

CS542 Project 4 report

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Introduction

In this project, an undo/Redo logging system is to be designed. The populations of cities and countries changes. We will change the population of each by 2% to represent the passage of a year. The purpose of this programming assignment is to programmatically make this change in all records and to generate undo/redo logs as we are doing it. Then we will move those logs to another machine that has a copy of the same data and apply the logs and observe that the data has changed. In this project we choose to write

Connection

The connection class defines the connection of each relation and return the record of each relation. The record represents data by a key row(attributes) and multiple value rows(value tuples). This class has two crucial methods select and union. Method 'select' Selects method to get required data from the relation, remove other useless data. Method 'Union' Unions this record with other records required. Moreover, method 'getonekey' can get the specific key form the relation by using its index number. Method 'getonevalue' can get the specific value form the relation by using its index number.

Relation

It includes methods which have been described in project 3. Method open():Define a buffer block to operate, get the contents of db file line by line,the first line of each file is the key attribute . Method getNext() : Get the next useful attribute record in the db file. Method close() : close all the connection from the buffer which meant the original record will not be changed any more. What's more, for this project, the Relation calss includes two main methods : update() and redo().

Method update(): param column is the operation target, param coefficient is the operation number , param readfile is the original db file, param upfile is the current db file, param logfile is the log file to be created.(we name them upCity.db and upCountry.db)

Method redo():Redo the current db file with the existing log file, make sure the data value is corresponding to the new value in log file. param readfile is the current db file, param logfile is the log file, param redoFile is the new generated db file to be created(we name them redocity.db and redocountry.db).

Test

(a) Change the population of each by 2%. After running the update that increases the populations by 2%, the program generate two log files(city.log and country.log) and two new database files(upCity.db and upcountry.db). Log files include the attribute which has been changed, original population and new population(increase 2%). Database files only update the population and other attributes remains unchanged.

country.log	city.log
<pre>1 start 2 Population,1,22720000,23174400 3 Population,2,12878000,13135560 4 Population,3,8000,8160 5 Population,4,3401200,3469224 6 Population,5,78000,79560 7 Population,6,217000,221340 8 Population,7,2441000,2489820 9 Population,8,37032000,3772640 10 Population,9,3520000,3590400 11 Population,10,68000,69360 12 Population,11,0,0 13 Population,12,0,0 14 Population,13,68000,69360 15 Population,14,18886000,19263720 16 Population,15,80918000,8253636 17 Population,16,7734000,7888680 18 Population,17,6695000,6828900 19 Population,18,10239000,10443780 20 Population,19,6097000,6218940 21 Population,20,11937000,12175740 22 Population,21,129155000,131738100 23 Population,22,8190900,8347718 24 Population,23,617000,629340</pre>	<pre>1 start 2 Population,1,1780000,1815600 3 Population,2,237500,242250 4 Population,3,186800,190536 5 Population,4,127800,130356 6 Population,5,731200,745824 7 Population,6,593321,605187 8 Population,7,440900,449718 9 Population,8,234323,239009 10 Population,9,201843,205879 11 Population,10,183238,197102 12 Population,11,172701,176155 13 Population,12,160398,163605 14 Population,13,153491,156560 15 Population,14,152463,155512 16 Population,15,149544,152534 17 Population,16,148772,151747 18 Population,17,142465,145314 19 Population,18,138020,140780 20 Population,19,135621,138333 21 Population,20,129170,131753 22 Population,21,126270,128795 23 Population,22,122007,124528 24 Population,23,119811,122207</pre>

upcountry.db	upcity.db
<pre>1 Code, Name, Continent, Region, SurfaceArea, IndepYear, Population, LifeExpectancy, GNP, GNPold, LocalName, GovernmentForm, HeadOfState, Capital, Code2 2 'AFG','Afghanistan','Asia','Southern and Central Asia',652090.00,1919,23174400,45.9,5976.00,NMLL,'Afghanistan/Afqanistan','Islamic Emirate','Mohammad Omar','1','AF' 3 'AGO','Angola','Africa','Central Africa',1246700.00,1975,13135560,38.3,6640.00,7884.00,'Angola','Republic','José Eduardo dos Santos','16','AO' 4 'AIA','Anguilla','North America','Caribbean',96.00,NMLL,8160,76.1,63.20,NMLL,'Anguilla','Dependent Territory of the UK','Elisabeth II','62','AI' 5 'ALB','Albania','Europe','Southern Europe',28742.00,1912,3469224,71.6,3205.00,2500.00,'Shqiperia','Republic','Rexhep Mejdani','34','AL' 6 'AND','Andorra','Europe','Southern Europe',468.00,1278,79560,83.5,1630.00,NMLL,'Andorra','Parliamentary Coprinipality','7','55','AD' 7 'ANT','Netherlands Antilles','North America','Caribbean',800.00,NMLL,221340,74.7,1941.00,NMLL,'Nederlandses Antillen','Nonmetropolitan Territory of The Netherlands','Beatrix','17','AN' 8 'ARE','United Arab Emirates','Asia','Middle East',33600.00,1971,2489820,74.1,37966.00,36846.00,'Al-Baarat al-'Arabiya al-Muttahida','Emirate Federation','Yasid bin Sultan','14','AE' 9 'ARG','Argentina','South America','South America',2780400.00,1816,3772640,75.1,340238.00,323310.00,'Argentina','Federal Republic','Fernando de la Rúa','69','AR' 10 'ARM','Armenia','Asia','Middle East',286600.00,1991,3590400,68.4,1413.00,1027.00,'Bghetstan','Republic','Robert Kotcharyan','124','AM' 11 'ASM','American Samoa','Oceania','Polynesia',159.00,NMLL,69360,75.1,334.00,NMLL,'Amerika Samoa','US Territory','George W. Bush','54','AS' 12 'ATA','Antarctica','Antarctica','Antarctica',13120000.00,NMLL,0,NMLL,0.00,NMLL,'-', '-', 'Co-administrated','-', 'NMLL','AQ' 13 'ATF','French Southern territories','Antarctica','Antarctica',7700.00,NMLL,0,NMLL,0.00,NMLL,'Terres australes françaises','Nonmetropolitan Territory of France','Jacques Chirac','17','TF' 14 'ATG','Antigua and Barbuda','North America','Caribbean',442.00,1981,69360,70.5,612.00,584.00,'Antigua and Barbuda','Constitutional Monarchy','Elisabeth II','63','AG' 15 'AUS','Australia','Oceania','Australia and New Zealand',7741220.00,1901,1263720,78.8,351182.00,392911.00,'Australia','Constitutional Monarchy Federation','Elisabeth II','1523','AU' 16 'AUT','Austria','Europe','Western Europe',83855.00,1918,8253636,77.7,211660.00,206025.00,'Österreich','Federal Republic','Thomas Klestil','1523','AT' 17 'AZE','Azerbaijan','Asia','Middle East',86600.00,1991,7888680,62.9,4127.00,4100.00,'Azərbaycan','Federal Republic','Heydar Aliyev','144','AZ' 18 'BDI','Burundi','Africa','Eastern Africa',27834.00,1962,628900,46.2,303.00,382.00,'Burundi/Burundi','Republic','Pierre Nkurunziza','352','BI' 19 'BEL','Belgium','Europe','Western Europe',30518.00,1830,10443780,77.8,249704.00,243948.00,'Belgie/Belgique','Constitutional Monarchy Federation','Albert II','179','BE' 20 'BFA','Burkina Faso','Africa','Western Africa',274000.00,1960,12175740,46.7,2425.00,2201.00,'Burkina Faso','Republic','Blaise Compaoré','549','BF' 21 'BGD','Bangladesh','Asia','Southern and Central Asia',143998.00,1971,131738100,60.2,32852.00,31966.00,'Bangladesh','Republic','Shahabuddin Ahmad','150','BD' 22 'BGR','Bulgaria','Europe','Eastern Europe',110284.00,1908,8347718,70.5,12178.00,10165.00,'Balgariya','Republic','Petar Borizov','528','BG' 23 'BHR','Bahrain','Asia','Middle East',684.00,1971,629340,73.0,6360.00,6087.00,'Al-Bahrayn','Monarchy/Emirate','Hamad ibn Isa al-Khalifa','149','BH'</pre>	<pre>1 ID, Name, CountryCode, District, Population 2 1, 'Kabul', 'AFG', 'Kabul', 1313560 3 2, 'Qandahar', 'AFG', 'Qandahar', 242250 4 3, 'Herat', 'AFG', 'Herat', 190536 5 4, 'Mazar-e-Sharif', 'AFG', 'Balkh', 130356 6 5, 'Amsterdam', 'NLD', 'Noord-Holland', 745824 7 6, 'Rotterdam', 'NLD', 'Zuid-Holland', 605187 8 7, 'Haag', 'NLD', 'Zuid-Holland', 449718 9 8, 'Utrecht', 'NLD', 'Utrecht', 239009 10 9, 'Eindhoven', 'NLD', 'Noord-Brabant', 205879 11 10, 'Tilburg', 'NLD', 'Noord-Brabant', 197102 12 11, 'Groningen', 'NLD', 'Groningen', 176155 13 12, 'Breda', 'NLD', 'Noord-Brabant', 163605 14 13, 'Apeldoorn', 'NLD', 'Gelderland', 156560 15 14, 'Willemstad', 'NLD', 'Gelderland', 155512 16 15, 'Eindhoven', 'NLD', 'Gelderland', 152534 17 16, 'Haarlem', 'NLD', 'Noord-Holland', 151747 18 17, 'Almere', 'NLD', 'Flevoland', 145314 19 18, 'Arnhem', 'NLD', 'Gelderland', 140780 20 19, 'Zaanstad', 'NLD', 'Noord-Holland', 138333 21 20, 'Zwolle', 'NLD', 'Overijssel', 131753 22 21, 'Amersfoort', 'NLD', 'Utrecht', 128795 23 22, 'Maastricht', 'NLD', 'Limburg', 124528 24 23, 'Dordrecht', 'NLD', 'Zuid-Holland', 122207</pre>

(b) Then we will move those logs to another machine that has a copy of the same data and apply the logs and observe that the data has changed. After running redo we get two new database files(redocity.db and redocountry.db). And both show populations that are 2% higher than the original.

redocountry.db	<pre>1 Code, Name, Continent, Region, SurfaceArea, IndepYear, Population, LifeExpectancy, GNP, GNPPold, LocalName, GovernmentForm, HeadOfState, Capital, Code2 2 'AFG', 'Afghanistan', 'Asia', 'Southern and Central Asia', 652090.00, 1919, 23174400, 45.9, 5976.00, NULL, 'Afghanistan/Afqanestan', 'Islamic Emirate', 'Mohammad Omar 3 'AGO', 'Angola', 'Africa', 'Central Africa', 1246700.00, 1975, 11131560, 38.2, 6648.00, 7984.00, 'Angola', 'Republic', 'Jose Eduardo dos Santos', 66, 'AO' 4 'AIA', 'Anguilla', 'North America', 'Caribbean', 86.00, NULL, 8160, 76.1, 63.20, NULL, 'Anguilla', 'Dependent Territory of the UK', 'Elisabeth II', 62, 'AI' 5 'ALB', 'Albania', 'Europe', 'Southern Europe', 28748.00, 1912, 3469224, 71.6, 3205.00, 2500.00, 'Shqipëria', 'Republic', 'Rexhep Mejdani', 34, 'AL' 6 'AND', 'Andorra', 'Europe', 'Southern Europe', 468.00, 1278, 78960, 83.2, 1630.00, NULL, 'Andorra', 'Parliamentary Coprincipality', '55, 'AD' 7 'ANT', 'Netherlands Antilles', 'North America', 'Caribbean', 800.00, NULL, 221340, 74.7, 1941.00, NULL, 'Nederlands Antillen', 'Nonmetropolitan Territory of The Ne 8 'ARE', 'United Arab Emirates', 'Asia', 'Middle East', 83600.00, 1971, 2489820, 74.1, 37966.00, 36846.00, 'Al-'Imarat al-'Arabiya al-Muttahida', 'Emirate Federation', 9 'ARG', 'Argentina', 'South America', 'South America', 2780400.00, 1816, 37772640, 75.1, 340238.00, 323310.00, 'Argentina', 'Federal Republic', 'Fernando de la Rúa', 6 10 'ARM', 'Armenia', 'Asia', 'Middle East', 29800.00, 1991, 3590400, 66.4, 1813.00, 1627.00, 'Hajastan', 'Republic', 'Robert Kotarjan', 126, 'AM' 11 'ASM', 'American Samoa', 'Oceania', 'Polynesia', 199.00, NULL, 69360, 75.1, 334.00, NULL, 'Amerika Samoa', 'US Territory', 'George W. Bush', 54, 'AS' 12 'ATA', 'Antarctica', 'Antarctica', 'Antarctica', 13120000.00, NULL, 0.00, NULL, '-', 'Co-administrated', '-', NULL, 'AQ' 13 'ATF', 'French Southern territories', 'Antarctica', 'Antarctica', 7780.00, NULL, 0.00, NULL, 'Terres australes françaises', 'Nonmetropolitan Territory of F 14 'AGB', 'Antigua and Barbuda', 'North America', 'Caribbean', 442.00, 1981, 69360, 70.5, 612.00, 584.00, 'Antigua and Barbuda', 'Constitutional Monarchy', 'Elizabeth II 15 'AUS', 'Australia', 'Oceania', 'Australia and New Zealand', 7741220.00, 1901, 18243720, 79.8, 351182.00, 382911.00, 'Australia', 'Constitutional Monarchy, Federatio 16 'AUT', 'Austria', 'Europe', 'Western Europe', 83859.00, 1918, 8253636, 77.7, 211860.00, 206025.00, 'Österreich', 'Federal Republic', 'Thomas Klestil', 1523, 'AT' 17 'AZE', 'Azerbaijan', 'Asia', 'Middle East', 86600.00, 1991, 7888680, 62.9, 4167.00, 4100.00, 'Azərbaycan', 'Federal Republic', 'Heydar Aliyev', 144, 'AZ' 18 'BDI', 'Burundi', 'Africa', 'Eastern Africa', 27834.00, 1962, 6231900, 46.7, 503.00, 981.00, 'Burundi/Burundi', 'Republic', 'Pierre Buyoya', 552, 'BI' 19 'BEL', 'Belgium', 'Europe', 'Western Europe', 30518.00, 1830, 10443780, 77.8, 249704.00, 243948.00, 'Belgie/Belgique', 'Constitutional Monarchy, Federation', 'Albert 20 'BEN', 'Benin', 'Africa', 'Western Africa', 112422.00, 1960, 6218940, 50.2, 2235.00, 2141.00, 'Benin', 'Republic', 'Mathieu Kérékou', 187, 'BJ' 21 'BFA', 'Burkina Faso', 'Africa', 'Western Africa', 274000.00, 1960, 12175740, 46.7, 2425.00, 2201.00, 'Burkina Faso', 'Republic', 'Blaise Compaoré', 549, 'BF' 22 'BGD', 'Bangladesh', 'Asia', 'Southern and Central Asia', 143998.00, 1971, 131738100, 60.2, 32852.00, 31966.00, 'Bangladesh', 'Republic', 'Shahabuddin Ahmad', 150, 'BD' 23 'BGR', 'Bulgaria', 'Europe', 'Eastern Europe', 110994.00, 1908, 8354710, 70.9, 12178.00, 10169.00, 'Balgaria', 'Republic', 'Petar Stojanov', 539, 'BG' 24 'BHR', 'Bahrain', 'Asia', 'Middle East', 694.00, 1971, 629340, 73.0, 6366.00, 6097.00, 'Al-Bahrayn', 'Monarchy/Emirate', 'Hamad ibn Isa al-Khalifa', 149, 'BH'</pre>
redocity.db	<pre>1 ID, Name, CountryCode, District, Population 2 1, 'Kabul', 'AFG', 'Kabul', 1815600 3 2, 'Gandahar', 'AFG', 'Gandahar', 242250 4 3, 'Herat', 'AFG', 'Herat', 190536 5 4, 'Mazar-e-Sharif', 'AFG', 'Balkh', 130356 6 5, 'Amsterdam', 'NLD', 'Noord-Holland', 745824 7 6, 'Rotterdam', 'NLD', 'Zuid-Holland', 605187 8 7, 'Haag', 'NLD', 'Zuid-Holland', 449718 9 8, 'Utrecht', 'NLD', 'Utrecht', 239009 10 9, 'Eindhoven', 'NLD', 'Noord-Brabant', 205879 11 10, 'Tilburg', 'NLD', 'Noord-Brabant', 197102 12 11, 'Groningen', 'NLD', 'Groningen', 174355 13 12, 'Breda', 'NLD', 'Noord-Brabant', 163605 14 13, 'Apeldoorn', 'NLD', 'Gelderland', 156560 15 14, 'Maastricht', 'NLD', 'Gelderland', 155512 16 15, 'Enschede', 'NLD', 'Overijssel', 152534 17 16, 'Haarlem', 'NLD', 'Noord-Holland', 151747 18 17, 'Almere', 'NLD', 'Flevoland', 145314 19 18, 'Arnhem', 'NLD', 'Gelderland', 140780 20 19, 'Zaanstad', 'NLD', 'Noord-Holland', 138333 21 20, 'e-Westerveld', 'NLD', 'Noord-Brabant', 131753 22 21, 'Amersfoort', 'NLD', 'Utrecht', 128795 23 22, 'Maastricht', 'NLD', 'Limburg', 124528 24 23, 'Dordrecht', 'NLD', 'Zuid-Holland', 122207</pre>