**Chat Bot Interaction**

Interactions with the Chat Bot will consist of three main stages, input parsing, input interpretation, and response. The input parsing stage involves obtaining user input, validating it, and then organizing it into a data structure that is ready to be interpreted. Input interpretation involves processing the input through a series of grammatical rules to determine if the input forms a valid sentence. The response stage involves constructing a valid response to the input. The response will be a simple statement or question, potentially guiding further conversation through prompts to the user or, if the chat bot has failed to understand the input, a change of subject. The three stages are explained in more detail below.

**Input Parsing**

The process of parsing the user’s input begins with obtaining the user’s input through the console. This input will be stored as a String. This input string will then be cut into substrings at each space in order to obtain individual words. During this process these strings are collected and stored in an ArrayList of strings. Next each word will then be checked against the dictionary files in order to determine its classification as a part of speech. If the word is found in a dictionary it is then wrapped in the appropriate part of speech object that is used during interpretation. In the event a word is not found in the dictionary the user will be prompted to confirm that the word is a valid word and then provide the correct classification. That word is then added to the appropriate dictionary and wrapped in the appropriate object. This process allows the chat bot to “learn” more words as it is used. During this process the part of speech objects are collected in an ArrayList of part of speech objects.

**Interpretation**

The interpretation of the input occurs on a stack and is dictated by grammatical rules which are expressed as an algorithm. Basically, we are concerned with articles, nouns, and verbs which can be combined in various ways to form noun phrases and verb phrases which form sentences. Using the ArrayList of part of speech objects our algorithm will push each object onto the stack, one at a time, and determine with each push if what is on the stack can be “reduced” into a more general part of a sentence. For example, the sentence, “The dog runs” which will have already been parsed in the appropriate objects, will be interpreted in the following manner:

* + Article(“The”) is pushed onto the stack.
  + The stack contains only an Article which cannot be reduced.
  + Noun(“Dog”) is pushed onto the stack.
  + The stack contains an Article and a Noun which can be reduced to a Noun Phrase.
  + Article(“The”) and Noun(“Dog”) are popped off the stack and reduced to NounPhrase(Article(“The”), Noun(“Dog”)) which is pushed onto the stack.
  + The stack contains only a Noun Phrase which cannot be reduced.
  + Verb(“runs”) is pushed onto the stack.
  + The stack contains a Noun Phrase and a Verb which can be reduced to a Noun Phrase and a Verb Phrase.
  + Verb(“runs”) is popped of the stack and reduced to VerbPhrase(“runs”) which is pushed back onto the stack.
  + The stack contains a Noun Phrase and a Verb Phrases which can be reduced to a sentence.
  + There are no more objects to push so the Noun Phrase and Verb Phrase are popped off the stack and reduced to a Sentence object.

In the event the input objects cannot be reduced the chat bot will prompt the user that it was unable to understand the input and prompt for new input. The resulting sentence object is stored for use in the response stage.

**Response**

The Response stage will make use of the valid sentence object to generate responses to the user’s input. The responses will consist of predesigned response templates which will can be dynamically altered to produce relevant questions and statements. For example:

Given the input “My dog runs” The chat bot may respond with a question template: “Why does (pronoun) (noun) (verb)?” The parts of speech are dynamically filled in and the output to the user is, “Why does your dog run?” The user may then respond with more input. The chat bot will attempt to continue a conversation until the language becomes too complex at which time it will attempt to change the subject.