Abacus Software Technical Proficiency Test

Review and technical test for new applicants

February 2017

Technical Test

This test consists of one design and programming exercise and two essay questions. There is no "right" or "wrong" answer to any of the programming or essay questions.

You are free to use either C# or JAVA and any publicly available open source libraries. You will be expected to explain the inner workings of your application as well as answer any questions about your solution.

The design and programming exercise is to create a random poem generator using the following grammatical rules:

```
POEM: <LINE> <LINE> <LINE> <LINE> <LINE>

LINE: <NOUN>|<PREPOSITION>|<PRONOUN> $LINEBREAK

ADJECTIVE: black|white|dark|light|bright|murky|muddy|clear <NOUN>|<ADJECTIVE>|$END

NOUN:
heart|sun|moon|thunder|fire|time|wind|sea|river|flavor|wave|willow|rain|tree|flowe
r|field|meadow|pasture|harvest|water|father|mother|brother|sister
<VERB>|<PREPOSITION>|$END

PRONOUN: my|your|his|her <NOUN>|<ADJECTIVE>

VERB:
runs|walks|stands|climbs|crawls|flows|flies|transcends|ascends|descends|sinks
<PREPOSITION>|<PRONOUN>|$END

PREPOSITION:
above|across|against|along|among|around|before|behind|beneath|beside|between|beyon
d|during|inside|onto|outside|under|underneath|upon|with|without|through
<NOUN>|<PRONOUN>|<ADJECTIVE>
```

- To the left of the colon is the name of the rule
- To the right of the colon is the rule definition which can consist of words, keywords and references to other rules.
- A reference to another rule is marked with angle brackets, for example `<NOUN>`. Rules can reference themselves, making them recursive.
- Keywords are marked with $. There are two keywords: `LINEBREAK` and `END`. `LINEBREAK` adds a line break to the output, `END` marks that the end of a line has been reached. This means that a line can only end with an adjective, a noun or a verb.

- A grouping of elements separated by | means that one of those elements should be selected at random.
- Anything else that is plain text can be considered a word, for example `murky` or `heart.`

For example, the rule `PRONOUN` is defined as `my|your|his|her <NOUN>|<ADJECTIVE>` which means that one of the words `my`, `your`, `his` or `her` should be selected at random followed by either a `NOUN` or an `ADJECTIVE`, also selected at random.

1) Create a class diagram which can be used to describe all the different elements of the grammatical rules and their relationships.

2) Using the design you created for question 1, write a program which first parses the grammatical rules from a text file into your data structure and then uses the data to generate a random poem. Here is an example of what the output might look like:

```
my sun among her white meadow

moon upon my light

moon

your rain climbs

her murky bright clear willow
```

3) Upon completion, explain how (at a high level) you might adapt this program to generate a haiku (in 2 – 3 sentences).

4) Given the choice between writing ideal code and meeting a critical deadline, which would you choose and why? Explain what changes you might be willing to compromise on.