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Principle of Programming Language
Assignment 3

Program Description

This program is written in the Julia, which is new modern language. In this programming assignment you will create a Julia program that reads text file. We wrote Julia program to compute the Spider Man numbers of a set of Marvel characters. Specifically, the program should take as input an arbitrary number of Marvel characters – either as integer indexes (easiest) or strings – and for each of these characters, print the character's name and their Spider Man number. This programming is running file and I have declared here the output of my program. Also plot.png is created after executing program.

Sources

Since the 1st part of the Julia code was given to us. Tutorials given in class were my biggest source here. I have learnt how to execute on the paper and learnt from Google how to apply Julia program. I have downloaded Julia pro and used atom to run jl files. I have created one folder and there I have saved given files.

- Here is the given code by professor:

```
function read_network(pathname)
   # Reads the ith vertex from file
   function read_vertex(i, file)
      m = match(r"""^([0-9]*)\s*"(.*)"$""", readline(file))
      if parse(Int, m[1]) != i
         error("Vertex number $i does not match expected number $line[1]")
      end
      return m[2]
   end
   # Process the input file
   open(pathname) do file
      # Read the *Vertices line
      parsed = split(readline(file))
      if parsed[1] != "*Vertices"
         error("Missing *Vertices line")
      end
      nvertices = parse(Int, parsed[2])
      ncharacters = parse(Int, parsed[3])
      ncomics = nvertices - ncharacters
      # Read vertices - characters and comics
      characters = [read_vertex(i, file) for i = 1:ncharacters]
      comics = [read_vertex(i, file) for i = ncharacters+1:nvertices]
      # Read *Edgeslist line
      if readline(file) != "*Edgeslist" then
         error("Missing *Edgeslist line")
      end
      # Read the edges - appearances
      appearances = spzeros(Int, ncharacters, ncomics)
      while !eof(file)
         parsed = split(readline(file))
         character = parse(Int, parsed[1])
         for i = 2:length(parsed)
            comic = parse(Int, parsed[i]) - ncharacters
```

```
            appearances[character, comic] = 1
        end
    end
    return characters, comics, appearances
end
```

Specifics

I have modified the given file to get the output according to the requirement. In this programming assignment, we want to develop a Julia program to compute the Spider Man number for any arbitrary Marvel character.

- This is the modified code by me.

```
function read_network(pathname)
    # Reads the ith vertex from file
    function read_vertex(i, file)
        m = match(r"""^([0-9]*)\s*"(.*)"$""", readline(file))
        if parse(Int, m[1]) != i
            error("Vertex number $i does not match expected number $line[1]")
        end
        return m[2]
    end
    # Process the input file
    open(pathname) do file
        # Read the *Vertices line
        parsed = split(readline(file))
        if parsed[1] != "*Vertices"
            error("Missing *Vertices line")
        end
        nvertices = parse(Int, parsed[2])
        ncharacters = parse(Int, parsed[3])
        ncomics = nvertices - ncharacters
        # Read vertices - characters and comics
        characters = [read_vertex(i, file) for i = 1:ncharacters]
        comics = [read_vertex(i, file) for i = ncharacters+1:nvertices]
        # Read *Edgeslist line
        if readline(file) != "*Edgeslist" then
            error("Missing *Edgeslist line")
        end
        # Read the edges - appearances
        appearances = spzeros(Int, ncharacters, ncomics)
        while !eof(file)
            parsed = split(readline(file))
            character = parse(Int, parsed[1])
            for i = 2:length(parsed)
                comic = parse(Int, parsed[i]) - ncharacters
                appearances[character, comic] = 1
            end
        end
        return characters, comics, appearances
    end
end
```

```
#const SPIDEY = 5306
function spidey_numbers(collaborations)
    ncharacters = size(collaborations, 1)
    nums = fill(-1, ncharacters)
    #const SPIDEY = 5306
    C = collaborations^0
    for i = 0:6
        for j = 1:ncharacters
            if nums[j] == -1 && C[5306, j] > 0
                nums[j] = i
            end
        end
        C *= collaborations
    end
    return nums
end



"""
The main program for the Marvel universe assignment. In this hint version it
reads the Marvel universe network from the file "porgat.txt" and prints some
simple statistics to make sure the file was properly read. Then it computes
the collaboration matrix.
"""
function main()
    # Read the network

    println("Reading Marvel universe network")
    characters, comics, appearances = read_network("porgat.txt")
    ncharacters = length(characters)
    ncomics = length(comics)
    # Print some statistics
    println("Number of characters = $ncharacters")
    println("Number of comics = $ncomics")
    nappearances = sum(appearances)
    @printf("Mean books per character = %0.2f\n", nappearances / ncharacters)
    @printf("Mean characters per book = %0.2f\n", nappearances / ncomics)

    # Compute books per character histogram
    println("Plotting books per character histogram")
    let x = 1:ncharacters, y = [sum(appearances[i, :]) for i = 1:ncharacters]
        p = plot(x, y, seriestype=:histogram, title="Books per Character")
        savefig(p, "plot11.png")
    end
    # Compute characters per book histogram
    println("Plotting characters per book histogram")
    let x = 1:ncomics, y = [sum(appearances[:, j]) for j = 1:ncomics]
        p = plot(x, y, seriestype=:histogram, title="Characters per Book")
        savefig(p, "plot22.png")
    end
    # Compute collaboration matrix
    println("Computing collaboration matrix")

    # Compute collaboration matrix
```

```
    collaborations = appearances * appearances'

    println("Plotting collaboration histogram")
    let x = 1:ncharacters, y = [sum(collaborations[i, 1:i-1]) for i = 1:ncharacters]
        p = plot(x, y, seriestype=:histogram, title="Collaborations")
        savefig(p, "plot33.png")
    end
    @show collaborations[1:30, 1:30]

    nums = spidey_numbers(collaborations)
    #@show nums

    #printing
    for i = 1:ncharacters
        name = characters[i]
        s = nums[i]
        if s == -1
            @printf("%s has a Spider Man number grater than 6\n", name)
        else
            @printf("%s has a Spider Man number of %d\n", name,s)
    end
    end
end

main()
```

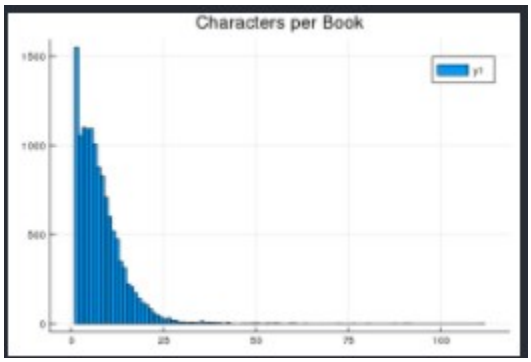
- **This is the output of my program.**

```
include("marvel-SucharitaDas.jl")
Reading Marvel universe network
Number of characters = 6486
Number of comics = 12942
Mean books per character = 14.90
Mean characters per book = 7.47
Plotting books per character histogram
Plotting characters per book histogram
Computing collaboration matrix
Plotting collaboration histogram
collaborations[1:30, 1:30] =
 [1 ,  1]  =  1
 [2 ,  2]  =  9
 [3 ,  3]  =  9
 [4 ,  4]  =  3
 [5 ,  5]  =  3
 [6 ,  6]  =  4
 [7 ,  7]  =  1
 [8 ,  8]  =  2
 [9 ,  9]  =  2
 [10, 10]  =  45
```

[16, 10] = 1
[21, 10] = 1
[11, 11] = 1
[17, 11] = 1
[12, 12] = 3
[13, 13] = 4
24-HOUR MAN/EMMANUEL has a Spider Man number of 3
3-D MAN/CHARLES CHAN has a Spider Man number of 1
4-D MAN/MERCURIO has a Spider Man number of 2
8-BALL/ has a Spider Man number of 2
A has a Spider Man number of 2
A'YIN has a Spider Man number of 2
ABBOTT, JACK has a Spider Man number of 1
ABCISSA has a Spider Man number of 2
ABEL has a Spider Man number of 2
ABOMINATION/EMIL BLO has a Spider Man number of 1
ABOMINATION | MUTANT has a Spider Man number of 2
ABOMINATRIX has a Spider Man number of 2
ABRAXAS has a Spider Man number of 2
ADAM 3,031 has a Spider Man number of 2
ABSALOM has a Spider Man number of 2
ABSORBING MAN/CARL C has a Spider Man number of 1
ABSORBING MAN | MUTA has a Spider Man number of 2
ACBA has a Spider Man number of 2
ACHEBE, REVEREND DOC has a Spider Man number of 2
ACHILLES has a Spider Man number of 3
ACHILLES II/HELMUT has a Spider Man number of 2
ACROBAT/CARL ZANTE has a Spider Man number of 2
ADAM X has a Spider Man number of 2
ADAMS, CINDY has a Spider Man number of 2
ADAMS, CONGRESSMAN H has a Spider Man number of 1
ADAMS, GEORGE has a Spider Man number of 2
ADAMS, MARTHA has a Spider Man number of 2
ADAMS, NICOLE NIKKI has a Spider Man number of 2
ADAMSON, JASON has a Spider Man number of 3
ADAMSON, REBECCA has a Spider Man number of 3
ADMIRAL PROTOCOL/ has a Spider Man number of 2
ADORA has a Spider Man number of 1
ADORA CLONE has a Spider Man number of 2
ADRIA has a Spider Man number of 2
ADVA has a Spider Man number of 1
ADVENT/KYLE GROBE has a Spider Man number of 2
ADVERSARY has a Spider Man number of 2
AEGIS/TREY ROLLINS has a Spider Man number of 2
AENTAROS has a Spider Man number of 2
AFTERLIFE has a Spider Man number of 2
AGAMEMNON has a Spider Man number of 3
AGAMEMNON II/ANDREI has a Spider Man number of 2
AGAMEMNON III/ has a Spider Man number of 2

AGAMOTTO has a Spider Man number of 1
AGARN, CAPT. has a Spider Man number of 3
AGED GENGHIS has a Spider Man number of 2
AGEE, DR. AUBREY has a Spider Man number of 2
AGEE, REBECCA has a Spider Man number of 2

- The program will create plot.png file after running.



Discussion and Conclusion

I wrote this code in Julia and this is a new programming language for me. We had very short time to learn a new language. I tried my best to execute the program. Professor explained in the class a lot and the step by step algorithm. I understand the algorithm part. I like to learn more this modern language. I can understand the julia code after reading somebody else's code. I am excited to see what I can do in the future with this innovative, promising language. This language is very new and I am glad that I have made through this assignment.