

%% Q.1: Among the paths starting from each graph-node, how many can end in multiple FPs? Which graph-nodes appear most frequently among all paths?

% Function to find number of distinct FPs in which paths starting from each node end and their abundances

% and which network-states (besides FPs) appear the most across all complete (ending in an FP) paths

```
function distinctFPsDictionary = howManyFPs(paths)
```

```
nodes = 1:64; % Initialize paths' first nodes array
```

```
numberOfFPs = zeros(1, 64); % Initialize first node-corresponding distinct FPs
```

```
for inPaths = nodes % Iterate through each first node
```

```
    if inPaths ~= 1 % For all first nodes except node 1
```

```
        forNode = inPaths - 1; % Term in product to reach current node's paths in paths cell
```

```
        pathCell20 = paths{1, (forNode*64) + 20}; % Extract current node's paths which end in FP node 20
```

```
        pathCell45 = paths{1, (forNode*64) + 45}; % Extract current node's paths which end in FP node 45
```

```
        pathCell54 = paths{1, (forNode*64) + 54}; % Extract current node's paths which end in FP node 54
```

```
    else % For first node = node 1
```

```
        pathCell20 = paths{1, 20}; % Extract paths which end in FP node 20
```

```
        pathCell45 = paths{1, 45}; % Extract paths which end in FP node 45
```

```
        pathCell54 = paths{1, 54}; % Extract paths which end in FP node 54
```

```
    end
```

```
    if ~isempty(pathCell20) % For paths between current first node and node 20 existing
```

```
        numberOfFPs(inPaths) = numberOfFPs(inPaths) + 1; % Update number of distinct FPs corresponding to current first node
```

```
    end
```

```
    if ~isempty(pathCell45) % For paths between current first node and node 45 existing
```

```
        numberOfFPs(inPaths) = numberOfFPs(inPaths) + 1; % Update number of distinct FPs corresponding to current first node
```

```

end

if ~isempty(pathCell54) % For paths between current first node and node 54
existing

    numberOfFPs(inPaths) = numberOfFPs(inPaths) + 1; % Update number of
distinct FPs corresponding to current first node

end

end

% Create and display dictionary mapping number of distinct FPs that appear at
the end of paths from each first node
distinctFPsDictionary = dictionary(nodes, numberOfFPs); % Create dictionary

disp("Number of distinct FPs paths starting from node, end in:")

disp(distinctFPsDictionary); % Display dictionary

%

% Find abundances of FPs' appearance across all graph paths
numOfNodesW1FP = sum(numberOfFPs == 1); % Abundance of first nodes which end in
only 1 FP

numOfNodesW2FPs = sum(numberOfFPs == 2); % Abundance of first nodes which end in
2 FPs

numOfNodesW3FPs = sum(numberOfFPs == 3); % Abundance of first nodes which end in
all 3 FPs

disp(['Number of nodes ending in 1 FP is ', num2str(numOfNodesW1FP), ', ', ...
' those ending in 2 FPs are ', num2str(numOfNodesW2FPs), ', and those ending
in all FPs are ', ...
num2str(numOfNodesW3FPs), '.']); % Display abundances

end

% Invoke function to get number of distinct FPs and their respective abundances
distinctFPsDictionary = howManyFPs(allPaths);

```

Output:

Number of distinct FPs paths starting from node, end in:

```

1  3
2  2
3  3
4  1

```

5 2

6 1

7 3

8 2

9 3

10 3

11 3

12 3

13 2

14 2

15 3

16 3

17 3

18 2

19 1

20 1

21 2

22 1

23 3

24 2

25 3

26 3

27 1

28 1

29 2

30 2

31 3

32 3

33 3

34 2

35 3

36 1

37 2
38 1
39 3
40 2
41 3
42 3
43 3
44 3
45 1
46 2
47 1
48 3
49 3
50 2
51 1
52 1
53 2
54 1
55 3
56 2
57 3
58 3
59 1
60 1
61 1
62 2
63 3
64 3

Number of nodes ending in 1 FP is 17, those ending in 2 FPs are 18, and those ending in all FPs are 29.