Part 4 - Data Structure

As specified in our leep_of_fate_lang.txt file, this is the contents and makeup of our PDA Data Structure:

$q_0\ q_1\ q_2$

$f\ w\ a\ e\ *$

q_0

q_2

$X\ Y\ Z$

$q_0\ lambda\ lambda\ =\ q_1\ Z$

$q_1\ f\ lambda\ =\ q_1\ Y$

$q_1\ w\ lambda\ =\ q_1\ Y$

$q_1\ a\ lambda\ =\ q_1\ X$

$q_1\ e\ lambda\ =\ q_1\ X$

$q_1\ lambda\ lambda\ =\ q_2\ lambda$

$q_1\ lambda\ Y\ =\ q_2\ lambda$

$q_2\ f\ Y\ =\ q_2\ lambda$

$q_2\ w\ Y\ =\ q_2\ lambda$

$q_2\ a\ X\ =\ q_2\ lambda$

$q_2\ e\ X\ =\ q_2\ lambda$

$q_2\ *\ Z\ =\ q_2\ lambda$

$q_2\ lambda\ lambda\ =\ q_1\ lambda$

This .txt file stores the pertinent information of our PDA so that our .py file can traverse the transitions of the PDA. It will determine if the given string is a valid input in our language, and if so, provides the transitions that it goes through.

The first line of the .txt file stores all the states of our PDA. Line 2 contains all our LEEP of Fate language's valid alphabet characters/symbols. Line 3 stores the start state, while line 4 stores the accepting state.

Line 5 contains all of the stack variables that are a part of our Pushdown Automata. Lines 6-18 represent all the valid transitions that our Pushdown Automata contains. It follows a specific format, similar to the Lecture Notes syntax, and is space-delimited:

<Current State before Transition> <Input Character to Consume> <Pop Stack Variable> <Equal Sign> <State to end up in After Transition> <Push Stack Variable>

In our *leep_of_fate_program.py* file, we created a *Leep_of_Fate* class and attributes for the specific information needed from the .txt file about the PDA. The *parse_file* function is a helper function that reads into the .txt file and saves the data. The *accept_reject_string* function is the main part of the code that utilizes the structure of the PDA and checks if there are accepting transitions that lead to an empty stack and an empty string in an accepting state. If so, it is a valid string for the PDA and returns the transitions. If not, it returns False. The main function asks the user for input, calls to the functions after creating an instance of the *Leep_of_Fate* Class, and also creates ASCII art depending on the validity of the string.

The **GitHub ReadMe** page specifies how to run this file and test input.
GitHub Link: https://github.com/SAJacob7/EECS510_Project_LEEP_of_Fate_Language

Reminders:

- Make sure to do pip install ascii_magic if you haven't already.
- Run the leep_of_fate_program.py
- Input your string into the terminal once you run it.

Screenshots of the Code Running:

Running The File:

```
annalin@Annas-MacBook EECS510_Project_Leep_of_Fate_Language % python3 leep_of_fate_program.py
---------- LEEP of Fate: Rock Chalk Chronicles ----------

Cast your battle spell with these elements to defeat the Wildcat!
But beware as if the right spell is not casted the Jahawks will admit defeat to the Wild Beast of the West!

  Fire: f
  Water: w
  Air: a
  Earth: e
  *: Defeating Blow

Enter Your Battle Spell Jayhawk!:
```

Valid Input Example (Jayhawk Win):

```
---------- LEEP of Fate: Rock Chalk Chronicles ----------

Cast your battle spell with these elements to defeat the Wildcat!
But beware as if the right spell is not casted the Jahawks will admit defeat to the Wild Beast of the West!

  Fire: f
  Water: w
  Air: a
  Earth: e
  *: Defeating Blow

Enter Your Battle Spell Jayhawk!: faewfaeae*
Accept

Transitions:
['q0', 'lambda', 'lambda', '=', 'q1', 'Z']
['q1', 'f', 'lambda', '=', 'q1', 'Y']
['q2', 'lambda', 'lambda', '=', 'q1', 'lambda']
['q1', 'a', 'lambda', '=', 'q1', 'X']
['q1', 'lambda', 'lambda', '=', 'q2', 'lambda']
['q2', 'e', 'X', '=', 'q2', 'lambda']
['q2', 'lambda', 'lambda', '=', 'q1', 'lambda']
['q1', 'w', 'lambda', '=', 'q1', 'Y']
['q1', 'lambda', 'Y', '=', 'q2', 'lambda']
['q2', 'f', 'Y', '=', 'q2', 'lambda']
['q2', 'lambda', 'lambda', '=', 'q1', 'lambda']
['q1', 'a', 'lambda', '=', 'q1', 'X']
['q1', 'e', 'lambda', '=', 'q1', 'X']
['q1', 'lambda', 'lambda', '=', 'q2', 'lambda']
['q2', 'a', 'X', '=', 'q2', 'lambda']
['q2', 'e', 'X', '=', 'q2', 'lambda']
['q2', '*', 'Z', '=', 'q2', 'lambda']

Rock Chalk Jayhwak, Go KU!

                                                  `QQQ.
                                              QQMD@@DW0Aq3f5gbUbb8RQ      ..
                                            QOSfnLzzjuJa?I??!t7taeumPE4E4EEXPb&RQ
                                          QNUya!??????II!aa!!!?II[7nfdXPGGGGPXEVgVbMQ
                                        QBmLaI!!!!!!!]anmd5!??tJmgq23gZZZZZZZZZZGghSGQ
                                      QMXu??!!???IIIawn&Fa}}e6PbZZPXGZGGGGGGGGGGZZPgSWQ
                                   QHhFn!?!!!?zm6F2Jja!TSL??LZZGGGGZGGGGZZZZGGGGGGGZShQ
                                   QDg5jI!!!!?thbg2EbP4m3wJ5SGGGGGZZbbbGXEgmd4d44ddVVd2R
                                     QDo??!!!Ie6SfopXZbbZX4GZZZZGghpfno1n3wgkDQQQQRH&$Q
                        QQQ          Q&jI!!!!!!!L5gVhm6mSghVhgm2Jz1!???!!ItCmSqSdGUNQ
                      QDJy$Q QGAQ    QAe??!!!!!!?!eCqEPGPXgE4dVVVd4444444d44VgqFfJFYRQ
                      QD!reGXNe1GQ   QkfI!?!!!!!!???[euwFqh4XPPPPXgPPPXgEdhVdgb8WQQQ
                     QOkys{IIgts]kGBQMS37I?I?!I}!!!????II?!?uyy35hkPXGZk&@RQQ
                  QXEQY?e****}I*{]!w0$Cez!{{****I}**??I*??}*{{{{!nY&Q
                  Qg}ju!{**********{zt?}nnwo!?I**{{{*********{}Itu5amQ
                   Qm{s**********!t1t!r1LTLjo**1aa1****{*}a2LnLe[zGQ
               QNQQE]****{{*{{*{**?2MP]JO6nDH7**1kUtI?!][yn7e{?ow4RQ
               Q$mfo1***IL175[[T{*sLQUAS?l!NDI**rG8}1oz7at!awFVGYGZBQ
                QH51{{**j5w777wFu}rLQOEUq[IBN!rsrOA{{ss!L5YHhdgXPPEgg$Q
                 QQKq1*!33Is{{}{[7I2RG!7XKhg@4#TFYjr}j6kQQDm6ZGZZZZGu2AQ
                   QQG}so6#]}{{{!5?eee1{s74Zg6nje**JAQQ0P3ypgXZGGZZECfOQ
                     Qk27I[ofLooajo{{{{{**{s}?*]*IJ1twERStwwt]edZZdq25hQ
                 QQDA&$gzy!f[I?*wt{*********{LYz2t{{s!n!tJw]?6GZPCqqSMQ
                  QAhV5Fy6hTo!#[{ens*********{T#Tm]s*}**uddg6wFbZEFhgE0
               QMg4dmw6ZZ457tjuCy6phJs****{jz{}}r!?tuu76hbbbPdmpgV8Q
               QBChPGPGZZG4XPPbbbbbZ4zI{{sfWZpg6ny2uC4PXEZZgJyhX8Q
                R4FFmSgS6mghVVhggSqSqqCaepMQ Q QD66m#mXZZPgwfG0Q
                 QUZPE4EXgdVhhghh4XbAHQ8$Q     0Sh&R&44m65Fq8kGA
                          QQQQQQQ.             R$Q   QHPEP@QQbY$
```

Invalid Input Example (Wildcat Win):