

Comp 543 Assignment 2

Kai-Po Lin

1.1 Connected Components

【Code】

-- 1.1 Connected Components

BEGIN

```
DECLARE @tempVisited TABLE (  
    id INT
```

```
);
```

```
INSERT INTO @tempVisited (id) (SELECT n.paperid FROM Nodes n);
```

```
DECLARE @tempVisitCnt INT = (  
    SELECT Count(*)
```

```
    FROM @tempVisited
```

```
);
```

```
WHILE (@tempVisitCnt > 0)
```

```
    BEGIN
```

```
        DECLARE @paperID INT, @connectedCnt INT=0;
```

```
        DECLARE @Visited TABLE (  
            id INT
```

```
        );
```

```
        DECLARE @NewAll TABLE (  
            id INT,
```

```
            visCnt INT
```

```
        );
```

```
        DECLARE @Temp TABLE (  
            id INT,
```

```
            visCnt INT
```

```
        );
```

```
        SET @paperID = (  
            SELECT TOP (1) v.id
```

```
            FROM @tempVisited v
```

```
        );
```

```
        INSERT INTO @Visited VALUES (@paperid);
```

```
        UPDATE @NewAll SET visCnt = 0;
```

```
        INSERT INTO @Visited (id)
```

```
        OUTPUT inserted.id INTO @Temp(id)
```

```
SELECT DISTINCT e.citedPaperID
FROM Edges e
WHERE e.paperID = @paperID AND e.citedPaperID <> @paperID
```

```
UPDATE @Temp SET visCnt = 0;
UPDATE @NewAll SET visCnt += 1;
DELETE FROM @NewAll WHERE visCnt = 2;
INSERT INTO @NewAll (id, visCnt) (SELECT * FROM @Temp);
DELETE FROM @Temp;
```

```
INSERT INTO @Visited (id)
OUTPUT inserted.id INTO @Temp (id)
SELECT DISTINCT e.PaperID
FROM Edges e JOIN @Visited v ON e.citedPaperID = v.id
WHERE e.paperID NOT IN (SELECT v1.id FROM @Visited v1)
```

```
UPDATE @Temp SET visCnt = 0;
UPDATE @NewAll SET visCnt += 1;
DELETE FROM @NewAll WHERE visCnt = 2;
INSERT INTO @NewAll (id, visCnt) (SELECT * FROM @Temp);
DELETE FROM @Temp;
```

```
DECLARE @NewCnt INT = (SELECT COUNT(*) FROM @NewAll);
WHILE (@NewCnt > 0)
    BEGIN
        INSERT INTO @Visited (id)
        OUTPUT inserted.id INTO @Temp (id)
        SELECT DISTINCT e.citedPaperID
        FROM Edges e JOIN @NewAll a ON e.paperID = a.id
        WHERE e.citedPaperID NOT IN (SELECT v.id FROM @Visited v)

        UPDATE @Temp SET visCnt = 0;
        UPDATE @NewAll SET visCnt += 1;
        DELETE FROM @NewAll WHERE visCnt = 2;
        INSERT INTO @NewAll (id, visCnt) (SELECT * FROM @Temp);
        DELETE FROM @Temp;

        SET @NewCnt = (SELECT COUNT(*) FROM @NewAll);
        IF (@NewCnt > 0)
            BEGIN
                INSERT INTO @Visited (id)
                OUTPUT inserted.id INTO @Temp (id)
```

```
SELECT DISTINCT e.PaperID
FROM Edges e JOIN @NewAll a ON e.citedPaperID = a.id
WHERE e.paperID NOT IN (SELECT v.id FROM @Visited v)
```

```
UPDATE @Temp SET visCnt = 0;
UPDATE @NewAll SET visCnt += 1;
DELETE FROM @NewAll WHERE visCnt = 2;
INSERT INTO @NewAll (id, visCnt) (SELECT * FROM @Temp);
DELETE FROM @Temp;
```

```
END;
SET @NewCnt = (SELECT COUNT(*) FROM @NewAll);
END;
```

```
SET @connectedCnt = (
    SELECT COUNT(DISTINCT v.id)
    FROM @Visited v
);
```

```
IF (@connectedCnt > 4 AND @connectedCnt <= 10)
BEGIN
    SELECT n.paperID, n.paperTitle
    FROM Nodes n, @Visited v
    WHERE n.paperID = v.id
END;
```

```
DELETE t FROM @tempVisited t JOIN @Visited v ON t.id = v.id;
DELETE FROM @Visited
```

```
SET @tempVisitCnt = (
    SELECT DISTINCT Count(*)
    FROM @tempVisited
);
END;
```

```
END;
```

【Result】

Table 1

	paperID	paperTitle
1	210310	Homotopy of Rational Maps and the Quantization of Skyrmons
2	12215	Solitonic fullerene structures in light atomic nuclei
3	206160	Skyrmed Monopoles
4	9904160	Spherically Symmetric Solutions of the SU(N) Skyrme Models
5	8110	Understanding Skyrmons using Rational Maps

Table 2

	paperID	paperTitle
1	9611150	Dimensional Renormalization in ϕ^3 theory: ladders and rainbows
2	9805025	A dilogarithmic 3-dimensional Ising tetrahedron
3	9612010	Weight Systems from Feynman Diagrams
4	9712140	Non-zeta knots in the renormalization of the Wess-Zumino model?
5	9807125	How useful can knot and number theory be for loop calculations?

Table 3

	paperID	paperTitle
1	9611185	A Nonrelativistic Chiral Soliton in One Dimension
2	9709075	Chiral solitons from dimensional reduction of Chern-Simons gauged
3	9507110	Calogero-Sutherland model from excitations of Chern-Simons vortices
4	9712255	Chiral solitons from dimensional reduction of Chern-Simons gauged
5	9706080	Moving Frames Hierarchy and BF Theory

Table 4

	paperID	paperTitle
1	9611025	Direct solution of the hard pomeron problem for arbitrary conformal
2	9805135	New Results on the Odderon in QCD
3	9802100	Solution of the Odderon Problem
4	9508025	Quasiclassical QCD Pomeron
5	9511210	Modular Invariance and the Odderon

Table 5

	paperID	paperTitle
1	9812105	Vassiliev Invariants in the Context of Chern-Simons Gauge Theory
2	9312215	Knot invariants from rational conformal field theories
3	9212110	Three Dimensional Chern-Simons Theory as a Theory of Knots and Links III
4	9607030	Vassiliev Invariants for Links from Chern-Simons Perturbation Theory
5	9401095	Chirality of Knots $9_{\{42\}}$ and $10_{\{71\}}$ and Chern-Simons Theory
6	9807155	Combinatorial Formulae for Vassiliev Invariants from Chern-Simons Gauge

Table 6

	paperID	paperTitle
1	9509135	Classical and Quantum Mechanics of Non-Abelian Chern-Simons Particles
2	304155	Exact String-like Solutions of the Gauged Nonlinear $O(3)$ Model
3	9805010	On the Gauged Non-compact Spin System
4	9507015	Topological and Nontopological Solitons in a Gauged $O(3)$ Sigma Model
5	9703185	$N=2$ Supersymmetric Gauged $O(3)$ Sigma Model
6	9506015	Statistical Mechanics of Non-Abelian Chern-Simons Particles
7	9303080	Non-Abelian Chern-Simons Quantum Mechanics
8	9707150	Bogomolnyi Solitons and Hermitian Symmetric Spaces

Table 7

	paperID	paperTitle
1	9510085	Calculation of the Aharonov-Bohm wave function
2	9710025	On the Nonrelativistic Limit of the Scattering of Spin One-half
3	9603185	The Aharonov-Bohm scattering : the role of the incident wave
4	9703200	The Low Energy Limit of the Chern-Simons Theory Coupled to Fermions
5	9703090	Perturbative Expansion in the Galilean Invariant Spin One-Half
6	9906170	Radiative Corrections to the Aharonov-Bohm Scattering
7	9411175	Aharonov-Bohm Scattering of a Localized Wave Packet: Analysis of the
8	9402020	Perturbative Bosonic End Anyon Spectra and Contact Interactions
9	7080	Relativistic scalar Aharonov-Bohm scattering
10	9502105	FIELD THEORETICAL AND QUANTUM MECHANICAL DESCRIPTIONS OF COLLIDING AND

Table 8

	paperID	paperTitle
1	9904055	Finiteness following from underlying theory: a natural strategy
2	3255	Dimensional Transmutation and Dimensional Regularization in Quantum
3	9906015	Two- and Three-particle States in a Nonrelativistic Four-fermion Model
4	9412050	Generalised Point Interactions for the Radial Schrodinger Equation via
5	5195	A differential equation approach for examining the subtraction schemes
6	9511010	The regulated four parameter one dimensional point interaction
7	9706070	Non-perturbative regularization and renormalization: simple examples

1-2 PageRank

【Code】

-- 1.2 PageRank

BEGIN

```
DECLARE @PageRank TABLE (  
    id INT,  
    rank FLOAT  
);
```

```
DECLARE @paperCited TABLE (  
    id INT  
);
```

```
DECLARE @Visited TABLE (  
    id INT  
);
```

```
DECLARE @Sink TABLE (  
    id INT  
);
```

-- Set up variables

```
DECLARE @dampingFactor FLOAT = 0.85;
```

```
DECLARE @nodeCnt FLOAT = (SELECT Count(*) FROM Nodes);
```

```
DECLARE @stayProb FLOAT = ((1 - @dampingFactor) / @nodeCnt);
```

```
DECLARE @sigma FLOAT = 1;
```

```
DECLARE @visitedCnt INT;
```

```
INSERT INTO @sink (id)  
SELECT DISTINCT n.paperID  
FROM Nodes n  
WHERE NOT EXISTS (  
    SELECT n1.paperID  
    FROM Nodes n1, Edges e  
    WHERE n.paperID = n1.paperID AND n1.paperID = e.paperID  
)
```

-- Initialize all ranks

```
INSERT INTO @PageRank (id) (SELECT n.paperID FROM Nodes n);
```

```
UPDATE @PageRank SET rank = (1 / @nodeCnt);
```

```
WHILE (@sigma > 0.01)
```

```
    BEGIN
```

```
        INSERT INTO @Visited (id) (SELECT n.paperid FROM Nodes n);
```

```

SET @visitedCnt = (SELECT COUNT(*) FROM @Visited)
SET @sigma = 0;
WHILE (@visitedCnt > 0)
    BEGIN
        -- Randomly pick a PaperID to calculate its PageRank
        DECLARE @curPaperID INT = (
            SELECT TOP(1) v.id
            FROM @Visited v
            ORDER BY NEWID()
        );

        INSERT INTO @paperCited (id)
        SELECT DISTINCT e.paperID
        FROM Edges e
        WHERE e.citedPaperID = @curPaperID

        -- @prevRank = All previous
        DECLARE @prevRank FLOAT = (
            SELECT p.rank
            FROM @PageRank p
            WHERE p.id = @curPaperID);
        DECLARE @updateVal FLOAT = 0;
        DECLARE @paperCitedCnt INT = (SELECT COUNT(*) FROM @paperCited);
        DECLARE @curSinkVal FLOAT = ((
            SELECT SUM(p.rank)
            FROM @Sink s, @PageRank p
            WHERE s.id = p.id) / @nodeCnt) * @dampingFactor;

        WHILE (@paperCitedCnt > 0)
            BEGIN
                DECLARE @paperID INT = (
                    SELECT TOP (1) p.id
                    FROM @paperCited p
                );

                DECLARE @paperIDCitedCnt INT = (
                    SELECT COUNT(e.citedPaperID)
                    FROM Edges e
                    WHERE e.paperID = @paperID
                );

                SET @updateVal += (
                    SELECT p.rank

```

```

        FROM @PageRank p
        WHERE p.id = @paperID
    ) / @paperIDCitedCnt;

    DELETE FROM @paperCited WHERE id = @paperID;
    SET @paperCitedCnt -= 1;

    END;

    SET @updateVal += @curSinkVal
    DECLARE @curRank FLOAT = @stayProb + @dampingFactor * @updateVal;
    SET @sigma += ABS(@curRank - @prevRank);

    UPDATE @PageRank SET rank = @curRank WHERE id = @curPaperID;
    DELETE FROM @Visited WHERE id = @curPaperID;
    SET @visitedCnt -= 1

    END;

    PRINT @sigma;

    END;

    SELECT TOP(10) p.id, n.paperTitle, p.rank
    FROM @PageRank p, Nodes n
    WHERE n.paperID = p.id
    ORDER BY p.rank DESC

    END;

```

【Result】

	id	paperTitle	rank
1	9504090	Massless Black Holes and Conifolds in String Theory	0.012402918223824456
2	9510135	Bound States Of Strings And p-Branes	0.012096013790628381
3	9711200	The Large N Limit of Superconformal Field Theories and Supergravity	0.011524424959577019
4	9802150	Anti De Sitter Space And Holography	0.008156857144475966
5	208020	Open strings and their symmetry groups	0.007296756063972605
6	9602065	D--branes and Spinning Black Holes	0.006377747349660877
7	9305185	Duality Symmetries of 4D Heterotic Strings	0.006355169135801032
8	9611050	TASI Lectures on D-Branes	0.005999771738579745
9	9501030	Strong/Weak Coupling Duality from the Dual String	0.004839057427360183
10	9602135	Entropy and Temperature of Black 3-Branes	0.004571579770257256