Report

Organs should be taken as vertices and arteries and veins as directional edges. There are eight organs in the program. Those are,

left Atrium	left Ventricle
Right Atrium	Right Ventricle
Lungs	Brain
Liver	Kidney

Assumption:
Distances and flow rate between organs are given below. Distance measure in cm and flow rate measure in $mlmin^{-1}$ (cm^3/min).

Edges between organs	Distance (cm)	Flow rate (ml/min)
left Atrium to left Ventricle	10	10
left Ventricle to brain	200	50
left Ventricle to liver	150	50
left Ventricle to kidney	100	100
Brain to Right Atrium	200	50
Liver to Right Atrium	150	50
Kidney to Right Atrium	100	100
Right Atrium to Right Ventricle	10	10
Right Ventricle to lungs	50	50
Lungs to left Atrium	50	50

DESIGN

Graph representation of blood circulatory system.

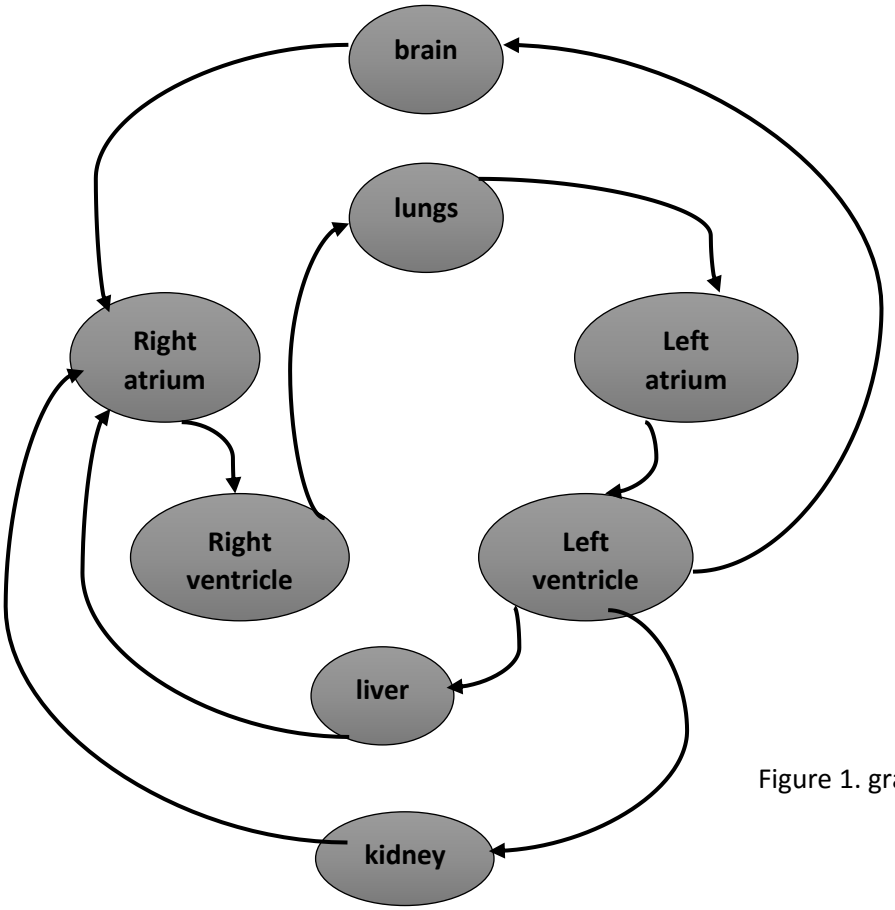


Figure 1. graph representation

Adjacency list representation of blood circulatory system.

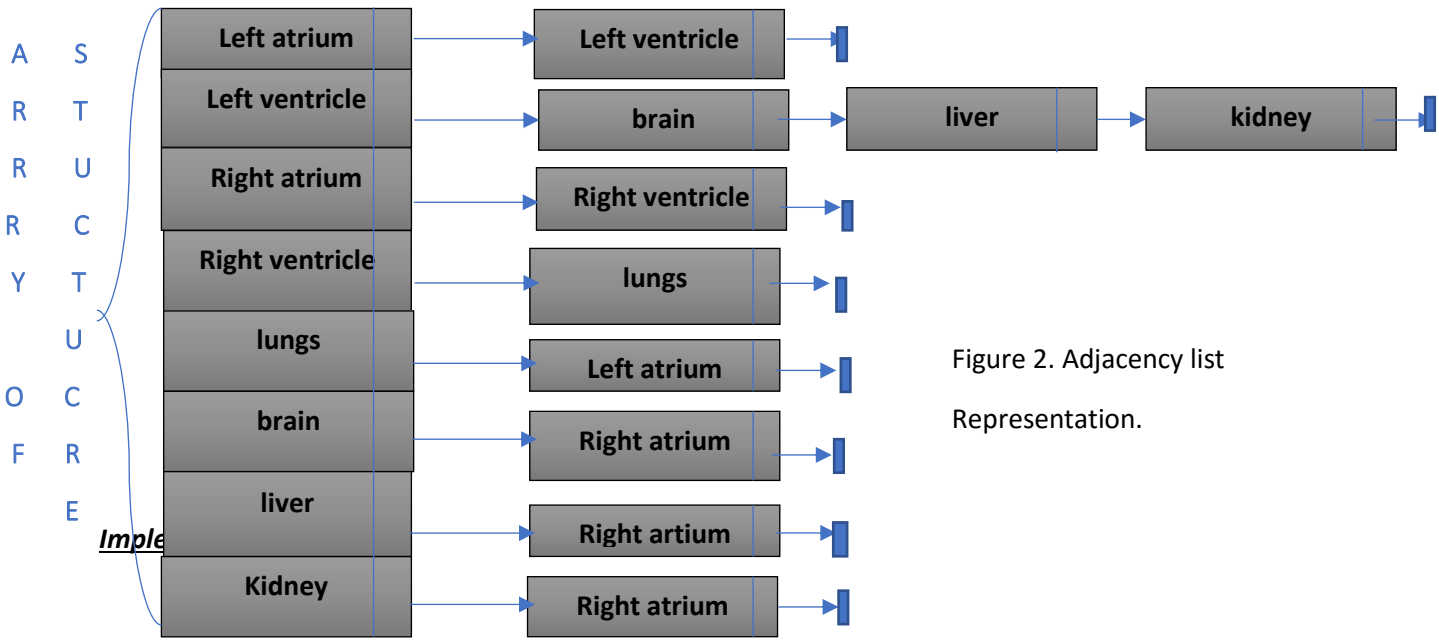
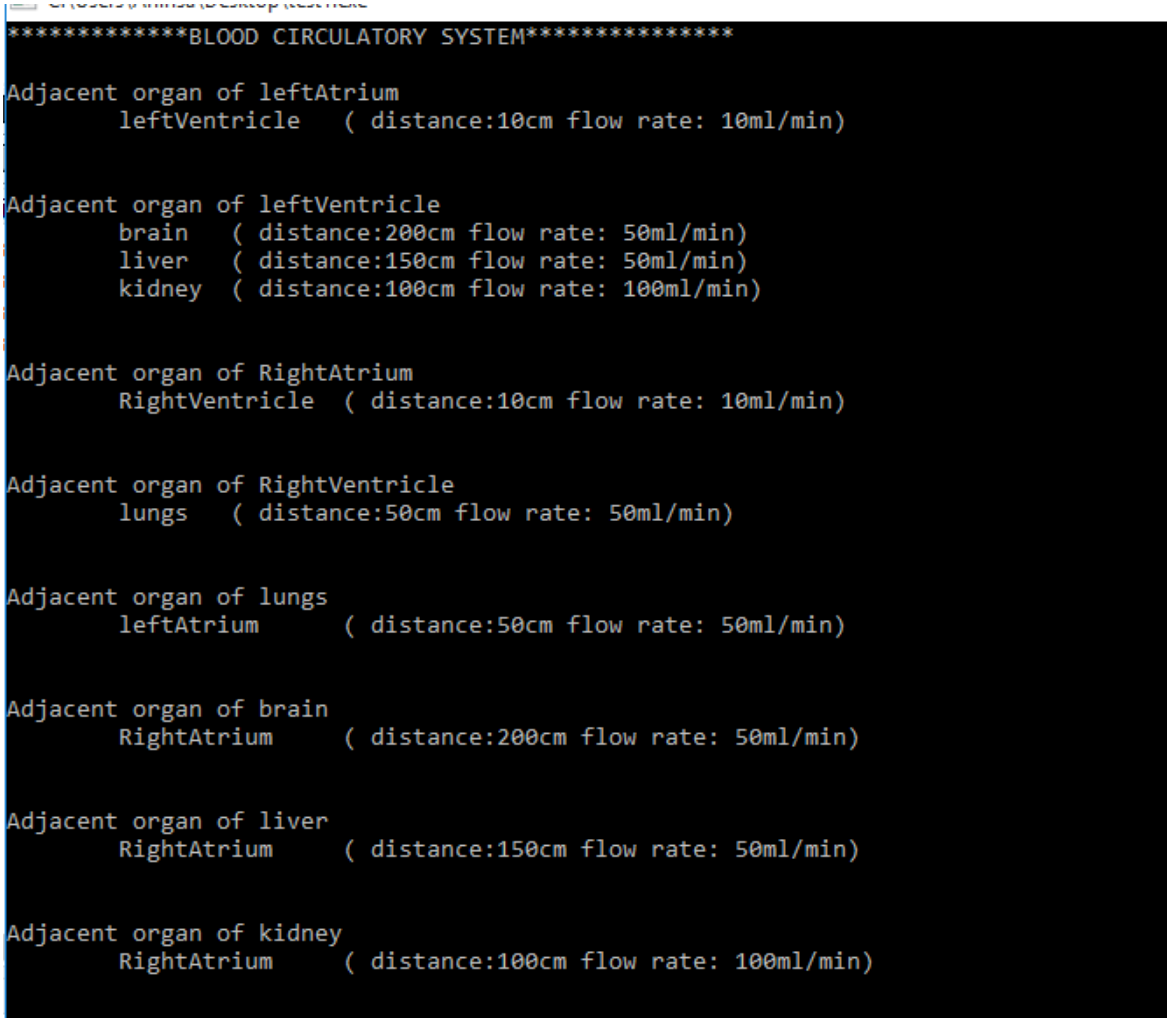


Figure 2. Adjacency list Representation.

Imple

- Array of Structure have been made for store the orans details (Figure 2). It will store organ name, distance, flowrate, visited and next. This will be done by “addorgan” function.
- New nodes have been created for adjacent and it will be pointed to relevant array of Structure element. Next pointer points to adjacent nodes. This will be done by “addedgeVessels” function.
- We can show what are the adjacent organs and the details using graph. It will be done by “printBloodSystem” function.



each cell (red cells, white cells, platelets) built using structure of Array. Each cell keeps details about organ names, cell counts of organs and visited time.

Assumption:

- assume that red cells in body = 100,000
- assume that white cells in body = 5000
- assume that platelets in body = 25000
- assume that life time of red cells =120 days
- assume that life time of white cells = 20 days
- assume that life time of platelets = 5 days
- after the life time finish, all the cells are died and new cells are born. In the interval there is no cells born or die.
- Each cell starts traverse though the body from left atrium.

TraverseBody function:

Cells use this function to traverse through the body. Each cell has own function(redcellTraverse, whitecellTraverse, plateletTraverse functions).Each function call to TraverseBody function. Time of particular cell is passed. This function is going to measure a no of times particular cell traverse through the organs in one day (1 day has 1140 min).

Left ventricle connect with brain, liver and kidney. If we traverse from left ventricle to brain, we have to traverse from brain to right atrium. So, there is no path to go back and traverse the liver or kidney. Cells traverse one time and after coming left ventricle then cells can traverse through liver or kidney. But not both. So,

Assumption:

- Cells traverse through only one organ (brain or liver or kidney) from left ventricle at one time. This will decide by human body. Program use random function to generate random numbers 1,2 and 3. If it generates 1 that's mean cells traverse through the brain. As well as 2 for liver and 3 for kidney. Generated random numbers we store in an array. When 1^{st} time cells traverse through the body it will take 1^{st} number (0^{th} element) in the array. As well as this will continue until finish the traverse.

```
for(int i = 0; i<250; i++) {      // generate random numbers and store it in array.
    RandIndex[i]=rand()%3+1;
 }
```

When cells traverse from one organ to another, time should be decreased. When time become 0 that's mean it will finish its traverse. To measure time between two organs, use,

- Time= distance(cm)/speed ($cmmin^{-1}$)
- Speed= flowrate($mlmin^{-1}$)/area(cm^2) note: $1ml = 1cm^3$
- Assume that area of vessels is equal to 1 cm^2.

After going through the body at one time, visited time will increase according to particular organ.

This function will return how many times particular cell traverse through the body in one day. Using this we can calculate no of time cells traverse in their life time (or user's given time).

- no of times traverse in their life time (or user's given time) = no of time per one day * lifetime (or user's given time).

Using this we can calculate the probability of particular cells travers through each organ in their life time (or user's given time).

Ex: no of times red cells traverse through body = 14400

No of times red cells traverse through brain= 5400

Probability of red cells traverse through brain= 5400/14400 (37.5%)

According to probability we can calculate how many cells traverse through particular organs.

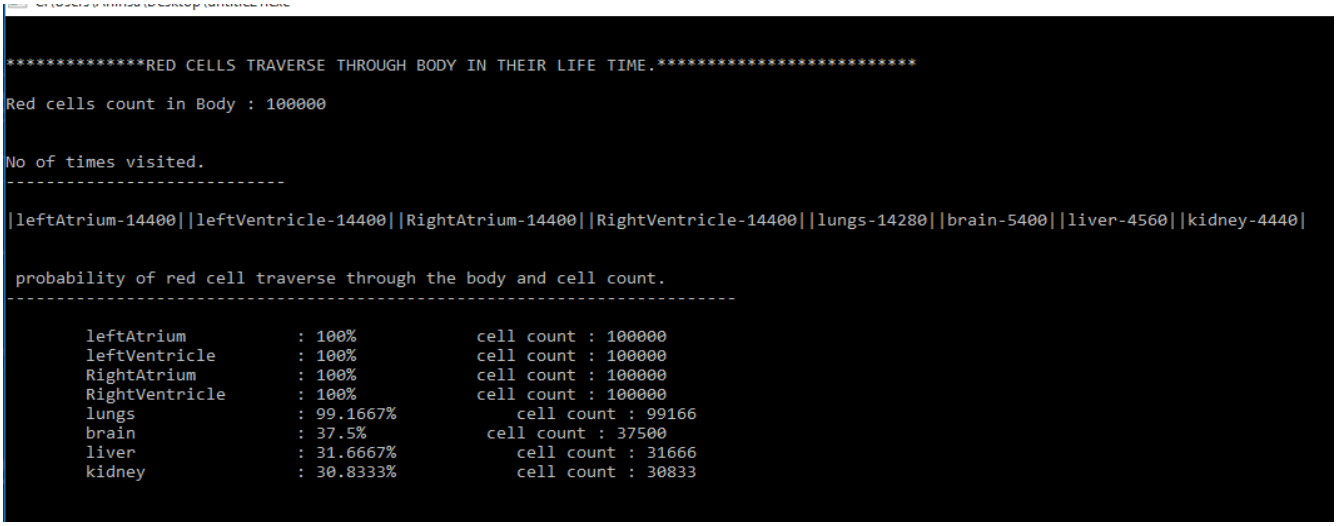
Ex: Probability of red cells traverse through brain = 37.5%

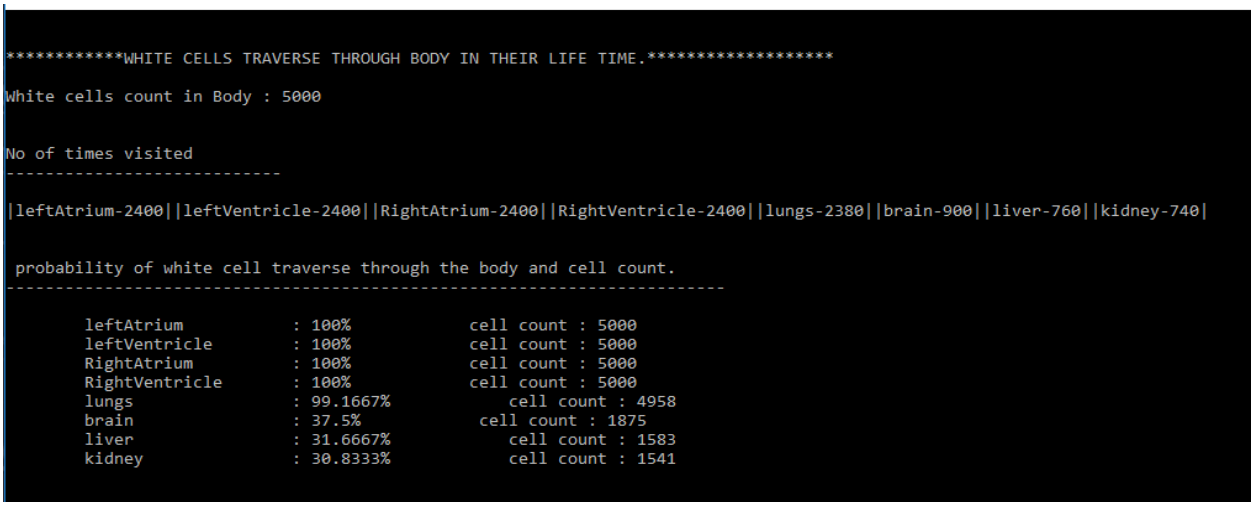
Red cells in body = 100000

No of red cells traverse through the brain (cell count) = 100000*0.375 = 37500

Program should automatically show the details of cells (red cells, white cells, palates) according to their life time. If user want to get details about particular cell for given time, they can choose the cell type and get those details. But user's given time must be below to cell's life time.

<u>Show details of cells according to life time.</u>





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--------------------------------------------------------------------------------

1. red cell traverse through body....
2. white cell traverse through body....
3. platelets traverse through body....
4. Exit

Enter your choice: 1
enter how many days to traverse the red cells(below 120) (days):90
Red cells count in Body : 100000


No of times visited.
---------------------------

|leftAtrium-11070||leftVentricle-11070||RightAtrium-11070||RightVentricle-10980||lungs-10980||brain-3510||liver-3870||kidney-3690|


 probability of red cell traverse through the body and cell count.
------------------------------------------------------------------------

       leftAtrium           : 100%            cell count : 100000
       leftVentricle        : 100%            cell count : 100000
       RightAtrium          : 100%            cell count : 100000
       RightVentricle       : 99.187%            cell count : 99187
       lungs                : 99.187%            cell count : 99187
       brain                : 31.7073%            cell count : 31707
       liver                : 34.9594%            cell count : 34959
       kidney               : 33.3333%            cell count : 33333


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**********PLATELETS TRAVERSE THROUGH BODY IN THEIR LIFE TIME.*************************

platlets count in Body : 25000


No of times visited
---------------------------

|leftAtrium-600| |leftVentricle-600| |RightAtrium-600| |RightVentricle-600| |lungs-595| |brain-225| |liver-190| |kidney-185|


 probability of platlets cell traverse through the body and cell count.
--------------------------------------------------------------------------------

       leftAtrium           : 100%            cell count : 25000
       leftVentricle        : 100%            cell count : 25000
       RightAtrium          : 100%            cell count : 25000
       RightVentricle       : 100%            cell count : 25000
       lungs                : 99.1667%            cell count : 24791
       brain                : 37.5%            cell count : 9375
       liver                : 31.6667%            cell count : 7916
       kidney               : 30.8333%            cell count : 7708

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<u>Show details of cells according to user's given time.</u>

- Red cells.

- white cells.

```
1. red cell traverse through body....
2. white cell traverse through body....
3. platelets traverse through body....
4. Exit

Enter your choice: 3
enter time to traverse the platelets(below 5) (days): 3
platlets count in Body : 25000


No of times visited
---------------------------

|leftAtrium-381| |leftVentricle-381| |RightAtrium-378| |RightVentricle-378| |lungs-378| |brain-126| |liver-102| |kidney-153|


 probability of platlets cell traverse through the body and cell count.
--------------------------------------------------------------------------------

       leftAtrium          : 100%           cell count : 25000
       leftVentricle       : 100%           cell count : 25000
       RightAtrium         : 99.2126%           cell count : 24803
       RightVentricle      : 99.2126%           cell count : 24803
       lungs               : 99.2126%           cell count : 24803
       brain               : 33.0709%           cell count : 8267
       liver               : 26.7717%           cell count : 6692
       kidney              : 40.1575%           cell count : 10039

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```

- Platelets.

- If user's entered time is excessive than life time it will show a message.

```
1. red cell traverse through body....
2. white cell traverse through body....
3. platelets traverse through body....
4. Exit

Enter your choice: 1
enter how many days to traverse the red cells(below 120) (days):125
enter below 120 days. life Time of red cell : 120 days
--------------------------------------------------------------------------------

1. red cell traverse through body....
2. white cell traverse through body....
3. platelets traverse through body....
4. Exit

Enter your choice: 2
enter how many days to traverse the white cells(bellow 20) (days): 30
enter below 20 days. life Time of white cell : 20 days
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1. red cell traverse through body....
2. white cell traverse through body....
3. platelets traverse through body....
4. Exit

Enter your choice: 3
enter time to traverse the platelets(below 5) (days): 10
enter below 5 days. life Time of platelets : 5 days
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- Enter 4 to exit the program.