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CYK Parser Project.

The goal of this project was to design a CYK parser to implement it in code and generate our own CNF language to test the code. I generated my CNF sentences to work with library book search operations. The vocabulary of my language is 48 with 6 parts of speech in the lexicon and 14 non-terminals in the CNF. The parser implementation is written in Python and can be repeated to input new sentences until the user ends the program. The output is a CYK table in CSV form with the correct values in their corresponding rows/columns.

The topic of my sentences is library book search operations. I chose relatively basic sentences to make the generation of my language a little bit simpler. The sentences sound as if they are instructions you may give a child when teaching them about how libraries work. The sentences cover librarian roles, catalogs, search, rules, and advice for library book search. There are 17 valid sentences, and 3 invalid at the end.

Sentences:
- The librarian helps find books.
- You can search for books.
- The system shows the location.
- A card is needed to borrow books.
- Books are arranged by topic.
- Books may not be available.
- Some books are borrowed.
- You can request books.
- The library has a catalog.
- The librarian can assist with books.
- The catalog helps you find authors.
- You may find books online.
- Books are located by number.
- The library updates its catalog.
- You can search by genre.
- The system is easy.
- Ask if you need help finding books.
- The librarian could not find it
- You can look for books on Google.
- Book the flight through Houston.

Lexicon

Det ➜ the | some | a | this

Noun ➜ librarian | books | system | location | card | topic | library | catalog | authors | online | number | genre | system | help

Verb ➜ helps | find | search | shows | needed | borrow | arranged | may | available | checked-out | request | has | assist | find | located | updates | search | is | easy | ask | need | finding

Pronoun ➜ you | its

Aux ➜ may | can | is | be | are | not

Preposition ➜ for | by | with | to | if

Grammar

CFG with sentences broken into their parts of speech.

S ➜ Det Noun Verb Det Noun
S ➜ Det Noun Aux Verb Preposition Verb Noun
S ➜ Det Noun Verb Det Noun
S ➜ Det Noun Aux Verb Preposition Verb Noun
S ➜ Noun Aux Verb Preposition Noun
S ➜ Noun Aux Aux Aux Verb
S ➜ Det Noun Aux Verb
S ➜ Pronoun Aux Verb Noun
S ➜ Det Noun Verb Det Noun
S ➜ Det Noun Aux Verb Pronoun Preposition Noun
S ➜ Det Noun Verb Pronoun Verb Noun
S ➜ Pronoun Aux Verb Noun Noun
S ➜ Det Noun Verb Pronoun Noun
S ➜ Verb Preposition Pronoun Verb Noun Verb Noun

CNF Conversion

S ➜ Det NV	S ➜ Noun AA	S ➜ Det NV
NV ➜ Noun VV	AA ➜ Aux AA	NV ➜ Noun VP
VV ➜ Verb VN	AA ➜ Aux AV	VP ➜ Verb PV
VN ➜ Verb Noun	AV ➜ Aux Verb	PV ➜ Pronoun VN
		VN ➜ Verb Noun
S ➜ Pronoun AV	S ➜ Det NA	
AV ➜ Aux VP	NA ➜ Noun AV	S ➜ Pronoun AV
VP ➜ Verb Preposition	AV ➜ Aux Verb	AV ➜ Aux VN
PN ➜ Preposition Noun		VN ➜ Verb NN
	S ➜ Pronoun AV	NN ➜ Noun Noun
S ➜ Det NV	AV ➜ Aux VN	
NV ➜ Noun VD	VN ➜ Verb Noun	S ➜ Det NV
VD ➜ Verb DN		NV ➜ Noun VP

DN ➜ Det Noun S ➜ Det NA NA➜ Noun AV AV ➜ Aux VP VP ➜ Verb PV PV ➜ Preposition VN VN ➜ Verb Noun S ➜ Noun AV AV ➜ Aux VP VP ➜ Verb PN PN ➜ Preposition Noun	S ➜ Det NV NV ➜ Noun VD VD ➜ Verb DN DN ➜ Det Noun S ➜ Det NA NA ➜ Noun AV AV ➜ Aux VP VP ➜ Verb PP PP ➜ Pronoun PN PN ➜ Preposition Noun	VP ➜ Verb PN PN ➜ Pronoun Noun S ➜ Verb PP PP ➜ Preposition PV PV ➜ Pronoun VN VN ➜ Verb NV NV ➜ Noun VN VN ➜ Verb Noun

CNF

S ➜ Det NV | Pronoun AV | Det NA | Noun AV | Noun AA | Verb PP

NV ➜ Noun VV | Noun VD | Noun VP | Noun VN

VN ➜ Verb Noun | Verb NN | Verb NV

AV ➜ Aux VP | Aux Verb | Aux VN

VP ➜ Verb PV | Verb PN | Verb PP

PN ➜ Preposition Noun | Pronoun Noun

PV ➜ Preposition VN | Pronoun VN

AA ➜ Aux AA | Aux AV

PP ➜ Pronoun PN | Preposition PV

VV ➜ Verb VN

VD ➜ Verb DN

DN ➜ Det Noun

NA ➜ Noun AV

NN ➜ Noun Noun

Det ➜ the | some | a | this

Noun ➜ librarian | books | system | location | card | topic | library | catalog | authors | online | number | genre | system | help

Verb ➜ helps | find | search | shows | needed | borrow | arranged | may | available | checked-out | request | has | assist | find | located | updates | search | is | easy | ask | need | finding

Pronoun ➜ you | its

Aux ➜ may | can | is | be | are | not

Preposition ➜ for | by | with | to | if