Design Document

For

Case Western Reserve University Baseball Alexa Skill

Version 1.1.0

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Date	Reason for Change	Version Number
10/17/2018	Initial Design	1.0.0
10/28/2018	Re-worked functionality based on website availability and interaction with Alexa	1.1.0

1. Introduction

This document describes the following aspects of the CWRU Baseball Alexa Skill software:

- Principle classes and their contained methods
- Failure and exception handling

For simple maintenance and reuse, we are using object-oriented architecture. Specifically, we are using Event-Driven Design. Typically, this architecture operates by responding to an external source of events and calling methods to handle those events. Normally these handle events are triggered by the detection of multiple trigger events, which allow events to occur and be handled concurrently. In our design, we do not have a case for multiple trigger events but, nonetheless, our software functionality is still triggered by external sources of events. Our interface, instead of a real-time system or GUI, is the Alexa device on which the user is accessing our information.

The Baseball Alexa Skill is intended to make it easy for people with Amazon Alexa devices to access data about the CWRU baseball team directly from the CWRU sports website. As opposed to using a database, the sports website is dynamic and constantly being updated, so users will always be getting the most up to date information about scores, statistics, etc. To do this, the user will issue voice commands to their Alexa device which will be interpreted by Alexa and our program, request the data from the sports website, and return a generated answer in English. Alexa can then verbalize the returned response to the user.

2. Applicable Documents

Baseball Alexa Skill Documents:

Software Requirements Specification for Case Western Reserve University Baseball Alexa Skill, 6 December 2018

3. Principle Classes

3.1. Responsibilities

The requirements of the Baseball Alexa Skill include the following responsibilities

R1. Search CWRU athletics website for baseball team scores and schedule
R2. Search CWRU athletics website for baseball player roster
R3. Search CWRU athletics website for baseball player statistics
R4. Search CWRU athletics website for individual team statistics

R5. Return requested information from applicable categories
R6. Return error message if requested information is outside of software's capabilities
R7. Return error message if requested information is unavailable on the website

3.2. Class Interfaces

This section describes the interfaces of the object classes identified to date for the CWRU Baseball Alexa skill software. The two object classes in our application are player and game. More information on these classes can be found below.

3.3. Class team

An instance of class *team* represents the CWRU Baseball team as a whole. The *team* class will be used whenever a user requests information that applies to the team and not individual players. It is created using an input of a specified year. If no year is given by the user the software will default to the current year. The purpose of this class is to fetch the information from the necessary pages within the CWRU Athletics website for the given year. If the season is ongoing, it will fetch the value for the current point in the season.

3.3.1. Function fetch_num_of_games
Returns the number of games played by the CWRU Baseball team for a specified year.

3.3.2. Function fetch_num_of_at_bats
Returns the number of at bats by the CWRU Baseball team for a specified year.

3.3.3. Function fetch_num_of_runs
Returns the number of runs scored by the CWRU Baseball team for a specified year.

3.3.4. Function fetch_num_of_hits
Returns the number of hits by the CWRU Baseball team for a specified year.

3.3.5. Function fetch_num_of_doubles
Returns the number of doubles hit by the CWRU Baseball team for a specified year.

3.3.6. Function fetch_num_of_triples
Returns the number of triples hit by the CWRU Baseball team for a specified year.

3.3.7. Function fetch_num_of_home_runs
Returns the number of home runs hit by the CWRU Baseball team for a specified year.

3.3.8. Function fetch_num_of_runs_batted_in
Returns the number of runs batted in (RBIs) hit by the CWRU Baseball team for a specified year.

3.3.9. Function fetch_num_of_extra_base_hits
Returns the number of extra base hits that were hit by the CWRU Baseball team for a specified year.

3.3.10. Function fetch_num_of_total_bases
Returns the total number of bases gotten while batting by the CWRU Baseball team for a specified year.

3.3.11. Function fetch_num_of_walks
Returns the number of walks gotten while batting by the CWRU Baseball team for a specified year.

3.3.12. Function fetch_num_of_hit_by_pitches
Returns the number hit-by-pitches gotten while batting by the CWRU Baseball team for a specified year.

3.3.13. Function fetch_num_of_strikeouts
Returns the number of strikeouts made while batting by the CWRU Baseball team for a specified year.

3.3.14. Function fetch_num_of_sacrifice_flies
Returns the number of sacrifice flies hit by the CWRU Baseball team for a specified year.

3.3.15. Function fetch_num_of_sacrifice_hits
Returns the number of sacrifice hits made while batting by the CWRU Baseball team for a specified year.

3.3.16. Function fetch_num_of_hit_into_double_play
Returns the number of times that CWRU baseball batters hit into a double play for a specified year.

3.3.17. Function fetch_num_of_stolen_bases
Returns the number of stolen bases made offensively by the CWRU Baseball team for a specified year.

3.3.18. Function fetch_num_of_caught_stealing
Returns the number of offensive CWRU baserunners who were caught stealing for a specified year.

3.3.19. Function fetch_batting_average
Returns the CWRU team offensive batting average for a specified year.

3.3.20. Function fetch_on_base_percentage
Returns the CWRU team offensive on base percentage for a specified year.

3.3.21. Function fetch_slugging_percentage
Returns the CWRU team offensive slugging percentage for a specified year.

3.3.22. Function fetch_earned_run_average

Returns the CWRU team defensive earned run average (ERA) for a specified year.

3.3.23. Function fetch_num_of_shutouts
Returns the number of shutouts for a specified year.

3.3.24. Function fetch_num_of_at_bats_against
Returns the number of at bats (ABA) against the CWRU team for a specific year

3.3.25. Function fetch_batting_average_against
Returns the batting average against (BAA) the CWRU team for a specific year

3.3.26. Function fetch_home_attendance
Returns the cumulative total of home attendance for CWRU team for a specific year

3.3.27. Function fetch_home_attendance_average
Returns the average home attendance for the CWRU team for a specific year

3.4. Class team_participant

The *team_participant* class is used whenever a user requests information or statistics about individual players instead of the team as a whole. It is created using a specified year. If no year is given by the user the software will default to the current year. The purpose of this class is to retrieve information on an individual from the CWRU Athletics website for the given year If the season is ongoing, it will fetch the most recent data for up to the current point in the season. To find a specific player, a player number and a year will be used in all fetch methods.

3.4.1. Function fetch_player_name
Returns name of player on the CWRU team for a specific year

3.4.2. Function fetch_player_position
Returns position of a player on the CWRU team for a specific year

3.4.3. Function fetch_player_bats_and_throws
Returns handedness of player for batting and throwing on the CWRU team for a specific year

3.4.4. Function fetch_player_height
Returns the listed height of a player on the CWRU team for a specific year

3.4.5. Function fetch_player_weight
Returns the listed weight of a player on the CWRU team for a specific year

3.4.6. Function fetch_player_year
Returns academic year of a player on the CWRU team for a specific year

3.4.7. Function fetch_player_hometown_and_high_school
Returns the hometown and high school of a player on the CWRU team for a specific year

3.4.8. Function fetch_batter_games_played
Returns number of games played for a batter on the CWRU team for a specific year

3.4.9. Function fetch_batter_num_of_at_bats
Returns number of at bats (AB) for a player on the CWRU team for a specific year

3.4.10. Function fetch_batter_num_of_runs
Returns number of runs scored for a player on the CWRU team for a specific year

3.4.11. Function fetch_batter_num_of_hits
Returns the number of hits recorded for a player on the CWRU team for a specific year

3.4.12. Function fetch_batter_num_of_doubles
Returns the number of doubles hits by a player on the CWRU team for a specific year

3.4.13. Function fetch_batter_num_of_triples
Returns the number of triples hit by a player on the CWRU team for a specific year

3.4.14. Function fetch_batter_num_of_home_runs
Returns the number of home runs hit by a player on the CWRU team for a specific year

3.4.15. Function fetch_batter_num_of_runs_batted_in
Returns the number of runs batted in (RBI) by a player on the CWRU team for a specific year

3.4.16. Function fetch_batter_num_of_walks
Returns the number of walks recorded by a player on the CWRU team for a specific year

3.4.17. Function fetch_batter_num_of_strikeouts
Returns the number of strikeouts recorded by a batter on the CWRU team for a specific year

3.4.18. Function fetch_batter_num_of_stolen_bases
Returns the number of stolen bases for a player on the CWRU team for a specific year

3.4.19. Function fetch_batter_batting_average
Returns the batting average (BA) for a player on the CWRU team for a specific year

3.4.20. Function fetch_batter_on_base_percentage
Returns the on base percentage (OBP) for a player on the CWRU team for a specific year

3.4.21. Function fetch_batter_slugging_percentage

Returns the slugging average (SLG) for a player on the CWRU team for a specific year

3.4.22. Function fetch_pitcher_num_of_appearances
Returns the number of appearances for a pitcher on the CWRU team for a specific year

3.4.23. Function fetch_pitcher_num_of_game_starts
Returns the number of games started for a pitcher on the CWRU team for a specific year

3.4.24. Function fetch_pitcher_num_of_wins
Returns the number of wins for a pitcher on the CWRU team for a specific year

3.4.25. Function fetch_pitcher_num_of_losses
Returns the number of losses for a pitcher on the CWRU team for a specific year

3.4.26. Function fetch_pitcher_num_of_saves
Returns number of saves recorded by a pitcher on the CWRU team for a specific year

3.4.27. Function fetch_pitcher_num_of_complete_games
Returns the number of complete games recorded by a pitcher on the CWRU team for a specific year

3.4.28. Function fetch_pitcher_num_of_innings_pitched
Returns the number of innings pitched by a pitcher on the CWRU team for a specific year

3.4.29. Function fetch_pitcher_num_of_hits
Returns the number of hits given up by a pitcher on the CWRU team for a specific year

3.4.30. Function fetch_pitcher_num_of_runs
Returns the number of runs given up by a pitcher on the CWRU team for a specific year

3.4.31. Function fetch_pitcher_num_of_earned_runs
Returns the number of earned runs given up by a pitcher on the CWRU team for a specific year

3.4.32. Function fetch_pitcher_num_of_walks
Returns number of walks (BB) given up by a pitcher on the CWRU team for a specific year

3.4.33. Function fetch_pitcher_num_of_strikeouts
Returns number of strikeouts (K) recorded by a pitcher on the CWRU team for a specific year

3.4.34. Function fetch_pitcher_strikeouts_per_nine_innings
Returns the number of strikeouts per nine innings (K/9) for a pitcher on the CWRU team for a specific year

3.4.35. Function fetch_pitcher_num_of_home_runs

Returns the number of home runs given up by a pitcher on the CWRU team for a specific year

3.4.36. Function fetch_pitcher_earned_run_average
Returns the earned run average (ERA) for a pitcher on the CWRU team for a specific year

3.5. Class player

The player class is an object class for holding and transferring all information scraped for a website for a specified player. It is used in conjunction with team_participant. It has no functions to be used as part of its interface.

3.6. Class schedule

An instance of class *schedule* represents the schedule assigned to the CWRU Baseball team for a given year. If no year is given by the user the software will default to the current year. The *Schedule* class will be used whenever a user requests information about the team's upcoming schedule of games or recent games played. The purpose of this class is to scrape the CWRU schedule page for the specified year to obtain information about games. It is created for a specified year.

3.6.1. Function fetch_games_by_date
Returns the date, location, opponent, status, and score if applicable for all games at the input date for the CWRU team for a specific year

3.6.2. Function fetch_previous_game
Returns the date, location, opponent, status and score of the most recent game for the CWRU team

3.6.3. Function fetch_next_game
Returns the date, time, location, and opponent for the next game for the CWRU team

3.7. Class game

This class is an object for storing and transferring information about a game fetched from the CWRU Baseball schedule. It is used in conjunction with the *schedule* class. It has no functions to be used as part of its interface.

3.8. Class lambda_function

This class is the class necessary to connect a skill developed on Amazon Development Console with our code on Amazon Web Services. It receives the incoming request from Alexa,

passes the information necessary to fulfill the request to *receiver*, constructs the outgoing object storing the response, and sends the response back to Alexa.

3.8.1. Function lambda handler

Handles the input from Alexa and returns the response

3.9. Class receiver

An instance of class *receiver* interprets a specific request sent by the Alexa. This class is created through an input of an intent (part of the Alexa generated request) passed to it by the lambda_functon. This class determines the type of request being asked, specifies the information to fetch, and creates the response object to generate the response.

3.6.1. Function get_response

Creates the response from the Alexa intent used to create this object

3.10. Class response

An instance of class *response* is responsible for creating an appropriate and human-sounding response. It is instantiated by an input dictionary containing necessary information to form a response such as the type of request and all values that have been fetched from the website. It is created by a *receiver*.

3.8.1. Function generate_response

Creates a English response based on the data dictionary of values used to create the instance of the object and returns it as a string.

4. Diagrams and Figures

4.1. Activity Diagram

Typical sequence and flow of events is shown in the diagram below (Figure 1). A description of each of these events, labeled 1 through 6 on the diagram, can be found on the list below the figure. Events are placed on top of the object or package that deals with the event: the user of the application, Receive package, Fetch package, and Respond package.

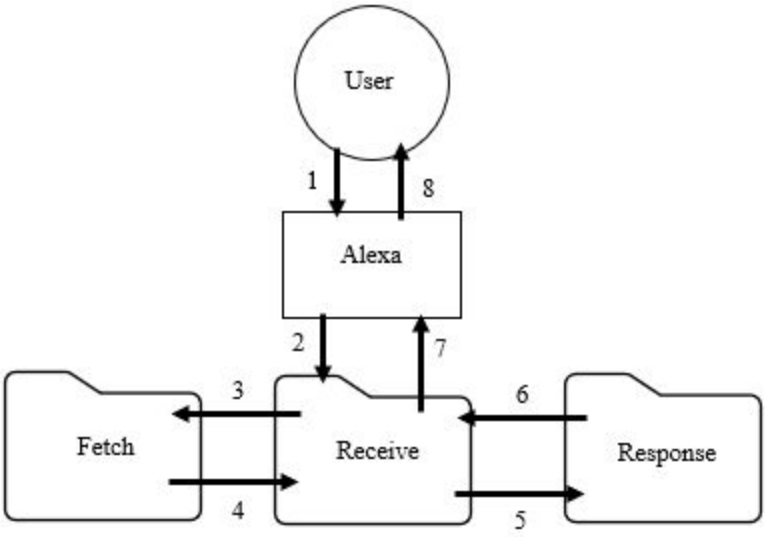

FIGURE 1

Figure 1 Explanation:

Alexa is the custom Interaction Model that we developed. It is hosted by Amazon through the Alexa Development Console. The Receive, Fetch, and Response packages are linked to our custom Alexa Interaction Model and stored on Amazon Web Services (AWS). The following explains each step of a request process as shown by the arrows in Figure 1:

1) User submits verbal query.
2) Alexa interprets verbal query, sends an intent request to the **Receive** package on AWS.
3) **Receive** package determines the necessary information to request and calls the corresponding functions in **Fetch** package.
4) **Fetch** package pulls the requested information from the CWRU Athletics Baseball website and returns them.
5) **Receive** package passes the gathered information and necessary original request information to the **Response** package.
6) **Response** forms a response and returns it to the **Receive** package.
7) **Receive** creates the response request and passses it back to Alexa.
8) Alexa verbalizes the response in the response request.

4.2. Class Structure within Packages

The next three diagrams (Figure 2, Figure 3, and Figure 4) demonstrate which classes, and their available functions, belong to which packages. The folder icons in the diagrams represent the package names and the boxes represent the classes within the listed package. Package interaction can be seen in Figure 1 of the previous section. Please also note that the data transfer classes of *player* and *game* can also be found in the **Fetch** package. We chose to omit them from the figure as they do not provide public functions to use.

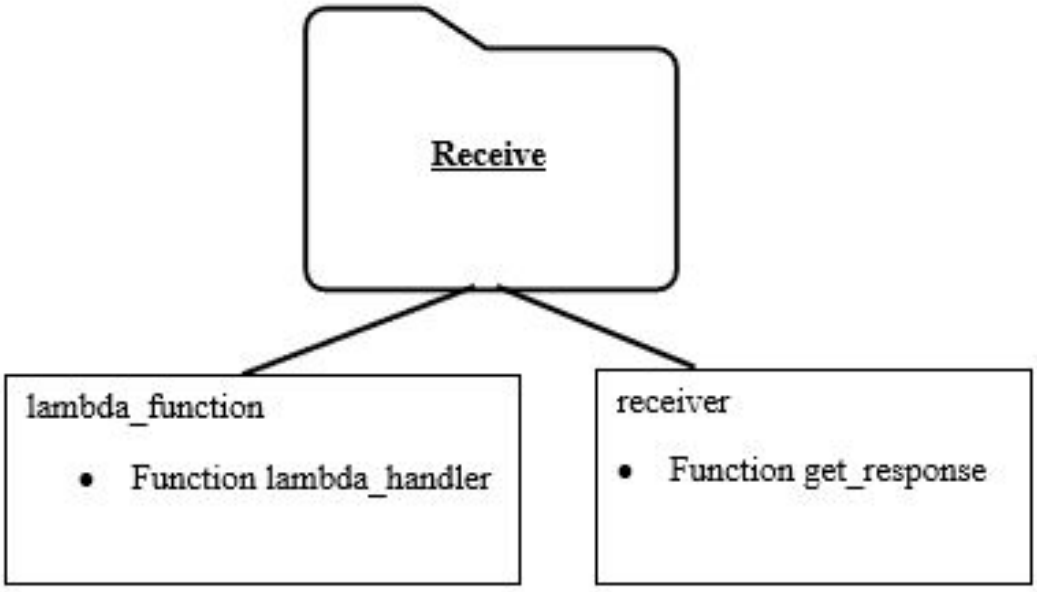

FIGURE 2

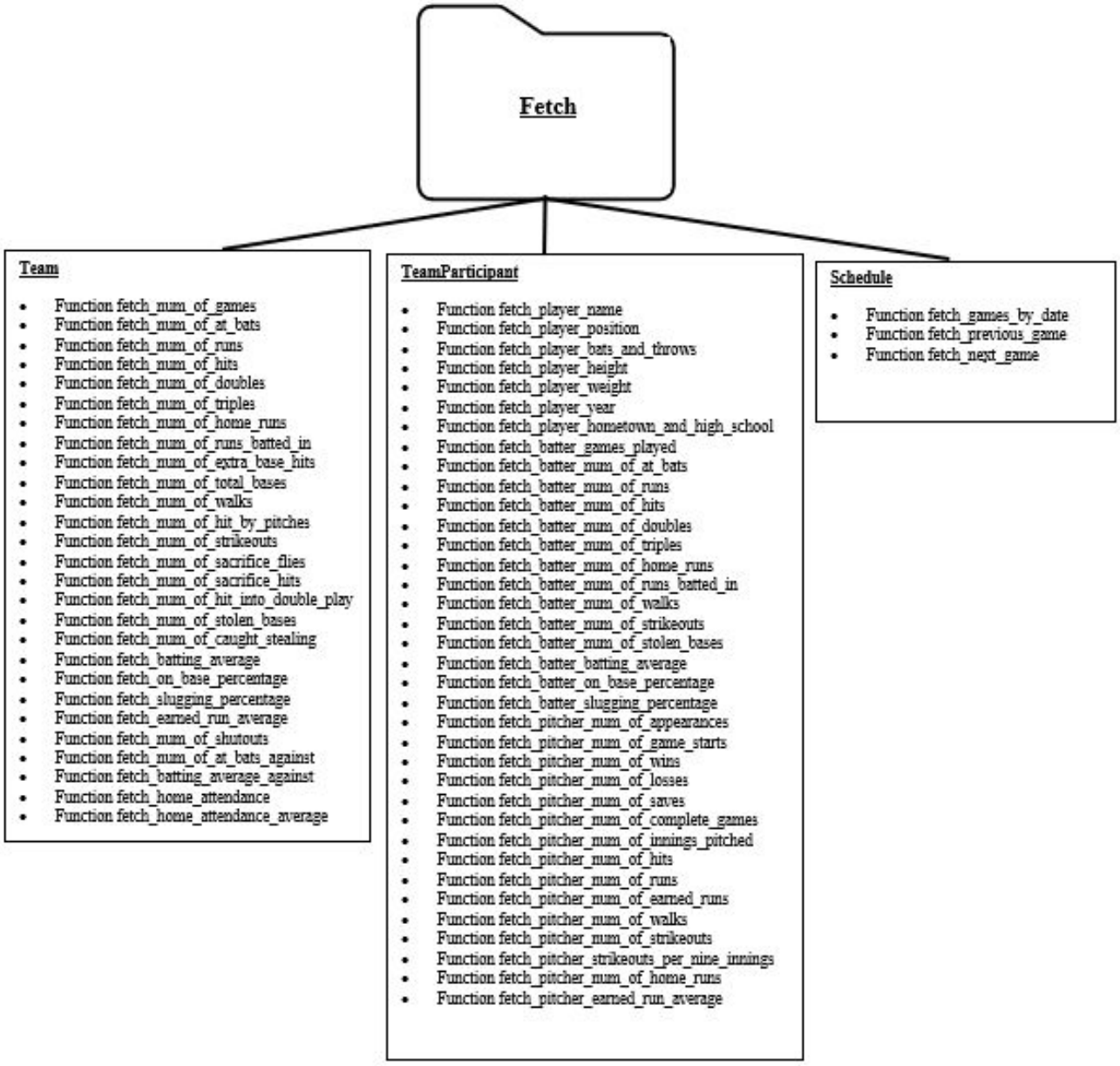
Fetch
Team
Function fetch_num_of_games
Function fetch_num_of_at_bats
Function fetch_num_of_runs
Function fetch_num_of_hits
Function fetch_num_of_doubles
Function fetch_num_of_triples
Function fetch_num_of_home_runs
Function fetch_num_of_runs_batted_in
Function fetch_num_of_extra_base_hits
Function fetch_num_of_total_bases
Function fetch_num_of_walks
Function fetch_num_of_hit_by_pitches
Function fetch_num_of_strikeouts
Function fetch_num_of_sacrifice_flies
Function fetch_num_of_sacrifice_hits
Function fetch_num_of_hit_into_double_play
Function fetch_num_of_stolen_bases
Function fetch_num_of_caught_stealing
Function fetch_batting_average
Function fetch_on_base_percentage
Function fetch_slugging_percentage
Function fetch_earned_run_average
Function fetch_num_of_shutouts
Function fetch_num_of_at_bats_against
Function fetch_batting_average_against
Function fetch_home_attendance
Function fetch_home_attendance_average
TeamParticipant
Function fetch_player_name
Function fetch_player_position
Function fetch_player_bats_and_throws
Function fetch_player_height
Function fetch_player_weight
Function fetch_player_year
Function fetch_player_hometown_and_high_school
Function fetch_batter_games_played
Function fetch_batter_num_of_at_bats
Function fetch_batter_num_of_runs
Function fetch_batter_num_of_hits
Function fetch_batter_num_of_doubles
Function fetch_batter_num_of_triples
Function fetch_batter_num_of_home_runs
Function fetch_batter_num_of_runs_batted_in
Function fetch_batter_num_of_walks
Function fetch_batter_num_of_strikeouts
Function fetch_batter_num_of_stolen_bases
Function fetch_batter_batting_average
Function fetch_batter_on_base_percentage
Function fetch_batter_slugging_percentage
Function fetch_pitcher_num_of_appearances
Function fetch_pitcher_num_of_game_starts
Function fetch_pitcher_num_of_wins
Function fetch_pitcher_num_of_losses
Function fetch_pitcher_num_of_saves
Function fetch_pitcher_num_of_complete_games
Function fetch_pitcher_num_of_innings_pitched
Function fetch_pitcher_num_of_hits
Function fetch_pitcher_num_of_runs
Function fetch_pitcher_num_of_earned_runs
Function fetch_pitcher_num_of_walks
Function fetch_pitcher_num_of_strikeouts
Function fetch_pitcher_strikeouts_per_nine_innings
Function fetch_pitcher_num_of_home_runs
Function fetch_pitcher_earned_run_average
Schedule
Function fetch_games_by_date
Function fetch_previous_game
Function fetch_next_game

FIGURE 3

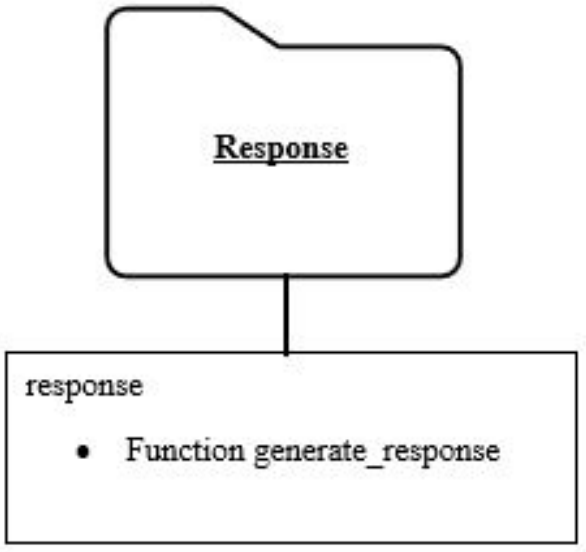

FIGURE 4

5. Issues and Resolutions

Issue	Status	Notes
Insufficient diagrams	Resolved	Added more detailed diagrams to the document
Functions did not match with SRS	Resolved	Added functions and modified others to better match with the SRS document
Confusion on how software would handle user queries	Resolved	In some instances use data transfer objects, in other instances use data values
Retrieving information from website is slow	Unresolved	The website is slow to connect to, at no fault of our own design. In some instances, the website takes 20 or more seconds to respond and return the HTML for our web scraping.