INSTITUTO TECNOLÓGICO Y DE ESTUDIOS SUPERIORES DE OCCIDENTE
Departamento de Electrónica, Sistemas e Informática.

ITESO

Universidad Jesuita
de Guadalajara

Creación de una base de datos basada en grafos

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Motivación:

Me motive hacer la base de datos enfocada al mundo de Mario debido a que a lo largo de mi vida siempre he tenido un acercamiento con los videojuegos, sin embargo, la mayoría de los juegos que más disfruto no cuentan con muchos personajes principales los cuales pueda usar de referencia, por lo que decidí realizar el trabajo sobre el universo preferido de nintendo, además de que crecí con varios de los juegos desarrollados en este mundo ficticio, se me hizo un tópico fácil de implementar para la funcionalidad que estamos buscando.

Creación del grafo:

```
Create
(h0:hero{name:'Mario'}),
(h1:hero{name:'Luigi'}),
(h2:hero{name:'Princesa Peach'}),
(h3:hero{name:'Toad'}),
(h4:hero{name:'Yoshi'}),
(h5:hero{name:'Princesa Daysi'}),
(v0:villain{name:'Bowser'}),
(v1:villain{name:'Donkey Kong'}),
(v2:villain{name:'Koopaline'}),
(v3:villain{name:'Goomba'}),
(v4:villain{name:'Bowser Jr.'}),
(v5:villain{name:'Kamek'}),
(g0:game{name:'Donkey Kong', designer:'Shigeru Miyamoto'}),
(g1:game{name:'Mario Bros', designer:'Shigeru Miyamoto'}),
(g2:game{name:'Super Mario Galaxy', designer:'Shigeru Miyamoto'}),
(g3:game{name:'Super Mario Sunshine', designer:'Shigeru Miyamoto'}),
(g4:game{name:'Super Mario World', designer:'Shigeru Miyamoto'}),
(g5:game{name:'New Super Mario Bros Wii', designer:'Michiho Hayashi'}),
(g6:game{name:'Super Smash Bros Ultimate', designer:'Masahiro Sakurai'}),
(g7:game{name:'Mario Kart', designer:'Shigeru Miyamoto'}),
(h0)-[:FRIEND_OF {weight:10}]->(h1),
(h0)-[:FRIEND_OF {weight:10}]->(h2),
(h0)-[:FRIEND_OF {weight:7}]->(h3),
(h0)-[:FRIEND_OF {weight:8}]->(h4),
(h0)-[:FRIEND_OF {weight:7}]->(h5),
(h1)-[:FRIEND_OF {weight:10}]->(h0),
(h1)-[:FRIEND_OF {weight:8}]->(h2),
(h1)-[:FRIEND_OF {weight:7}]->(h3),
(h1)-[:FRIEND_OF {weight:8}]->(h4),
(h1)-[:FRIEND_OF {weight:10}]->(h5),
(h2)-[:FRIEND_OF {weight:10}]->(h0),
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```
(h2)-[:FRIEND_OF {weight:8}]->(h1),
(h2)-[:FRIEND_OF {weight:8}]->(h3),
(h2)-[:FRIEND_OF {weight:10}]->(h5),
(h3)-[:FRIEND_OF {weight:8}]->(h0),
(h3)-[:FRIEND_OF {weight:8}]->(h1),
(h3)-[:FRIEND_OF {weight:10}]->(h2),
(h3)-[:FRIEND_OF {weight:7}]->(h4),
(h3)-[:FRIEND_OF {weight:8}]->(h5),
(h4)-[:FRIEND_OF {weight:10}]->(h0),
(h4)-[:FRIEND_OF {weight:10}]->(h1),
(h4)-[:FRIEND_OF {weight:8}]->(h3),
(h5)-[:FRIEND_OF {weight:8}]->(h0),
(h5)-[:FRIEND_OF {weight:10}]->(h1),
(h5)-[:FRIEND_OF {weight:10}]->(h2),
(h5)-[:FRIEND_OF {weight:8}]->(h3),
(v0)-[:ALLY_OF {weight:7}]->(v2),
(v0)-[:ALLY_OF {weight:7}]->(v3),
(v0)-[:ALLY_OF {weight:10}]->(v4),
(v0)-[:ALLY_OF {weight:8}]->(v5),
(v2)-[:ALLY_OF {weight:10}]->(v0),
(v2)-[:ALLY_OF {weight:8}]->(v3),
(v2)-[:ALLY_OF {weight:10}]->(v4),
(v3)-[:ALLY_OF {weight:10}]->(v0),
(v3)-[:ALLY_OF {weight:8}]->(v2),
(v3)-[:ALLY_OF {weight:10}]->(v4),
(v4)-[:ALLY_OF {weight:10}]->(v0),
(v4)-[:ALLY_OF {weight:8}]->(v2),
(v4)-[:ALLY_OF {weight:8}]->(v3),
(v4)-[:ALLY_OF {weight:8}]->(v5),
(v5)-[:ALLY_OF {weight:10}]->(v0),
(v5)-[:ALLY_OF {weight:10}]->(v4),
(v0)-[:ENEMY_OF {weight:10}]->(h0),
(v0)-[:ENEMY_OF {weight:10}]->(h1),
(v0)-[:ENEMY_OF {weight:10}]->(h2),
(v0)-[:ENEMY_OF {weight:10}]->(h3),
(v0)-[:ENEMY_OF {weight:10}]->(h4),
(v0)-[:ENEMY_OF {weight:6}]->(h5),
(v1)-[:ENEMY_OF {weight:6}]->(h0),
(v1)-[:ENEMY_OF {weight:6}]->(h1),
(v1)-[:ENEMY_OF {weight:4}]->(h5),
(v2)-[:ENEMY_OF {weight:2}]->(h0),
(v2)-[:ENEMY_OF {weight:2}]->(h1),
(v2)-[:ENEMY_OF {weight:6}]->(h3),
(v2)-[:ENEMY_OF {weight:6}]->(h4),
(v3)-[:ENEMY_OF {weight:2}]->(h0),
(v3)-[:ENEMY_OF {weight:2}]->(h1),
(v3)-[:ENEMY_OF {weight:6}]->(h3),
(v3)-[:ENEMY_OF {weight:6}]->(h4),
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```
(v4)-[:ENEMY_OF {weight:8}]->(h0),
(v4)-[:ENEMY_OF {weight:8}]->(h1),
(v4)-[:ENEMY_OF {weight:8}]->(h2),
(v4)-[:ENEMY_OF {weight:4}]->(h3),
(v4)-[:ENEMY_OF {weight:6}]->(h5),
(v5)-[:ENEMY_OF {weight:8}]->(h0),
(v5)-[:ENEMY_OF {weight:8}]->(h1),
(v5)-[:ENEMY_OF {weight:7}]->(h4),
(h0)-[:APPEARS_IN {role:'hero'}]->(g0),
(h0)-[:APPEARS_IN {role:'hero'}]->(g1),
(h0)-[:APPEARS_IN {role:'hero'}]->(g2),
(h0)-[:APPEARS_IN {role:'hero'}]->(g3),
(h0)-[:APPEARS_IN {role:'hero'}]->(g4),
(h0)-[:APPEARS_IN {role:'hero'}]->(g5),
(h0)-[:APPEARS_IN {role:'hero'}]->(g6),
(h0)-[:APPEARS_IN {role:'notApply'}]->(g7),
(h1)-[:APPEARS_IN {role:'hero'}]->(g1),
(h1)-[:APPEARS_IN {role:'hero'}]->(g2),
(h1)-[:APPEARS_IN {role:'hero'}]->(g4),
(h1)-[:APPEARS_IN {role:'hero'}]->(g5),
(h1)-[:APPEARS_IN {role:'hero'}]->(g6),
(h1)-[:APPEARS_IN {role:'notApply'}]->(g7),
(h2)-[:APPEARS_IN {role:'victim'}]->(g2),
(h2)-[:APPEARS_IN {role:'victim'}]->(g4),
(h2)-[:APPEARS_IN {role:'victim'}]->(g5),
(h2)-[:APPEARS_IN {role:'hero'}]->(g6),
(h2)-[:APPEARS_IN {role:'notApply'}]->(g7),
(h3)-[:APPEARS_IN {role:'assistant'}]->(g2),
(h3)-[:APPEARS_IN {role:'assistant'}]->(g3),
(h3)-[:APPEARS_IN {role:'hero'}]->(g5),
(h3)-[:APPEARS_IN {role:'assistant'}]->(g6),
(h3)-[:APPEARS_IN {role:'notApply'}]->(g7),
(h4)-[:APPEARS_IN {role:'assistant'}]->(g3),
(h4)-[:APPEARS_IN {role:'assistant'}]->(g4),
(h4)-[:APPEARS_IN {role:'assistant'}]->(g5),
(h4)-[:APPEARS_IN {role:'hero'}]->(g6),
(h4)-[:APPEARS_IN {role:'notApply'}]->(g7),
(h5)-[:APPEARS_IN {role:'hero'}]->(g6),
(h5)-[:APPEARS_IN {role:'notApply'}]->(g7),
(v0)-[:APPEARS_IN {role:'Villain'}]->(g2),
(v0)-[:APPEARS_IN {role:'Villain'}]->(g3),
(v0)-[:APPEARS_IN {role:'Villain'}]->(g4),
(v0)-[:APPEARS_IN {role:'Villain'}]->(g5),
(v0)-[:APPEARS_IN {role:'Villain'}]->(g6),
(v0)-[:APPEARS_IN {role:'notApply'}]->(g7),
(v1)-[:APPEARS_IN {role:'Villain'}]->(g0),
(v1)-[:APPEARS_IN {role:'hero'}]->(g6),
(v1)-[:APPEARS_IN {role:'notApply'}]->(g7),
```

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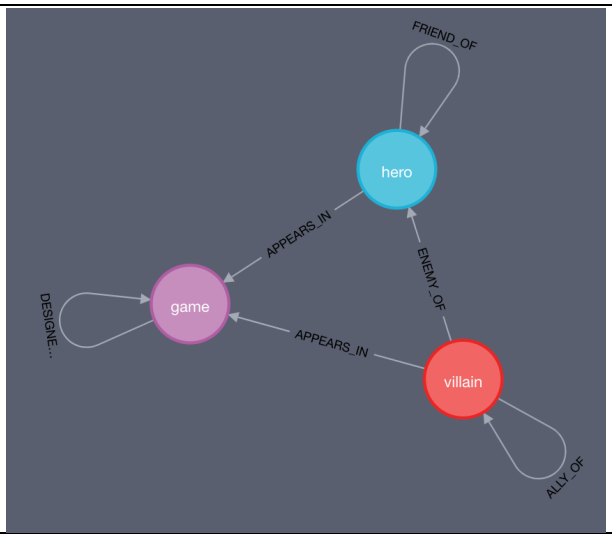
(v2)-[:APPEARS_IN {role:'Villain'}]->(g4),
(v2)-[:APPEARS_IN {role:'Villain'}]->(g5),
(v2)-[:APPEARS_IN {role:'notApply'}]->(g7),
(v3)-[:APPEARS_IN {role:'Villain'}]->(g2),
(v3)-[:APPEARS_IN {role:'Villain'}]->(g4),
(v3)-[:APPEARS_IN {role:'Villain'}]->(g5),
(v4)-[:APPEARS_IN {role:'Villain'}]->(g2),
(v4)-[:APPEARS_IN {role:'Villain'}]->(g3),
(v4)-[:APPEARS_IN {role:'Villain'}]->(g5),
(v4)-[:APPEARS_IN {role:'Villain'}]->(g6),
(v4)-[:APPEARS_IN {role:'notApply'}]->(g7),
(v5)-[:APPEARS_IN {role:'Villain'}]->(g4),
(v5)-[:APPEARS_IN {role:'Villain'}]->(g5),
(v5)-[:APPEARS_IN {role:'notApply'}]->(g7),
(g0)-[:DESIGNED_BY_DESIGNER_OF {year:1981}]->(g1),
(g0)-[:DESIGNED_BY_DESIGNER_OF {year:1981}]->(g2),
(g0)-[:DESIGNED_BY_DESIGNER_OF {year:1981}]->(g3),
(g0)-[:DESIGNED_BY_DESIGNER_OF {year:1981}]->(g4),
(g0)-[:DESIGNED_BY_DESIGNER_OF {year:1981}]->(g7),
(g1)-[:DESIGNED_BY_DESIGNER_OF {year:1983}]->(g0),
(g1)-[:DESIGNED_BY_DESIGNER_OF {year:1983}]->(g2),
(g1)-[:DESIGNED_BY_DESIGNER_OF {year:1983}]->(g3),
(g1)-[:DESIGNED_BY_DESIGNER_OF {year:1983}]->(g4),
(g1)-[:DESIGNED_BY_DESIGNER_OF {year:1983}]->(g7),
(g2)-[:DESIGNED_BY_DESIGNER_OF {year:2007}]->(g0),
(g2)-[:DESIGNED_BY_DESIGNER_OF {year:2007}]->(g1),
(g2)-[:DESIGNED_BY_DESIGNER_OF {year:2007}]->(g3),
(g2)-[:DESIGNED_BY_DESIGNER_OF {year:2007}]->(g4),
(g2)-[:DESIGNED_BY_DESIGNER_OF {year:2007}]->(g7),
(g3)-[:DESIGNED_BY_DESIGNER_OF {year:2002}]->(g0),
(g3)-[:DESIGNED_BY_DESIGNER_OF {year:2002}]->(g1),
(g3)-[:DESIGNED_BY_DESIGNER_OF {year:2002}]->(g2),
(g3)-[:DESIGNED_BY_DESIGNER_OF {year:2002}]->(g4),
(g3)-[:DESIGNED_BY_DESIGNER_OF {year:2002}]->(g7),
(g4)-[:DESIGNED_BY_DESIGNER_OF {year:1985}]->(g0),
(g4)-[:DESIGNED_BY_DESIGNER_OF {year:1985}]->(g1),
(g4)-[:DESIGNED_BY_DESIGNER_OF {year:1985}]->(g2),
(g4)-[:DESIGNED_BY_DESIGNER_OF {year:1985}]->(g3),
(g4)-[:DESIGNED_BY_DESIGNER_OF {year:1985}]->(g7),
(g7)-[:DESIGNED_BY_DESIGNER_OF {year:1992}]->(g0),
(g7)-[:DESIGNED_BY_DESIGNER_OF {year:1992}]->(g1),
(g7)-[:DESIGNED_BY_DESIGNER_OF {year:1992}]->(g2),
(g7)-[:DESIGNED_BY_DESIGNER_OF {year:1992}]->(g3),
(g7)-[:DESIGNED_BY_DESIGNER_OF {year:1992}]->(g4)
```

Consultas:

1. Esquema de la base de datos.

Código Cypher	Resultado
call db.schema.visualization	

Existen 3 tipos de nodo:

- Hero
- Villain
- Game

Existen 6 nodos de tipo Hero, su único atributo es name

Existen 6 nodos de tipo Villain, su único atributo es name

Existen 8 nodos de tipo Game, sus atributos son name y designer

Existen 26 relaciones tipo FRIEND_OF, su único atributo es weight

Existen 25 relaciones tipo ENEMY_OF, su único atributo es weight

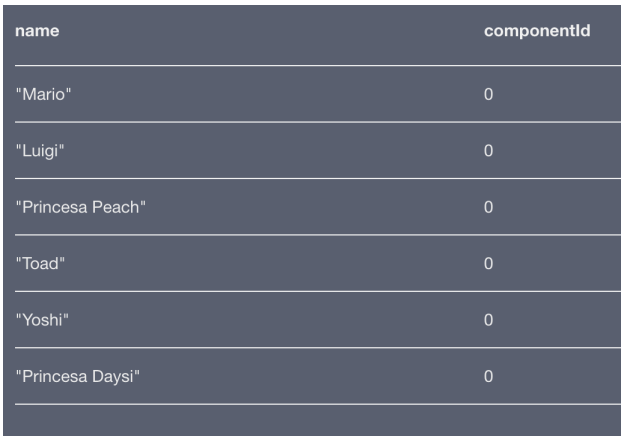
Existen 16 relaciones tipo ALLY_OF, su único atributo es weight

Existen 54 relaciones tipo APPEARS_IN, su único atributo es role

Existen 30 relaciones tipo DESIGNED_BY_DESIGNER_OF, su único atributo es year

2. Nodos aislados del grafo(Weakly Connected Components)

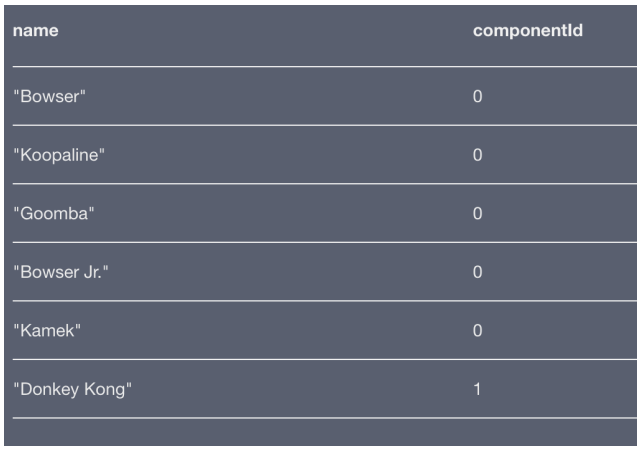
- Héroes:

Código Cypher	Resultado
CALL gds.graph.create("MyGraphWCC", "hero", "FRIEND_OF", {relationshipProperties:'weight' }) CALL gds.wcc.stream('MyGraphWCC') YIELD nodeId, componentId RETURN gds.util.asNode(nodeId).name AS name, componentId ORDER BY componentId	

name	componentId
"Mario"	0
"Luigi"	0
"Princesa Peach"	0
"Toad"	0
"Yoshi"	0
"Princesa Daysi"	0

Se muestra que ningún nodo tipo “hero” esta aislado.

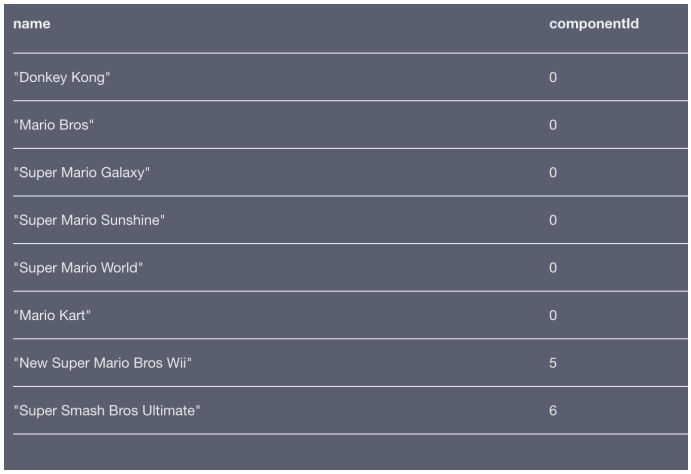
- Villanos:

Código Cypher	Resultado
CALL gds.graph.create("MyGraphWCC", "villain", "ALLY_OF", {relationshipProperties:'weight'}) CALL gds.wcc.stream('MyGraphWCC') YIELD nodeId, componentId RETURN gds.util.asNode(nodeId).name AS name, componentId ORDER BY componentId	

name	componentId
"Bowser"	0
"Koopaline"	0
"Goomba"	0
"Bowser Jr."	0
"Kamek"	0
"Donkey Kong"	1

Se muestra que el nodo tipo “villain” con el parametro “name” equivalente a “Donkey Kong” es considerado un nodo aislado según la relación “ALLY_OF”.

- Juegos:

Código Cypher	Resultado
CALL gds.graph.create("MyGraphWCC", "game", "DESIGNED_BY_DESIGNER_OF", {relationshipProperties:'year'}) CALL gds.wcc.stream('MyGraphWCC') YIELD nodeId, componentId RETURN gds.util.asNode(nodeId).name AS name, componentId ORDER BY componentId	

name	componentId
"Donkey Kong"	0
"Mario Bros"	0
"Super Mario Galaxy"	0
"Super Mario Sunshine"	0
"Super Mario World"	0
"Mario Kart"	0
"New Super Mario Bros Wii"	5
"Super Smash Bros Ultimate"	6

Se puede observar como los juegos “New Super Mario Broos Wii” y “Super Smash Bros Ultimate” son juegos que se consideran aislados según la relación “DESIGNED_BY_DESIGNER_OF”.

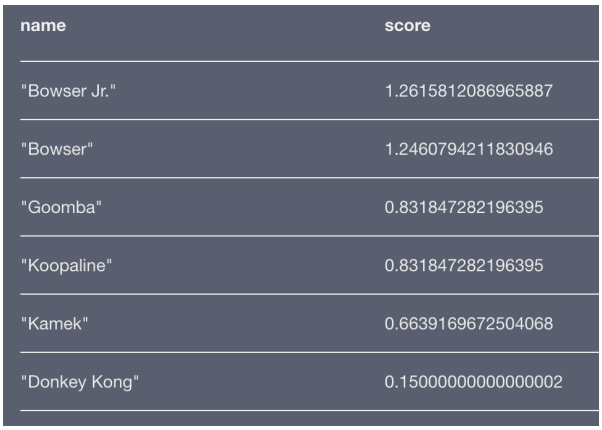
3. Nodos con mayor importancia(Page Rank)

- Héroes:

Código Cypher	Resultado
CALL gds.graph.create("MyGraphPageRank", "hero", "FRIEND_OF", {relationshipProperties:'weight'}) CALL gds.pageRank.stream('MyGraphPageRank', {maxIterations: 20, dampingFactor: 0.85, relationshipWeightProperty: 'weight' }) YIELD nodeId, score RETURN gds.util.asNode(nodeId).name AS name, score ORDER BY score DESC, name ASC	 name / score "Luigi" 1.1365659488830715 "Mario" 1.1341693137772382 "Toad" 0.9801096827024597 "Princesa Peach" 0.9754721229895951 "Princesa Daysi" 0.9234867435880009 "Yoshi" 0.6525225535035132

En la tabla anterior se muestra en orden descendente los nodos de tipo “hero” según su importancia en la relación “FRIEND_OF”.

- Villanos:

Código Cypher	Resultado
CALL gds.graph.create("MyGraphPageRank", "villain", "ALLY_OF", {relationshipProperties:'weight'}) CALL gds.pageRank.stream('MyGraphPageRank', {maxIterations: 20, dampingFactor: 0.85, relationshipWeightProperty: 'weight' }) YIELD nodeId, score RETURN gds.util.asNode(nodeId).name AS name, score ORDER BY score DESC, name ASC	 name / score "Bowser Jr." 1.2615812086965887 "Bowser" 1.2460794211830946 "Goomba" 0.831847282196395 "Koopaline" 0.831847282196395 "Kamek" 0.6639169672504068 "Donkey Kong" 0.15000000000000002

En la consulta anterior se muestra en orden descendente los nodos de tipo “villain” según su importancia en la relación “ALLY_OF”.

- Juegos:

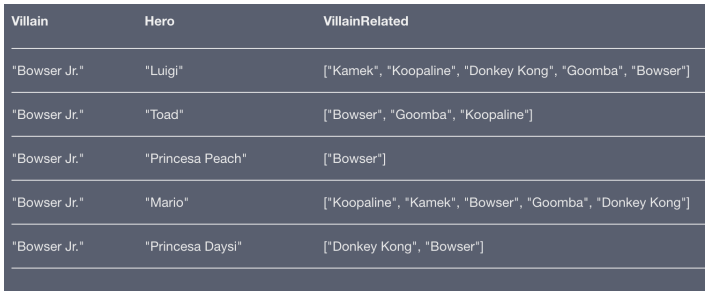
Código Cypher	Resultado
CALL gds.graph.create("MyGraphPageRank", "game", "DESIGNED_BY_DESIGNER_OF", {relationshipProperties:'year'}) CALL gds.pageRank.stream('MyGraphPageRank', {maxIterations: 20, dampingFactor: 0.85}) YIELD nodeId, score RETURN gds.util.asNode(nodeId).name AS name, score ORDER BY score DESC, name ASC	

name	score
"Donkey Kong"	0.9670542652718723
"Mario Bros"	0.9670542652718723
"Mario Kart"	0.9670542652718723
"Super Mario Galaxy"	0.9670542652718723
"Super Mario Sunshine"	0.9670542652718723
"Super Mario World"	0.9670542652718723
"New Super Mario Bros Wii"	0.15000000000000002
"Super Smash Bros Ultimate"	0.15000000000000002

En esta tabla se puede apreciar de man dera descendente todoos los juegos según su importancia en la relación “DESIGNED_BY_DESIGNER_OF”.

4. Recomendar más nodos en base a otro nodo

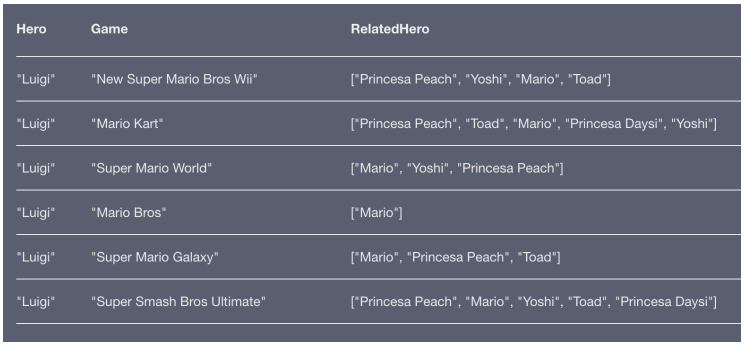
- Héroes:

Código Cypher	Resultado
MATCH (v:villain{name:'Bowser Jr.'}) -[:ENEMY_OF]->(h:hero) <-[:ENEMY_OF]-(v2:villain) WITH v, h, v2 RETURN v.name AS Villain, h.name AS Hero, collect(v2.name) AS VillainRelated	

Villain	Hero	VillainRelated
"Bowser Jr."	"Luigi"	["Kamek", "Koopaline", "Donkey Kong", "Goomba", "Bowser"]
"Bowser Jr."	"Toad"	["Bowser", "Goomba", "Koopaline"]
"Bowser Jr."	"Princesa Peach"	["Bowser"]
"Bowser Jr."	"Mario"	["Koopaline", "Kamek", "Bowser", "Goomba", "Donkey Kong"]
"Bowser Jr."	"Princesa Daysi"	["Donkey Kong", "Bowser"]

En la anterior consulta se pueden observar a los enemigos de “Bowser Jr.”, así como al resto de villanos a los que se enfrenta cada uno de ellos.

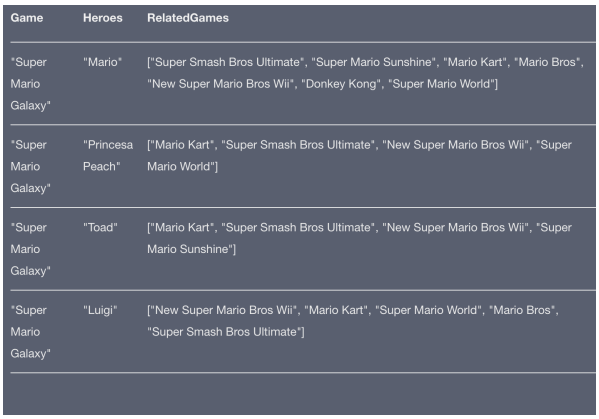
- Villanos:

Código Cypher	Resultado
MATCH (h:hero{name:'Luigi'}) -[:APPEARS_IN]->(g:game) <-[:APPEARS_IN]-(h2:hero) WITH h, g, h2 RETURN h.name AS Hero, g.name AS Game, collect(h2.name) AS RelatedHero	

Hero	Game	RelatedHero
"Luigi"	"New Super Mario Bros Wii"	["Princesa Peach", "Yoshi", "Mario", "Toad"]
"Luigi"	"Mario Kart"	["Princesa Peach", "Toad", "Mario", "Princesa Daysi", "Yoshi"]
"Luigi"	"Super Mario World"	["Mario", "Yoshi", "Princesa Peach"]
"Luigi"	"Mario Bros"	["Mario"]
"Luigi"	"Super Mario Galaxy"	["Mario", "Princesa Peach", "Toad"]
"Luigi"	"Super Smash Bros Ultimate"	["Princesa Peach", "Mario", "Yoshi", "Toad", "Princesa Daysi"]

En la anterior tabla se muestran los juegos en los que aparece “Luigi”, así como el resto de héroes que aparecen en cada uno de ellos.

- Juegos:

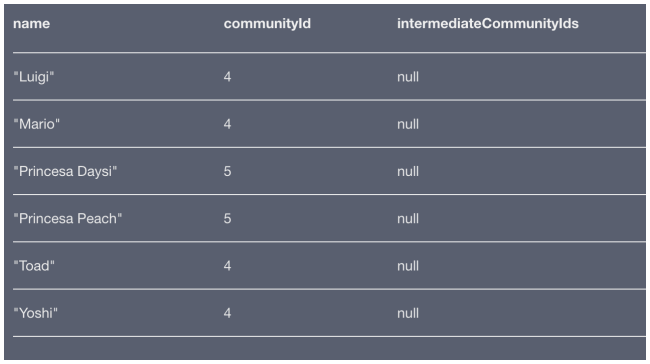
Código Cypher	Resultado
MATCH (g:game{name:'Super Mario Galaxy'})<-[:APPEARS_IN]-(h:hero)-[:APPEARS_IN]->(g2:game) RETURN g.name AS Game, h.name AS Heroes, collect(g2.name) AS RelatedGames	

Game	Heroes	RelatedGames
"Super Mario Galaxy"	"Mario"	["Super Smash Bros Ultimate", "Super Mario Sunshine", "Mario Kart", "Mario Bros", "New Super Mario Bros Wii", "Donkey Kong", "Super Mario World"]
"Super Mario Galaxy"	"Princesa Peach"	["Mario Kart", "Super Smash Bros Ultimate", "New Super Mario Bros Wii", "Super Mario World"]
"Super Mario Galaxy"	"Toad"	["Mario Kart", "Super Smash Bros Ultimate", "New Super Mario Bros Wii", "Super Mario Sunshine"]
"Super Mario Galaxy"	"Luigi"	["New Super Mario Bros Wii", "Mario Kart", "Super Mario World", "Mario Bros", "Super Smash Bros Ultimate"]

En esta consulta se pueden observar a los héroes que aparecen en “Super Mario Galaxy”, así como el resto de juegos donde hacen aparición.

5. Analizar las comunidades de cada tipo de nodo(Louvain)

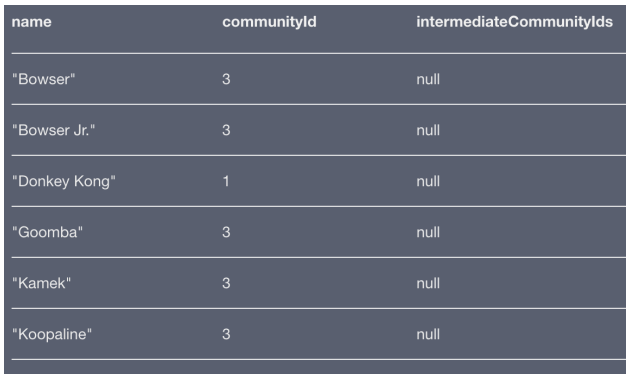
- Héroes:

Código Cypher	Resultado
CALL gds.graph.create("MyGraphLouvain", "hero", {FRIEND_OF:{orientation:'UNDIRECTED'}}, {relationshipProperties: 'weight'}) CALL gds.louvain.stream("MyGraphLouvain") YIELD nodeId, communityId, intermediateCommunityIds RETURN gds.util.asNode(nodeId).name as name, communityId, intermediateCommunityIds ORDER BY name ASC	

name	communityId	intermediateCommunityIds
"Luigi"	4	null
"Mario"	4	null
"Princesa Daysi"	5	null
"Princesa Peach"	5	null
"Toad"	4	null
"Yoshi"	4	null

En la anterior tabla se muestra la existencia de 2 comunidades en los nodos de tipo “hero”.

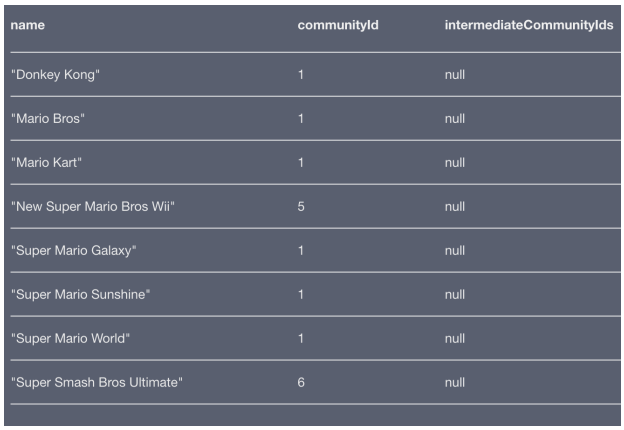
- Villanos:

Código Cypher	Resultado
CALL gds.graph.create("MyGraphLouvain", "villain", {ALLY_OF:{orientation:'UNDIRECTED'}}, {relationshipProperties: 'weight'}) CALL gds.louvain.stream("MyGraphLouvain") YIELD nodeId, communityId, intermediateCommunityIds RETURN gds.util.asNode(nodeId).name as name, communityId, intermediateCommunityIds ORDER BY name ASC	

name	communityId	intermediateCommunityIds
"Bowser"	3	null
"Bowser Jr."	3	null
"Donkey Kong"	1	null
"Goomba"	3	null
"Kamek"	3	null
"Koopaline"	3	null

En la anterior table se muestra la existencia de 2 comunidades en los nodos de tipo villain.

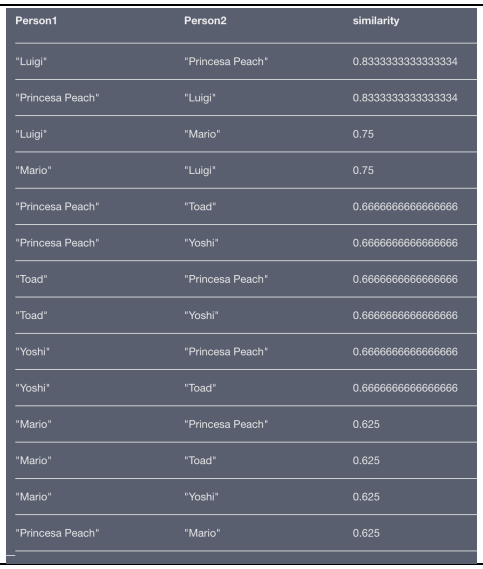
- Juegos:

Código Cypher	Resultado
CALL gds.graph.create("MyGraphLouvain", "game", {DESIGNED_BY_DESIGNER_OF: {orientation:'UNDIRECTED'}}, {relationshipProperties: 'year'}) CALL gds.louvain.stream("MyGraphLouvain") YIELD nodeId, communityId, intermediateCommunityIds RETURN gds.util.asNode(nodeId).name as name, communityId, intermediateCommunityIds ORDER BY name ASC	

name	communityId	intermediateCommunityIds
"Donkey Kong"	1	null
"Mario Bros"	1	null
"Mario Kart"	1	null
"New Super Mario Bros Wii"	5	null
"Super Mario Galaxy"	1	null
"Super Mario Sunshine"	1	null
"Super Mario World"	1	null
"Super Smash Bros Ultimate"	6	null

En la anterior consulta se muestra la existencia de 3 comunidades en los nodos de tipo “game”.

6. Analizar la similaridad (Node Similarity)

Código Cypher	Resultado
CALL gds.graph.create("MyGraphSimilarity", ['hero', 'game'], 'APPEARS_IN'); CALL gds.nodeSimilarity.stream('MyGraphSimilarity') YIELD node1, node2, similarity RETURN gds.util.asNode(node1).name AS Person1, gds.util.asNode(node2).name AS Person2, similarity ORDER BY similarity DESCENDING, Person1, Person2	

Person1	Person2	similarity
"Luigi"	"Princesa Peach"	0.8333333333333334
"Princesa Peach"	"Luigi"	0.8333333333333334
"Luigi"	"Mario"	0.75
"Mario"	"Luigi"	0.75
"Princesa Peach"	"Toad"	0.6666666666666666
"Princesa Peach"	"Yoshi"	0.6666666666666666
"Toad"	"Princesa Peach"	0.6666666666666666
"Toad"	"Yoshi"	0.6666666666666666
"Yoshi"	"Princesa Peach"	0.6666666666666666
"Yoshi"	"Toad"	0.6666666666666666
"Mario"	"Princesa Peach"	0.625
"Mario"	"Toad"	0.625
"Mario"	"Yoshi"	0.625
"Princesa Peach"	"Mario"	0.625

En la anterior tabla se muestra la similaridad que tienen los nodos de tipo “hero”, si el parametro “similarity” es 1, quiere decir que los nodos comparados son totalmente similares.

Conclusiones y recomendaciones

Esta práctica me parecio bastante útil para prácticar la creación de nodos y relaciones en el lenguaje Cypher, así cómo la comprensión y utilidad de algoritmos como Weakly Connected Components y Page Rank.

Referencias

Robinson, I., Webbe, J., & Eifrem, E.. (2015). Graph Databases. United States of America: O'Reilly.

Needham, M. & Hodler, A. (2019). Graph algorithms. United States of America: O'Reilly.

Chapter 5 Algorithms. Abril 28, 2020, de NEO4J Sitio web: https://neo4j.com/docs/graph-data-science/current/algorithms/