitize the process of drafting and reviewing bills, and to automatically compile laws and regulations as XML data. As a result, it is now possible to process everything from the drafting of bills to the official publication of statutes electronically, whereas previously laws and regulations had to be drafted on paper.

The e-LAWS operation has led to a change in the format of electronically published data from HTML to XML to facilitate secondary use. Figure 1 shows a screenshot of Administrative Counselors Act on e-Gov, a portal site for Japanese laws.² Figure 2 shows the XML data of the Japanese laws that make this possible.

The document structuring of legal data with this schema has realized the separation of content and style. For example, law titles and article headings can be assigned to the LawTitle and ArticleCaption tags, respectively. In addition, styles can be written separately to facilitate processing and use in applications. The use of a legal standard schema can enhance the usefulness of machine-readable legal documents and increase transparency by automating the legislative process.

Prior to e-LAWS, the Japanese Law Translation Database System (JLT)³ was the first attempt to develop an XML database for Japanese laws and regulations (Toyama et al., 2011; Toyama et al., 2012). JLT is a system that provides English translations of major Japanese laws,

² <https://elaws.e-gov.go.jp> (in Japanese)

³ <https://www.japaneselawtranslation.go.jp>



Figure 1. Screen shot of e-Gov

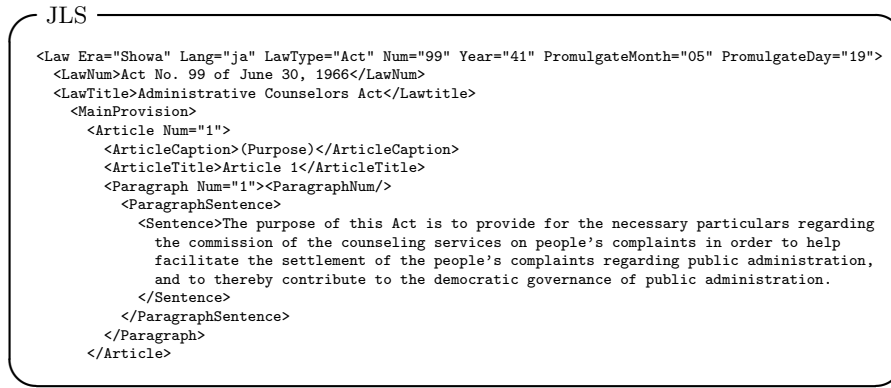


Figure 2. Example of JLS (translated in English)

a standard bilingual dictionary of legal terms in Japanese and English, and related information on English translations of Japanese laws and regulations on the Internet free of charge.

JLT stores bilingual law data in XML format in the Bilingual Laws and Regulations Database. To achieve this, a document type definition consisting of 103 element type declarations and 75 attribute list declarations has been designed.

Table I shows a history of Japanese XML. JLS is the successor to JLT, and as a result of a thorough analysis of the textual structure of

Table I. Japanese Legal XML

Acronym	Release	Purpose	Standard	Akoma Ntoso converter
JLT	2009	Japanese law translation database system	DTD	(Kawachi et al., 2016)
e-LAWS	2016	Japanese e-legislation system	JLS	–

the legislation, the document type definitions have been extended to 134 element type declarations and 121 attribute list declarations.

2.2. AKOMA NTOSO

Research and development of e-legislation systems and legal information dissemination are being actively conducted around the world, including EUR-LEX. One of the most important technologies supporting this is the legal standard XML Schema.

The XML standard has a long history, and its development has been divided into four generations. EnAct (Arnold-Moore and Clemes, 2000) for the first generation, NomeInRete (Lupo et al., 2007) for the second generation, and MetaLex (Boer et al., 2008) for the third generation are representative examples.

Akoma Ntoso (Architecture for Knowledge-Oriented Management of Any Normative Texts using Open Standards and Ontologies) (Palmirani and Vitali, 2011), is a jurisdiction-independent XML standard that can be used for interchange between public organizations or business enterprises and as a platform for generic legal software (Boer et al., 2007). Akoma Ntoso is positioned in the third generation of the above. It was originally created to share legislative documents among African countries, and is now widely used as the OASIS (Organization for the Advancement of Structured Information Standards) *LegalDocumentML*⁴ which was developed based on Akoma Ntoso's specifications. In face, a number of government bodies in several countries, such as EUCases and LexML Brazil apply this schema to legal documents. Flexibility is a desirable trait of Akoma Ntoso, allowing many jurisdictions to employ this schema.

⁴ OASIS, OASIS LegalDocumentML (LegalDocML) TC https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=legaldocml.

2.3. STUDY OF JAPANESE LAW IN AKOMA NTOSO

We have proposed a method for converting JLT-based structured documents to Akoma Ntoso format (Kawachi et al., 2016) as shown in Table I. As a result, we compared and analyzed the JLT version schema and Akoma Ntoso design, defined 131 conversion rules, and developed a prototype of the converter. Compared to the JLT version, JLS has been greatly expanded in terms of data type definitions and notation patterns for all laws and regulations, so that existing conversion methods cannot be used. In this study, we examine extensions to JLS and the problems that may arise, and develop a converter and interface.

3. Applications for legal data

3.1. APPLICATIONS FOR JLS

So far, e-legislation applications such as an editor, a search tool, and a database management tool have been developed by MIC and actually used by the ministries, but they are not open to the public.⁵

The “visualization laws” project, which analyzes and visualizes legal data, is now open to the public. The website introduces that “Law Visualization is a project to make the law easier to understand using information technology.”⁶ Figure 3 demonstrates a graph structure of the River Act and laws that have referential relationships with it.

In addition, several other applications for smartphones that search and display legal data are available.

3.2. APPLICATIONS FOR AKOMA NTOSO

The following list shows applications provided as open source for Akoma Ntoso. They could be used for Japanese laws.

- Editors: Lime, Bungeni, AT4AM
- URI/IRI Resolvers: Akoma Ntoso URI Resolver
- XML Validator: The Akoma Ntoso Subschema Validator
- Presentation: SCRIBA, PDF Formatter for Swiss Akoma Ntoso files

⁵ The original editor for Japanese legislation was introduced by Shuhei Ohkubo, Daichi Saito and Makoto Nakamura in the session “Free Access to Japanese Law and Beyond: Work on the e-Legislative Activity and Work Support System (e-LAWS)” in the Law via the Internet 2020 Conference.

⁶ <https://www.lawvis.info> (in Japanese)

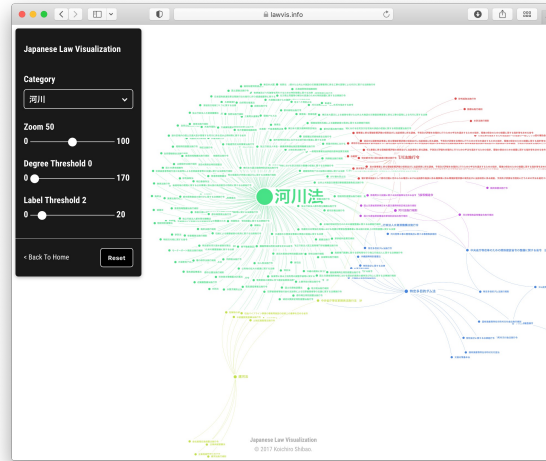


Figure 3. Screen shot of the project of Law Visualization

Various other tools have also been developed through hackathons.

4. Project to provide a sufficient number of applications for Japanese legal data

The purpose of this study is to provide applications of Akoma Ntoso for Japanese law data so that everyone can use it effectively. In other words, we aim to create an environment in which users can not only obtain the necessary law data, but also freely process these data with a wide variety of applications. This is expected to increase the number of users and further improve the quality of the applications as the open data of laws and regulations are widely recognized.

However, transplanting these applications is not an easy task. As mentioned above, JLS is designed based on strict description rules because it follows practical work related to laws and regulations. On the other hand, Akoma Ntoso is used by countries and organizations all over the world, so the data restrictions in the applications are likely to be looser than in JLS. Table II summarizes these differences. It is expected that it would be costly to transplant all of the target applications with the strict description rules of the Japanese laws and regulations.

To solve this problem, this study proposes a method of converting Japanese law schema to Akoma Ntoso format. Figure 4 shows the law data in Figure 2 converted to the Akoma Ntoso format. Once

Table II. Strict markup vs. markup for easy international sharing

Japan Legal XML Schema (JLS)	Akoma Ntoso
- XML schema for legal documents - Specified for structuring Japanese laws and regulations - Designed based on the strict description rules of Japanese laws and regulations	- XML schema for legal documents - OASIS global standard - Assumed to be used in countries and organizations around the world - Supports a wide variety of document types, such as laws, bills, proceedings, etc.

the Japanese law data is converted to Akoma Ntoso format, the applications are expected to work. They could be made available with modifications as necessary to comply with the Japanese language and Japanese laws and regulations.

The positioning of this research is shown in Figure 5. Applications for JLS are still in the development stage and are not fully provided. Developing many applications is costly. In contrast, applications for Akoma Ntoso are widely developed and some of them are available as open source. The uniqueness of this study is that it does not transplant the applications for Akoma Ntoso but converts the law data from the JLS format to the Akoma Ntoso format in order to enhance applications for JLS. This reduces the difficulty of software development and makes it feasible.

The creativity of this research lies in the sharing of software resources around the world. Various legal data can be shared because of the compatibility with legal documents of other countries and organizations that have adopted Akoma Ntoso. This facilitates the use of common visualization tools for analysis when comparing Japanese law data with those of other countries all over the world. As a result, new developments in Japanese legal information research are expected.

5. Current progress

5.1. CONVERTER

The converter has been implemented and is available on the Web⁷. Figure 6 shows the converter operation screen for Administrative Counselors Act. The left side of the screen shows JLS and the right side

⁷ <http://e-legislation.jp/akn-search/>

Akoma Ntoso

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<akomaNtoso xmlns="http://docs.oasis-open.org/legaldocml/ns/akn/3.0"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://docs.oasis-open.org/legaldocml/akn-core/v1.0/os/part2-specs/schemas/
    ./akomantoso30.xsd">
  <act name="Administrative Counselors Act">
    <meta>
      <identification source="#somebody">
        <FRBRWork>
          <FRBRthis value="/jp/act/2020-mm-dd/000/main"/>
          <FRBRuri value="/jp/act/2020-mm-dd/000"/>
          <FRBRdate date="2020-11-26" name="Generation"/>
          <FRBRauthor href="#parliament" as="#author"/>
          <FRBRcountry value="jp"/>
        </FRBRWork>
        <FRBRExpression>
          <FRBRthis value="/jp/act/2020-mm-dd/000/ja@main"/>
          <FRBRuri value="/jp/act/2020-mm-dd/000/ja@"/>
          <FRBRdate date="2020-11-26" name="Generation"/>
          <FRBRauthor href="#somebody" as="#editor"/>
          <FRBRlanguage language="ja"/>
        </FRBRExpression>
        <FRBRManifestation>
          <FRBRthis value="/jp/act/2020-mm-dd/000/ja@main.xml"/>
          <FRBRuri value="/jp/act/2020-mm-dd/000/ja@.akn"/>
          <FRBRdate date="2020-11-26" name="Generation"/>
          <FRBRauthor href="#somebody" as="#editor"/>
        </FRBRManifestation>
      </identification>
    </meta>
    <preface>
      <p class="LawNum">
        <docNumber>Act No. 99 of June 30, 1966</docNumber>
      </p>
      <p class="LawTitle">
        <docTitle>Administrative Counselors Act</docTitle>
      </p>
    </preface>
    <body>
      <article eId="chp1-art1">
        <heading>(Purpose)</heading>
        <num>Article 1</num>
        <paragraph eId="chp1-art1">
          <content>
            <blockContainer class="ParagraphSentence">
              <p><inline name="Sentence">The purpose of this Act is to provide for the necessary
                particulars regarding the commission of the counseling services on people's
                complaints in order to help facilitate the settlement of the people's complaints
                regarding public administration, and to thereby contribute to the democratic
                governance of public administration.</inline></p>
            </blockContainer>
          </content>
        </paragraph>
      </article>

```

Figure 4. Example of Japanese law in Akoma Ntoso (translated in English)

shows Akoma Ntoso's XML, respectively. The Akoma Ntoso file can be downloaded by clicking the Download button. If an English translation exists, the link at the top jumps to the JLT website.

These are basically converted according to the XML tag conversion rules. Table III shows an excerpt of the rules used for converting the Administrative Counselor Law from JLS to Akoma Ntoso. The conversion process is performed by 50 conversion rules, each of which covers multiple element types.

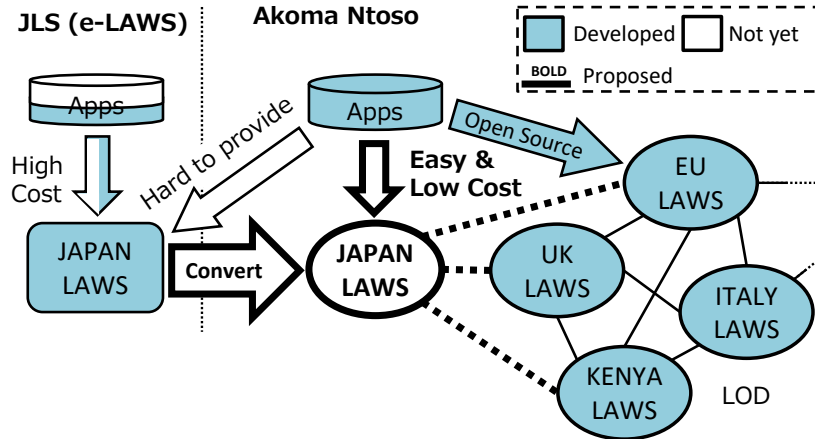


Figure 5. Development plan



Figure 6. Screen shot of the Japanese Laws and Regulations Search

The major difference between JLS and Akoma Ntoso is the absence or presence of meta information. The meta tags contain information such as the effective date of the law, but JLS does not have such information and only contains the information described in the law. Therefore, the meta information is filled with tentative values, and calendar information is provided only for the date of conversion to Akoma Ntoso.

There is a structure that exists in JLS but not in Akoma Ntoso. The structure of paragraph sentences is an example. In such cases, a new structure can be defined using the concept of a block container. This is one of the most important features of the Akoma Ntoso, as it allows for laws and regulations from many countries and organizations.

Table III. Conversion rule

JLS	Akoma Ntoso
<code><Law></code> <code><LawNum><i>v</i>₁</LawNum></code> <code><LawBody></code> <code><LawTitle><i>v</i>₂</LawTitle></code> <code><MainProvision></code> <code>...</code> <code></MainProvision></code> <code></LawBody></code> <code></Law></code>	<code><akomantoso xmlns="http://docs.oasis-open.org/legaldocml/ns/akn/3.0" xsi:schemaLocation="http://docs.oasis-open.org/legaldocml/akn-core/v1.0/oa/part2-specs/schemas/. /akomantoso30.xsd"></code> <code><act name=<i>v</i>₂ contains="originalVersion"></code> <code><meta></code> <code>...</code> <code></meta></code> <code><preface></code> <code><p class="LawNum"></code> <code><docNumber><i>v</i>₁</docNumber></code> <code></p></code> <code></preface></code> <code><body></code> <code>...</code> <code></body></code> <code></act></code> <code></akomantoso></code>
<code><ArticleCaption><i>v</i>₁</ArticleCaption></code> <code><ArticleTitle><i>v</i>₁</ArticleTitle></code> <code><Paragraph Num="1"></code> <code><ParagraphNum><i>v</i>₁</ParagraphNum></code> <code><ParagraphSentence><i>v</i>₂</ParagraphSentence></code> <code><Paragraph></code>	<code><subheading><i>v</i>₁</subheading></code> <code><heading><i>v</i>₁</heading></code> <code><paragraph eid="art1-part1"></code> <code><num><i>v</i>₁</num></code> <code><content></code> <code><blockContainer class="ParagraphSentence"></code> <code><p><inline name="Sentence"><i>v</i>₂</inline></p></code> <code></blockContainer></code> <code></content></code> <code></paragraph></code>

We conducted validation experiments on these conversion rules. The converted data in Akoma Ntoso format passed the validation check completely. In addition, 10 laws selected at random from more than 2,000 total laws were manually verified to ensure that they were converted correctly.

5.2. USE OF AKOMA NTOSO APPLICATIONS

The conversion of Japanese law data into Akoma Ntoso enables the use of dedicated applications; the LIME editor is provided as open source, and we successfully installed and ran it on the Japanese law Akoma Ntoso server. The execution screen is shown in Figure 7, in which Figure 7a demonstrates the loading and editing of a draft law, and Figure 7b shows the insertion of a table.

There are not many open source applications available, and even if there are, some of them are not maintained and are difficult to install.

5.3. DEVELOPMENT OF AKOMA NTOSO APPLICATIONS

A tool for converting arbitrary JLS-format files to Akoma Ntoso format is available⁸. The execution screen is shown in Figure 8, and the converted file can be downloaded by uploading a JLS-formatted file.

This web application can provide JLS-formatted law data edited by a third party that is not provided by e-Gov, converted to Akoma Ntoso format. By providing such a converter that anticipates editing by secondary use, it is expected to encourage the development of further applications.

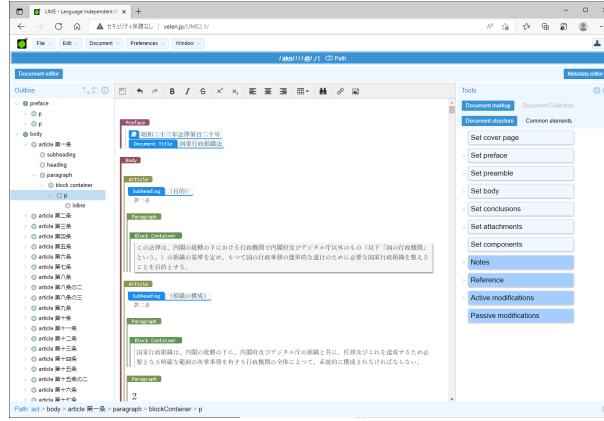
5.4. SHARING OF LEGAL DATA FROM AROUND THE WORLD AND CONTRIBUTION TO COMPARATIVE LEGAL RESEARCH

By describing Japanese laws in a common XML schema with laws around the world, it may be possible to utilize this schema for comparative legal research. For example, it would be easy to compare the terms used in the laws of different countries in terms of the structure of the laws by using a common statistical application.

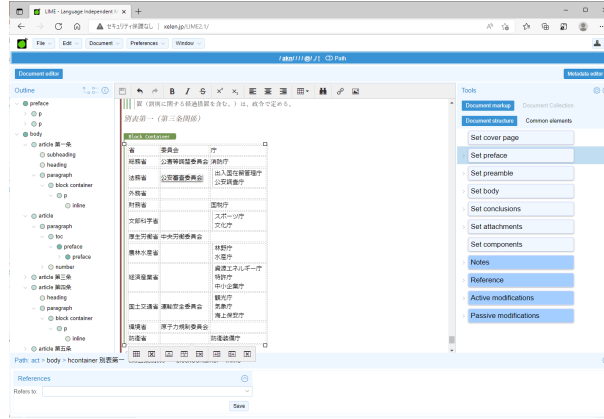
In addition, there is an automatic discovery of similar laws and provisions in different countries in ongoing comparative legal research (Cho et al., 2022). If this can be done, it will be advantageous to be able to clarify the differences between the laws of a foreign country and the laws of one's own country when doing business with that country.

For example, Figure 9 shows that Article 772 of the Japanese Civil Code corresponds to Paragraph 1, Section 1592 of the German Civil

⁸ <http://e-legislation.jp/akn-trans/>



(a) Inserting a paragraph



(b) Inserting a table

Figure 7. Demonstration of Lime Editor

Code. It is known that the Japanese Civil Code was greatly influenced by the German Civil Code, the French Civil Code and so on when it was drafted. So far, such mapping has been found mainly by hand, which has been a heavy burden for researchers.

If such relationships could be “exhaustively” and “automatically” discovered among the laws of the world, it would be possible to view similar relationships among the laws of the world at a glance. Currently, we are experimenting with plain text Japanese and German laws, but the use of Akoma Ntoso will allow us to target legal data from all over the world. Translation accuracy will be an issue as mentioned in (Cho and Nakamura, 2021), nevertheless, an exhaustive comparison will yield groundbreaking results. We constructed a model using the BERT language model (Devlin et al., 2019; Chalkidis et al., 2020), a



Figure 8. Screen shot of the converter from JLS to Akoma Ntoso

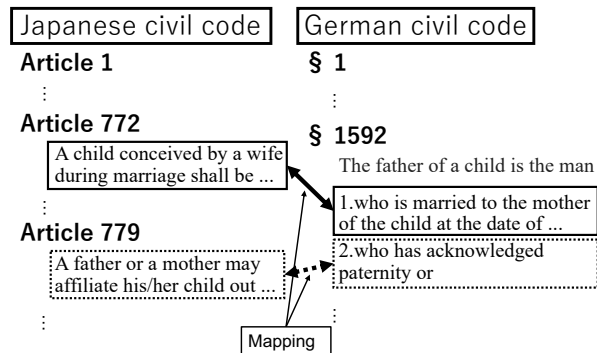


Figure 9. Mapping similar provisions between laws in the different countries

type of deep learning. Currently, when we compared between Japanese civil law and German civil law on family law, the correctness rate was about 29.6%. We expect that the performance will be improved in the future.

6. Conclusion

Although the digitization of Japanese laws and regulations has actually entered into operation, there are still many problems. For example, a news reported that 134 errors were found in a bill.⁹ The reason for this was that the ministries and agencies were not using e-LAWS when they prepared bills. Full automation, including training of users, may take more time.

⁹ 134 Errors Found in Legislation, Yellow Signal for Government IT Business Reform, Nikkei Xtech (May, 2021): <https://xtech.nikkei.com/atcl/nxt/mag/nc/18/092400133/051900050/> (in Japanese)

When developing an application, useful functions can be understood more quickly by using it than by reading its specifications. This is the basic idea behind this project, which was started to make open source applications available for Japanese laws and regulations.

Most of the development of the converter was completed quickly because the analysis of JLT, the previous version of JLS, existed (Kawachi et al., 2016), but the conversion of the tables was tricky. This was handled by converting the data so that they could be viewed.

We have confirmed the operation of some applications by loading the Japanese laws and regulations written in Akoma Ntoso. In reality, there are not that many open source applications, and some were not easy to install due to lack of maintenance. This project could be further developed by collaborating with developers.

In the future, we plan to develop an application to conduct comparative legal research with laws of other countries, and we expect that Akoma Ntoso data will enable us to make groundbreaking comparisons, since it is possible to compare from the document structure.

Acknowledgments

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