

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.db	<pre> 1 Code, Name, Continent, Region, SurfaceArea, IndepYear, Population, LifeExpectancy, GNP, GNPO 2 'ABW', 'Aruba', 'North America', 'Caribbean', 193.00, NULL, 103000, 78.4, 828.00, 793.00, 'Aruba', 'Non 3 'AFG', 'Afghanistan', 'Asia', 'Southern and Central Asia', 652090.00, 1919, 22720000, 45.9, 5976.00, 4 'AGO', 'Angola', 'Africa', 'Central Africa', 1246700.00, 1975, 12878000, 38.3, 6648.00, 7984.00, 'Ango 5 'AIA', 'Anguilla', 'North America', 'Caribbean', 96.00, NULL, 8000, 76.1, 63.20, NULL, 'Anguilla', 'Dep 6 'ALB', 'Albania', 'Europe', 'Southern Europe', 28748.00, 1912, 3401200, 71.6, 3205.00, 2500.00, 'Shqip 7 'AND', 'Andorra', 'Europe', 'Southern Europe', 468.00, 1278, 78000, 83.5, 1630.00, NULL, 'Andorra', 'Pa 8 'ANT', 'Netherlands Antilles', 'North America', 'Caribbean', 800.00, NULL, 217000, 74.7, 1941.00, NUL 9 'ARE', 'United Arab Emirates', 'Asia', 'Middle East', 83600.00, 1971, 2441000, 74.1, 37966.00, 36846. 10 'ARG', 'Argentina', 'South America', 'South America', 2780400.00, 1816, 37032000, 75.1, 340238.00, 32 11 'ARM', 'Armenia', 'Asia', 'Middle East', 29800.00, 1991, 3520000, 66.4, 1813.00, 1627.00, 'Hajastan', ' 12 'ASM', 'American Samoa', 'Oceania', 'Polynesia', 199.00, NULL, 68000, 75.1, 334.00, NULL, 'Amerika Sam 13 'ATA', 'Antarctica', 'Antarctica', 'Antarctica', 13120000.00, NULL, 0, NULL, 0.00, NULL, '-', 'Co-admin 14 'ATF', 'French Southern territories', 'Antarctica', 'Antarctica', 7780.00, NULL, 0, NULL, 0.00, NULL, </pre>
city.db	<pre> 1 ID, Name, CountryCode, District, Population 2 1, 'Kabul', 'AFG', 'Kabol', 1780000 3 2, 'Qandahar', 'AFG', 'Qandahar', 237500 4 3, 'Herat', 'AFG', 'Herat', 186800 5 4, 'Mazar-e-Sharif', 'AFG', 'Balkh', 127800 6 5, 'Amsterdam', 'NLD', 'Noord-Holland', 731200 7 6, 'Rotterdam', 'NLD', 'Zuid-Holland', 593321 8 7, 'Haag', 'NLD', 'Zuid-Holland', 440900 9 8, 'Utrecht', 'NLD', 'Utrecht', 234323 10 9, 'Eindhoven', 'NLD', 'Noord-Brabant', 201843 11 10, 'Tilburg', 'NLD', 'Noord-Brabant', 193238 12 11, 'Groningen', 'NLD', 'Groningen', 172701 13 12, 'Breda', 'NLD', 'Noord-Brabant', 160398 14 13, 'Apeldoorn', 'NLD', 'Gelderland', 153491 15 14, 'Nijmegen', 'NLD', 'Gelderland', 152463 16 15, 'Enschede', 'NLD', 'Overijssel', 149544 17 16, 'Haarlem', 'NLD', 'Noord-Holland', 148772 18 17, 'Almere', 'NLD', 'Flevoland', 142465 19 18, 'Arnhem', 'NLD', 'Gelderland', 138020 20 19, 'Zaanstad', 'NLD', 'Noord-Holland', 135621 </pre>

Table 1 original city.db and country.db

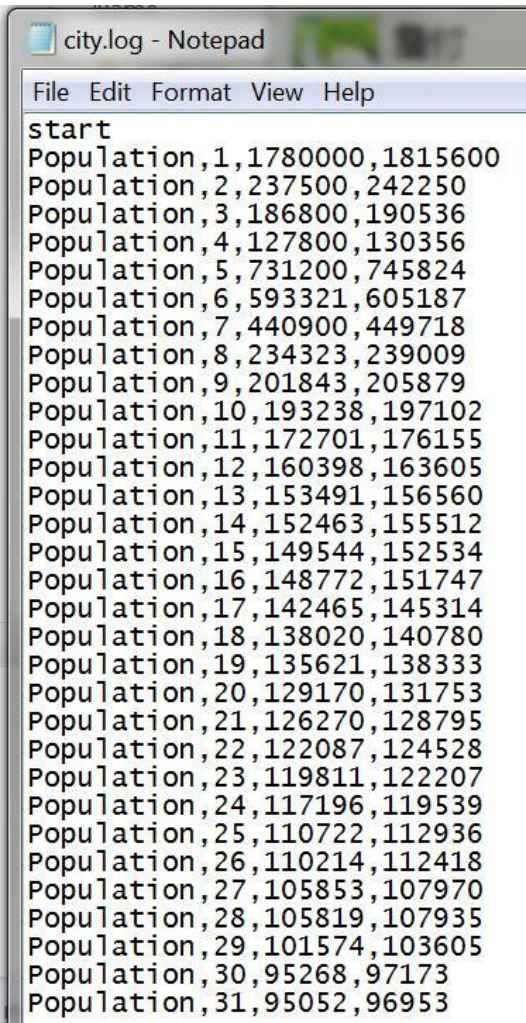
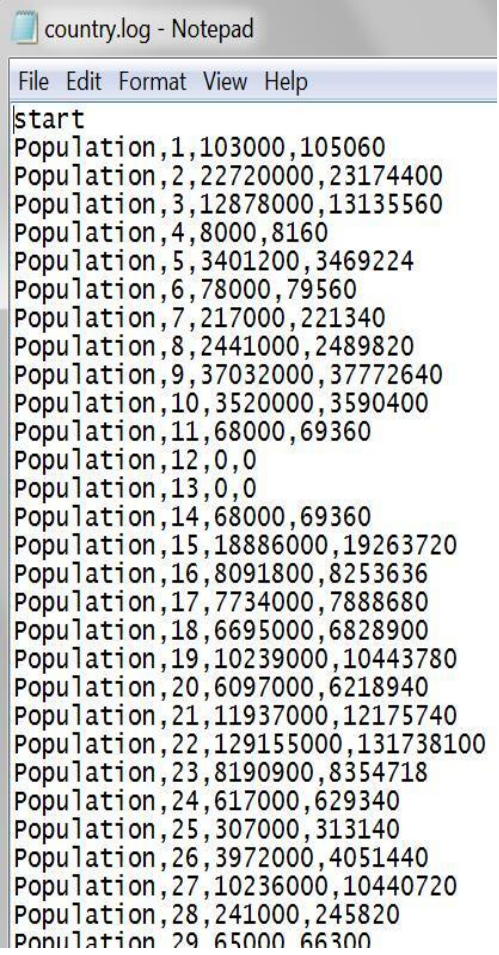
city.log	country.log
 <pre> city.log - Notepad File Edit Format View Help start Population,1,1780000,1815600 Population,2,237500,242250 Population,3,186800,190536 Population,4,127800,130356 Population,5,731200,745824 Population,6,593321,605187 Population,7,440900,449718 Population,8,234323,239009 Population,9,201843,205879 Population,10,193238,197102 Population,11,172701,176155 Population,12,160398,163605 Population,13,153491,156560 Population,14,152463,155512 Population,15,149544,152534 Population,16,148772,151747 Population,17,142465,145314 Population,18,138020,140780 Population,19,135621,138333 Population,20,129170,131753 Population,21,126270,128795 Population,22,122087,124528 Population,23,119811,122207 Population,24,117196,119539 Population,25,110722,112936 Population,26,110214,112418 Population,27,105853,107970 Population,28,105819,107935 Population,29,101574,103605 Population,30,95268,97173 Population,31,95052,96953 </pre>	 <pre> country.log - Notepad File Edit Format View Help start Population,1,103000,105060 Population,2,22720000,23174400 Population,3,12878000,13135560 Population,4,8000,8160 Population,5,3401200,3469224 Population,6,78000,79560 Population,7,217000,221340 Population,8,2441000,2489820 Population,9,37032000,37772640 Population,10,3520000,3590400 Population,11,68000,69360 Population,12,0,0 Population,13,0,0 Population,14,68000,69360 Population,15,18886000,19263720 Population,16,8091800,8253636 Population,17,7734000,7888680 Population,18,6695000,6828900 Population,19,10239000,10443780 Population,20,6097000,6218940 Population,21,11937000,12175740 Population,22,129155000,131738100 Population,23,8190900,8354718 Population,24,617000,629340 Population,25,307000,313140 Population,26,3972000,4051440 Population,27,10236000,10440720 Population,28,241000,245820 Population,29,65000,66300 </pre>

Table 2 city and country log files

upcountry.db	<pre> 1 Code, Name, Continent, Region, SurfaceArea, IndepYear, Population, LifeExpectancy, GNP, GNPOld, L 2 'ABW', 'Aruba', 'North America', 'Caribbean', 193.00, NULL, 105060.78.4, 828.00, 793.00, 'Aruba', 'Nonmetro 3 'AFG', 'Afghanistan', 'Asia', 'Southern and Central Asia', 652090.00, 1919, 23174400.45.9, 5976.00, NULL, 4 'AGO', 'Angola', 'Africa', 'Central Africa', 1246700.00, 1975, 13135560.38.3, 6648.00, 7984.00, 'Angola', ' 5 'AIA', 'Anguilla', 'North America', 'Caribbean', 96.00, NULL, 8160.76.1, 63.20, NULL, 'Anguilla', 'Dependen 6 'ALB', 'Albania', 'Europe', 'Southern Europe', 28748.00, 1912, 3469224.71.6, 3205.00, 2500.00, 'Shqipëria' 7 'AND', 'Andorra', 'Europe', 'Southern Europe', 468.00, 1278, 79560.83.5, 1630.00, NULL, 'Andorra', 'Parliam 8 'ANT', 'Netherlands Antilles', 'North America', 'Caribbean', 800.00, NULL, 221340.74.7, 1941.00, NULL, 'Ne 9 'ARE', 'United Arab Emirates', 'Asia', 'Middle East', 83600.00, 1971, 2489820.74.1, 37966.00, 36846.00, 'A 10 'ARG', 'Argentina', 'South America', 'South America', 2780400.00, 1816, 37772640.75.1, 340238.00, 323310. 11 'ARM', 'Armenia', 'Asia', 'Middle East', 29800.00, 1991, 3590400.66.4, 1813.00, 1627.00, 'Hajastan', 'Repub 12 'ASM', 'American Samoa', 'Oceania', 'Polynesia', 199.00, NULL, 69360.75.1, 334.00, NULL, 'Amerika Samoa', ' 13 'ATA', 'Antarctica', 'Antarctica', 'Antarctica', 13120000.00, NULL, 0, NULL, 0.00, NULL, '-?', 'Co-administr 14 'ATF', 'French Southern territories', 'Antarctica', 'Antarctica', 7780.00, NULL, 0, NULL, 0.00, NULL, 'Terra 15 'ATG', 'Antigua and Barbuda', 'North America', 'Caribbean', 442.00, 1981, 69360.70.5, 612.00, 584.00, 'Ant 16 'AUS', 'Australia', 'Oceania', 'Australia and New Zealand', 7741220.00, 1901, 19263720.79.8, 351182.00, 3 </pre>
upcity.db	<pre> 1 ID, Name, CountryCode, District, Population 2 1, 'Kabul', 'AFG', 'Kabul', 1815600 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, 'Nijmegen', '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, '’s-Hertogenbosch', 'NLD', 'Noord-Brabant', 131753 22 21, 'Amersfoort', 'NLD', 'Utrecht', 128795 23 22, 'Maastricht', 'NLD', 'Limburg', 124528 24 23, 'Dordrecht', 'NLD', 'Zuid-Holland', 122207 25 24, 'Leiden', 'NLD', 'Zuid-Holland', 119539 26 25, 'Haarlemmermeer', 'NLD', 'Noord-Holland', 112936 27 26, 'Zoetermeer', 'NLD', 'Zuid-Holland', 112418 28 27, 'Emmen', 'NLD', 'Drenthe', 107970 29 28, 'Zwolle', 'NLD', 'Overijssel', 107935 30 29, 'Ede', 'NLD', 'Gelderland', 103605 31 30, 'Delft', 'NLD', 'Zuid-Holland', 97173 </pre>

Table 3 country and city db files after update

(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.

redoc ountr y.db	1	Code, Name, Continent, Region, SurfaceArea, IndepYear, Population, LifeExpectancy, GNP, GNPOld, LocalName, Capital
	2	'ABW', 'Aruba', 'North America', 'Caribbean', 193.00, NULL, 105060, 78.4, 828.00, 793.00, 'Aruba', 'Nonmetropolitan Territory'
	3	'AFG', 'Afghanistan', 'Asia', 'Southern and Central Asia', 652090.00, 1919, 23174400, 45.9, 5976.00, NULL, 'Afghanistan', 'Islamic Republic of'
	4	'AGO', 'Angola', 'Africa', 'Central Africa', 1246700.00, 1975, 13135560, 38.3, 6648.00, 7984.00, 'Angola', 'Republic', 'Luanda'
	5	'AIA', 'Anguilla', 'North America', 'Caribbean', 96.00, NULL, 8160, 76.1, 63.20, NULL, 'Anguilla', 'Dependent Territory of the United Kingdom', 'Saint John'
	6	'ALB', 'Albania', 'Europe', 'Southern Europe', 28748.00, 1912, 3469224, 71.6, 3205.00, 2500.00, 'Shqipëria', 'Republic', 'Tirana'
	7	'AND', 'Andorra', 'Europe', 'Southern Europe', 468.00, 1278, 79560, 83.5, 1630.00, NULL, 'Andorra', 'Parliamentary Constitutional Monarchy', 'Andorra la Vella'
	8	'ANT', 'Netherlands Antilles', 'North America', 'Caribbean', 800.00, NULL, 221340, 74.7, 1941.00, NULL, 'Nederlandse Antillen', 'Kingdom of the Netherlands', 'Willemstad'
	9	'ARE', 'United Arab Emirates', 'Asia', 'Middle East', 83600.00, 1971, 2489820, 74.1, 37966.00, 36846.00, 'Al-Imarat al-Arabiyyah al-Mi'thamah', 'United Arab Emirates', 'Dubai'
	10	'ARG', 'Argentina', 'South America', 'South America', 2780400.00, 1816, 37772640, 75.1, 340238.00, 323310.00, 'Argentina', 'Republic', 'Buenos Aires'
	11	'ARM', 'Armenia', 'Asia', 'Middle East', 29800.00, 1991, 3590400, 66.4, 1813.00, 1627.00, 'Hajastan', 'Republic', 'Yerevan'
	12	'ASM', 'American Samoa', 'Oceania', 'Polynesia', 199.00, NULL, 69360, 75.1, 334.00, NULL, 'Amerika Samoa', 'US Territory', 'Pago Pago'
	13	'ATA', 'Antarctica', 'Antarctica', 'Antarctica', 13120000.00, NULL, 0, NULL, 0.00, NULL, '-', 'Co-administrated', 'McMurdo Station'
	14	'ATF', 'French Southern territories', 'Antarctica', 'Antarctica', 7780.00, NULL, 0, NULL, 0.00, NULL, 'Terres australes françaises', 'French Southern Territories', 'Port-aux-Français'
	15	'ATG', 'Antigua and Barbuda', 'North America', 'Caribbean', 442.00, 1981, 69360, 70.5, 612.00, 584.00, 'Antigua and Barbuda', 'Republic', 'Saint John's'
	16	'AUS', 'Australia', 'Oceania', 'Australia and New Zealand', 7741220.00, 1901, 19263720, 79.8, 351182.00, 392911.00, 'Australia', 'Commonwealth of Australia', 'Canberra'
	17	'AUT', 'Austria', 'Europe', 'Western Europe', 83859.00, 1918, 8253636, 77.7, 211860.00, 206025.00, 'Österreich', 'Federal Republic of Austria', 'Vienna'
	18	'AZE', 'Azerbaijan', 'Asia', 'Middle East', 86600.00, 1991, 7888680, 62.9, 4127.00, 4100.00, 'Azərbaycan', 'Republic', 'Baku'
	19	'BDI', 'Burundi', 'Africa', 'Eastern Africa', 27834.00, 1962, 6828900, 46.2, 903.00, 982.00, 'Burundi/Uburundi', 'Republic', 'Gitega'
	20	'BEL', 'Belgium', 'Europe', 'Western Europe', 30518.00, 1830, 10443780, 77.8, 249704.00, 243948.00, 'België/Belgique', 'Kingdom of Belgium', 'Brussels'
	21	'BEN', 'Benin', 'Africa', 'Western Africa', 112622.00, 1960, 6218940, 50.2, 2357.00, 2141.00, 'Bénin', 'Republic', 'Cotonou'
	22	'BFA', 'Burkina Faso', 'Africa', 'Western Africa', 274000.00, 1960, 12175740, 46.7, 2425.00, 2201.00, 'Burkina Faso', 'Republic', 'Ouagadougou'
	23	'BGD', 'Bangladesh', 'Asia', 'Southern and Central Asia', 143998.00, 1971, 131738100, 60.2, 32852.00, 31966.00, 'Bangladesh', 'People's Republic', 'Dhaka'
redoc ity.db	1	ID, Name, CountryCode, District, Population
	2	1, 'Kabul', 'AFG', 'Kabul', 1815600
	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, 'Nijmegen', '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, 's-Hertogenbosch', 'NLD', 'Noord-Brabant', 131753
	22	21, 'Amersfoort', 'NLD', 'Utrecht', 128795
	23	22, 'Maastricht', 'NLD', 'Limburg', 124528
	24	23, 'Dordrecht', 'NLD', 'Zuid-Holland', 122207
	25	24, 'Leiden', 'NLD', 'Zuid-Holland', 119539
	26	25, 'Haarlemmermeer', 'NLD', 'Noord-Holland', 112936
	27	26, 'Zoetermeer', 'NLD', 'Zuid-Holland', 112418
	28	27, 'Emmen', 'NLD', 'Drenthe', 107970
	29	28, 'Zwolle', 'NLD', 'Overijssel', 107935
	30	29, 'Ede', 'NLD', 'Gelderland', 103605
	31	30, 'Delft', 'NLD', 'Zuid-Holland', 97173
	32	31, 'Heerlen', 'NLD', 'Limburg', 96953
	33	32, 'Alkmaar', 'NLD', 'Noord-Holland', 94567
	34	33, 'Willemstad', 'ANT', 'Curaçao', 2391
	35	34, 'Tirana', 'ALB', 'Tirana', 275400

Table4 country and city db fils after redo