Natural Language 2021/22 | Mini Project 1
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The work was divided equally between the members of the group.

I.   Introduction

The objective of this project is to make a transducer to convert "Roman birthdates" into an "Arabic-text birthdate" format.

II.   Description and Comments on the Solution

Initially, we developed eight transducers:
- o **mm2mmm** – converts from 2-digit Arabic numbers to 3-letter month names.
- o **d2dd** - converts Arabic numbers with a single digit to 2-digit numbers, we use a "eps" transition with a weight of 1 so that other transitions are chosen if the number has more than 1 digit.
- o **d2dddd** – converts Arabic numbers with 1, 2, or 3-digits to 4-digit numbers. From the initial state we have three eps transitions to emit one, two or three zeros, the eps transitions have increasingly higher weights according to the size of the "jump" of the eps transition.
- o **copy** – copies a single digit to the output tape.
- o **skip** – converts a single digit into "eps".
- o **date2year** - selects the year in Arabic birthdates by skipping the day and month, until it has no alternative but to use the transition with an input of "/ " with a weight.
- o **leap** - analyses whether one year is a "not-leap" or a "leap" year by checking if the number formed by the last two digits is a multiple of 4, if so it's "leap", if not it's "not-leap".
- o **R2A** - converts Roman numerals to Arabic numbers.

Using the previous transducers, we developed another five transducers:
- o **A2R** – converts Arabic numbers to Roman numbers by inverting the **R2A** transducer.
- o **birthR2A** – converts Roman birthdates to Arabic birthdates. For the day and month to have 2 digits, we compose **R2A** and **d2dd**, creating the transducer R2A_2_digits. For the year to have 4 digits, we compose **R2A** with **d2dddd**, making the transducer R2A_4_digits. Then, we concatenate R2A_2_digits with copy so we get the "/", then we concatenate the transducer with itself, so we get "dd/mm/" and finally we concatenate with the R2A_4_digits transducer to get the year.
- o **birthA2T** – converts Arabic birthdates to Arabic-text format birthdates. We **copy** the input until we reach the "/" separator. Then this transducer is concatenated with **mm2mmm** to convert the month from digits to text. Finally, the closure of the **copy** transducer is concatenated in order to copy all 4 digits of the year.
- o **birthT2R** – converts Arabic-text birthdates to Roman birthdates. We inverted the **birthA2T** to get the Arabic birthdate from the Arabic-text format birthdate, then we invert **birthR2A** to get the Roman birthdate from the Arabic birthdate. Finally, we compose the two transducers obtained.
- o **birthR2L** – converts Roman birthdates to leap/not-leap. A composition of the **birthR2A** transducer is made with the **date2year** transducer, in order to first convert the date to Arabic and then extract the year from the arabic date. Finally, this transducer is also composed with the **leap** transducer to output if the year is either leap or not-leap.