NLP Oriented Japanese Pun Classification

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Abstract—In this paper we describe a phonetic classification of Japanese puns (dajare). Basing on real life examples gathered from available sources (books, Internet), we divided Japanese puns into 12 groups with numerous subgroups, according to phonetic changes that occur within them. This classification was prepared for the NLP purpose, i.e. to be used in humor processing. Its usefulness was shown in a research project, aimed at constructing a humor-equipped conversational system for Japanese.

Keywords: natural language processing, humor processing, artificial intelligence

I. INTRODUCTION

Artificial humor generation is still a problematic task. In the first place, performing such research requires a robust and complex linguistic basis, needed to create appropriate resources (such as lexicons, templates or databases) in order to generate humorous contents. One linguistic study that should be performed before the actual system development, includes deciding how humorous contents should be generated, i.e. what linguistic processes should occur in the given materials in order to generate humorous contents.

In our research on humor generation we focus on a particular humor type, known as “puns”. As the language of the research is Japanese (reasons for this are explained in Section II), the subject of this work was a genre called dajare, which is a Japanese word for puns. We present a complex phonetic classification of dajare, based on mora changes that occur within them. On the basis of this classification, we defined numerous pun generation techniques which can be used in research on dajare processing. Some of the techniques were tested in our research on humor-equipped conversational systems [1].

The techniques described below are universally formalized so that they can be used in any NLP-related research on Japanese puns, not only for humor generation, but also for its recognition and interpretation.

In below sections we first briefly describe dajare as a genre (section II), then we explain in details the proposed Japanese pun classification (III) and the pun techniques defined on its basis (IV). Next we mention other existing sets of NLP-oriented Japanese pun techniques (V) and shortly summarize our research on dajare generation within dialogues with humans, in which our generation techniques were tested (VI).

II. JAPANESE PUNS

Most of existing works on humor processing (such as [2] or [3]) focus on a genre of humor in which the source of funniness lies in the features of language. This genre is often called “puns” or “word plays”. The reason of its popularity among AI researchers is that it is relatively easy to process with the tools and methods used in NLP. The sound similarity, or homophony, is one of commonly used techniques in puns. Homophony is present in virtually every existing language. Some languages, however, are extremely rich in homophonic phrases. Due to its syllabic structure, one such language is Japanese, which makes it a perfect subject of research on computable humor.

Therefore, in our research we focus on Japanese puns, called dajare. As there is no one uncontroversial definition of dajare, we assumed that this genre includes all jokes with linguistic ambiguities, such as homophones. This was our working definition of Japanese puns.

III. JAPANESE PUN CLASSIFICATION

As mentioned above, in our research, in order to construct a system able to generate Japanese puns, we needed pun generation patterns, i.e. formulas of how some words or phrases can be transformed into others to create puns. In order to obtain such patterns, we gathered examples of human created puns and analyzed them to find regularities in sound transformations. On this basis, we defined 12 groups of dajare, some of which were internally divided into smaller subgroups (see D).

A. Structure of Japanese puns

For the needs of this classification, we defined the notions of “base phrase” and “punning phrase”. A base phrase is a phrase before transformation into a pun, and a punning phrase is a phrase after transformation. In the following example: Kusa wa kusai (Straw stinks), the base phrase is kusa (straw), and the punning phrase is kusai (to stink). The former was transformed into the latter by adding a single sound –i to its end. The methods of transforming base phrases into punning phrases are the basis of this classification (see D).

B. Mora as a metric unit

According to multiple sources (well summarized in [4]), the most appropriate sound unit in Japanese is mora.
It is roughly equivalent to a syllable, although in case of Japanese it is more relevant due to several elements present in this language, such as geminated consonants or long vowels. For example, the word kitte (a post stamp) has 2 syllables (kit-te), but three morae (ki-t-te). Thus, in order to track the sound transformations in puns more precisely, we decided to use mora as a base metric unit in some groups of our classification. In other groups we used morphemes, whole phrases or their parts.

C. Sources of puns

As mentioned above, the analysis of sound transformations in dajare was conducted on a set of human created puns. Those were collected in years 2004-2005 using resources available at the time: books [5, 6] and web pages [7, 8]. We collected 200 examples of puns [1].

D. Classification

The examples of human created puns were analyzed to find regularities in sound transformations that occur between the base phrase and the punning phrase. As a result, we named 12 pun transformation techniques. Groups 2), 3) and 4) were also internally divided into subgroups. Below we present all these groups along with actual pun examples.

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1) Homophony

Puns in this group are based on perfect homophony of phrases. In other words, phonetically no mora change occurs between the base phrase and the punning phrase.

Example: Kaeru ga kaeru (A frog comes back)
base phrase: kaeru (a frog)
punning phrase: kaeru (come back)

2) Mora addition

In this group, base phrase is transformed into punning phrase by adding one or more morae. This group is internally divided into 3 subgroups, according to position on which mora is added:

2.1) Initial mora addition

Mora are added in the front of the base phrase.

Example: Suika wa yasuika? (Are watermelons cheap?)
base phrase: suika (watermelon)
punning phrase: yasuika (is it cheap?)
added mora: ya-

2.2) Final mora addition

Mora are added in the end of the base phrase.

Example: Kaba no kaban (Hippo’s bag)
base phrase: kaba (hippo)
punning phrase: kaban (bag)
added mora: -n

2.3) Internal mora addition

Mora are inserted into the base phrase.

Example: Kichin to katazuita kitchin (A thoroughly cleaned kitchen)
base phrase: kichin (thorough)
punning phrase: kitchin (kitchen)
inserted mora: -i-

3) Mora omission

In this group, base phrase is transformed into punning phrase by deleting one or more morae. This group is internally divided into 2 subgroups, according to position on which mora is deleted: final mora omission and internal mora omission. No example of a pun was found in which initial mora would be omitted. However, this technique still remains as one potentially usable in pun generation.

3.1) Final mora omission

Final morae of the base phrase are deleted.
Example: Sukii ga suki (I like skiing)
base phrase: sukii (ski)
punning phrase: suki (to like)
 omitted mora: -i-

3.2) Internal mora omission

Internal morae of the base phrase are deleted.
Example: Suteeki ga suteki (Steaks are nice)
base phrase: suteeki (a steak)
punning phrase: suteki (nice)
 omitted mora: -e-

4) Mora transformation

In this group, base phrase is transformed into punning phrase by transforming one or more morae into other. This group is internally divided into 2 subgroups, according to type of mora that is transformed:

4.1) Consonant transformation

In this group one consonant is transformed into another.
Example: Tomato wo taberu to tomadou (I get confused when I eat tomatoes)
base phrase: tomato (a tomato)
punning phrase: tomadou (get confused)
 mora transformation: -t- into -d-
* also: final mora addition: -i-

4.2) Vowel transformation

In this group one vowel is transformed into another.
Example: Mezurashii, mizurashii (Peculiar, it’s like water)
base phrase: mezurashii (peculiar)
punning phrase: mizurashii (like water)
mora transformation: -e- into -i-

5) Mora metathesis

In this group, base phrase is transformed into punning phrase by switching places of two morae.
Example: Dajare wo iu no wa dare ja? (Who says puns?)
base phrase: dajare (a pun)
punning phrase: dare ja (who?)
mora switched: -ja-, -re-

6) Morpheme metathesis

In this group, base phrase is transformed into punning phrase by switching places of two morphemes (not morae) in the base phrase.
Example: Otoko wo uru omoide (Memory of selling a guy)
base phrase: omoide wo uru otoko
punning phrase: otoko wo uru omoide
morphemes switched: otko, omoide

This is a parody of a musical title “Omoide wo uru otoko” (“A man selling memories”).

7) Kanji readings change

In this group, base phrase is transformed into punning phrase by changing standard reading of kanji characters (which originate in Chinese and usually have multiple
readings) to one that is not commonly used. This often requires some creativity, as in the example below.

**Example**: *Shokkingu* (shocking)

- **base phrase**: 食 - shoka + 王 - ou (“eat” + “king”)
- **punning phrase**: shokkingu (shocking)

The English word “shocking” is written with a characters for “eating” (shoka) and “king” (ou). This phrase was used for a name of an actual restaurant.

8) **Blend**

In this group, puns are constructed by blending two phrases into one, in a manner that both base phrases are still recognizable.

**Example**: *Oite wa koto wo shisonzuru* (When you get old, you make waste)

- **base phrase**: oite wa ko ni shitagae
- **punning phrase**: seite wa koto wo shisonzuru

This is a blend of two sayings: *oite wa ko ni shitagae* (When you get old, you should listen to your children) and *seite wa koto wo shisonzuru* (Haste makes waste).

9) **Division**

In this group, puns are constructed by dividing one phrase into two (opposite to the technique 8. blend).

**Example**: *Yudetamago wo yudeta no wa mago* (It’s the grandchild who boiled the eggs)

- **base phrase**: yudetamago (boiled egg)
- **punning phrase**: yudeta (boiled), mago (grandchild)

10) **Riddles**

Puns from this group occur in forms of riddles.

**Example**: Nichuu, kuruma wo kowashite bakari iru hito te dare deshoo? Kotae: haisha (What do you call someone who spends all days breaking cars? The answer is: a dentist)

- **base phrase**: haisha (broken car)
- **punning phrase**: haisha (dentist)

11) **Mix of languages**

In puns from this group Japanese and foreign (mostly English) phrases are used.

**Example**: Souri dajin ga ayamatta: “Aimu souri” (The prime minister apologized: I’m sorry)

- **base phrase**: souri (prime [minister])
- **punning phrase**: souri (sorry)

Here, the Japanese reading of English word “sorry” (souri) is used as a homophone to the Japanese word souri (prime [minister]).

12) **Pause transference**

Base phrase is transformed into punning phrase by moving the pause (comma) present in the base phrase.

**Example**: *Kane wo kure, tanomu. Kane wo kureta, nomu!* (“I beg you, give me some money!” „OK, you gave me the money, let’s drink!”)

- **base phrase**: kure, tanomu (please, give me)
- **punning phrase**: kureta, nomu (you gave, I drink)

**E. Remarks**

Above we presented a classification of Japanese puns. The base unit in groups 1-5 is mora. In further groups we take into consideration also morphemes and parts of phrases. In most of gathered examples from groups 1-5 changes between base phrases and punning phrases affected only 1 or 2 morae. The maximum amount of affected morae was 4.

It should be noted that some examples from groups 6-12 also use mora-based techniques from groups 1-5, like the example given for group 11 (see above), basing on the technique of homophony (of the words souri – prime [minister] and souri – sorry).

In some pun examples more than one techniques are used. For example, in the most classical *dajare*, which is *Futon ga futtonda* (Futon flew away), the techniques used are 2.3 internal mora addition (+-) and 2.2 final mora addition (-da-). Thus, techniques from different groups and subgroups can be combined, which extends the possibilities of pun generation.

**IV. JAPANESE PUN GENERATION TECHNIQUES**

The sound transformation patterns, on which the above classification was based, were used to create Japanese pun generation techniques, i.e. formulas that can be used in research on humor processing. They are formed in a universal manner, which makes them possible to be used not only in our research on humor generation (see VI), but also in other projects related to Japanese puns, like their recognition or interpretation.

Below we present the list of pun generation techniques, written in forms of computable patterns ([*] stands for one or more morae):

1. **Homophony**
   - {base phrase} = [punning phrase]
2. **Mora addition**
   - 2.1 Initial mora addition
     - [*] + {base phrase} = [punning phrase]
   - 2.2 Final mora addition
     - {base phrase} + [*] = [punning phrase]
   - 2.3 Internal mora addition
     - {base (+[*]) phrase} = [punning phrase]
3. **Mora omission**
   - 3.1 Final mora omission
     - {base phrase} - [*] = [punning phrase]
   - 3.2 Internal mora omission
     - {base – [*]) phrase} = [punning phrase]
4. **Mora transformation**
   - 4.1 Consonant transformation
     - {base phrase (cons.1)} \rightarrow [punning phrase (cons.2)]
   - 4.2 Vowel transformation
     - {base phrase (vowel 1)} \rightarrow [punning phrase (vowel 2)]
5. **Mora metathesis**
   - {base phrase (mora 1-2)} \rightarrow [punning phrase (mora 2-1)]
6. **Morpheme metathesis**
   - {base phrase (morpheme 1-2)} \rightarrow [punning phrase (morpheme 2-1)]
7. **Kanji readings change**
   - {base phrase (kanji reading 1)} \rightarrow [punning phrase (kanji reading 2)]
8. **Blend**
   - {base phrase (phrase 1, phrase 2)} \rightarrow [punning phrase (phrase 1+2)]
9. **Division**
   - {base phrase (phrase 1+2)} \rightarrow [punning phrase (phrase 1, phrase 2)]
V. PUN GENERATION PATTERNS IN OTHER RESEARCH

Japanese puns are still quite underinvestigated as a genre. That said, some works exist that tackle the subject of dajare classification. One of the sources of examples used in our research was Odashima’s book “Dajare no ryunugi” (“Manners of dajare”) [5], in which the author mentions some types of puns, without, however, proposing a formal classification.

One of the first and best known computer systems in the field of humor processing is Binsted’s JAPE [2]. It generated puns belonging to the type of riddles (group 10 in our classification). Humorous contents in JAPE are generated using techniques such as alliteration, homophony, rhyming or spoonerizing. A Japanese version of JAPE, called BOKE [9], however, generated puns only using a technique equivalent to the one we named “mora transformation” (see III.D). Albeit this technique is quite prolific, resigning from other techniques may lead to the lack of variety of output.

Another research project aimed at constructing a Japanese pun generating engine was launched by Tanabe [10]. He named 8 dajare generation patterns: 1) homophony, 2) vowel transformation, 3) consonant transformation, 4) consonant voicing, 5) final sound addition, 6) metathesis, 7) pronunciation (de facto: homophony) and 8) mix of two or more techniques. This classification, albeit more complex than in the case of BOKE, still does not cover some techniques which we defined in our classification. Also, to our best knowledge, the pun generation techniques defined by Tanabe were not actually implemented into a system.

Also other existing projects on Japanese puns generation (e.g. [11] or [12]) proposed some computable generation patterns, but not formalized sets of pun techniques, that would be based on robust and complex linguistic analysis.

VI. TESTING THE PUN GENERATION PATTERNS

The pun generation patterns described above were partially implemented into a pun generator, which in turn was implemented into a conversational system for Japanese. As a result, we constructed a talking system, able to generate puns in conversations with humans [1].

So far, pun generation techniques from groups 1-4 (with all the subgroups) were implemented, which gives a total of 8 techniques. Currently we are working on implementation of further groups. Experiments conducted to evaluate our system showed that it is able to successfully generate puns, which were appreciated by the users. In one experiment we compared the output of our system with phrases that were actually used in human-created puns. The results showed that our system can generate puns with 75% accuracy (comparing to human level) [1].

In other experiments we asked 13 users to evaluate the system’s performance in comparison with a similar system without humor, and also had the chat logs of their interactions with the systems analyzed by our automatic affect analysis system. In both experiments the results were in favor of the humor equipped system. Users assessed it as more interesting, friendly, making them feel better and using humor in appropriate moments. The affect analysis of chat logs showed that users generally displayed more emotions towards the system with humor, most of which changed to positive (94% emotion valence changes to positive, compared to 68% changes to positive for the non-humorous system). [1].

Below we present a fragment of a conversation between the humorous system and a user.

User: Samui neta ha uke ga warui mono desu.
(Old and low-level puns are not really interesting.)

System: Neta to ieba netami da ne.
(Speaking of pun levels, I’m envious.)

User: [Warai] Unai koto tu hito no saion ni ha shitto shimasu.
([Smile] Yes, I envy people who can tell good puns.)

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