

Data Structures and Algorithms Assignment Report

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UNIT: Data Structures and Algorithms (COMP1002) - Curtin University Bentley

Introduction

This is a collection of java programs to explore the implementation of abstract data types (ADT), especially with cryptocurrency data.

Through the use of ADTs, cryptocurrencies (assets) and their trade pairs (trades) can be represented in a program.

The program constructs a graph, where each vertex/node is a representative crypto currency. Each vertex is given a label eg: "BTC", and attached is a CryptoCurrency Object, that holds information such as price, market cap, percentage change.

Sequentially, edges (trade pairs) are added to the graph to connect two nodes. For example the trade pair "ETHBTC" creates a single directed path from ETH to BTC. Lastly the trades within the last 24hrs are read in to create a CryptoTrade Object, which is then attached to the matching edge.

Resulting in the adjacency list such as:

```
ETH | [ BTC, ]  
BTC | [ none ]
```

Resulting in the edge list such as:

```
[ETHBTC, ]
```

Using this representation the program can

- Read and parse csv / JSON files to construct a graph.
- Find an asset in the graph and return its CryptoCurrency Object.
- Find a trade in the graph and return its CryptoTrade Object.
- Find direct paths to other cryptocurrencies.
- Find all potential paths to other cryptocurrencies.
- Remove assets from the graph "filtering"
- Find top 10 cryptocurrencies by PRICE
- Find top 10 trade pairs by VOLUME

Installation

Dependencies * org.Json package

How to run/install the program

Compilation

- `javac -cp .:json.jar *.java`

Run the program

- example \$ `java -cp .:json.jar -i asset_info.csv exchangeInfo.json`

The program expects 3 command line arguments

```
java -cp .:json.jar cryptoGraph <flag> <asset_file.csv> <trade_data.json>
```

- <flag> = '-i' or '-r' for interactive and report mode respectively"
- <asset_file.csv> = asset file
- <trade_data.json> = trade file

Files

- `cryptoGraph.java` - This file provides the main function to run the program.
- Is responsible for calling functions that read, write, create and update - the graph.
- `CryptoCurrency.java` - Class file for creating currency objects.
- `CryptoTrade.java` - Class file for creating trade/pair objects.
- `DSAGraph.java` - Graph Abstract Data Type (ADT) class. Comprised from `DSAGraphVertex` and `DSAGraphEdge` class.
- `DSAGraphEdge.java` - Class file for edge objects. Owned by `DSAGraph`.
- `DSAGraphVertex.java` - Class file to store vertex information in graph.
- `DSAHeap.java` - Heap Abstract Data Type (ADT) class.
- `DSAHeapEntry.java` - Class file for heap entry while is owned by `DSA-Heap.java`
- `DSAJson.java` - JSON parser to read finance data.
- `DSALinkedList.java` - `LinkedList` Abstract Data Type (ADT) class.
- `DSAListNode.java` - `ListNode` Abstract Data Type (ADT) class.
- `DSAQueue.java` - `Queue` Abstract Data Type (ADT) class.
- `DSAStack.java` - `Stack` Abstract Data Type (ADT) class.
- `FileIO.java` - File I/O csv parser.

Terminology

- “Asset” :

Walkthrough

```
java -cp ../json.jar cryptoGraph <flag> <asset_file.csv> <trade_data.json>
```

The program has two modes * “interactive mode” using the -i flag * “report mode” using the -r flag

Interactive mode (-i)

When the program is run in this mode, the user is greeted with a menu. The menu will loop until the user selects 9. Exit

```
Assets: xxxx
Trades: xxxx
"1. Load Data"
"2. Find and display an asset"
"3. Find and display trade details"
"4. Find and display potential trade paths"
"5. Set asset filter"
"6. Asset overview"
"7. Trade overview"
"8. Save Data"
"9. Exit"
```

1. Load Data

2. Find and display an asset

```
You selected, 2. Find and display an asset
Please enter the asset symbol eg: 'BTC'
>>>
```

The user will then input a symbol eg BTC and the data will be displayed

```
name           : Bitcoin
symbol         : BTC
market cap     : 2.25970487355E11
price          : 12199.63
circulating supply : "18,522,731 BTC"
volume24hr     : 3.46577063E10
change1hr      : 1.82%
change24hr     : 4.2%
change7d       : 6.71%
```

If the symbol cannot be found a short message is displayed

```
>>> junk
Cannot find 'JUNK'
```

The user is then prompted if to continue searching

find another asset? (y/n) >>>

3. Find and Display Trade Details

You selected, 3. Find and display trade details
Please enter the trade symbol eg: 'BTCETH'

The user will then input a symbol eg ethbtc and the data will be displayed.

```
>>> ethbtc
      name           : ETHBTC
      price           : 0.028229
      price change    : -2.16E-4
      price change %  : -0.759%
      volume          : 174841.101
      count           : 84327.0
```

If the symbol cannot be found a short message is displayed

```
>>> junk
Cannot find 'JUNK'
```

The user is then prompted if to continue searching

find another trade? (y/n) >>>

4. Find and Display Potential Trade Paths

Select an option >>> 4

4. Find and display potential trade paths

Please enter the source symbol eg: 'ETH'

```
>>> xrp
```

Please enter the destination symbol eg: 'BTC'

```
>>> usdt
```

POTENTIAL PATHS

BTC->USDT->

TUSD->USDT->

PAX->USDT->

USDC->USDT->

BUSD->USDT->

TRY->IDRT->BIDR->BKRW->DAI->TRY->BKRW->IDRT->BIDR->DAI->ETH->BTC->USDT->

TUSD->USDT->

PAX->USDT->

USDC->USDT->

BUSD->USDT->

TRY->IDRT->BIDR->BKRW->DAI->TRY->BKRW->IDRT->BIDR->DAI->USDT->

TUSD->USDT->

```

PAX->USDT->
USDC->USDT->
BUSD->USDT->
TRY->IDRT->BIDR->BKRW->DAI->TRY->BKRW->BIDR->DAI->USDT->
BNB->BTC->USDT->
TUSD->USDT->
PAX->USDT->
USDC->USDT->
BUSD->USDT->
TRY->IDRT->BIDR->BKRW->DAI->TRY->BKRW->IDRT->BIDR->DAI->ETH->BTC->USDT->
TUSD->USDT->
PAX->USDT->
USDC->USDT->
BUSD->USDT->
TRY->IDRT->BIDR->BKRW->DAI->TRY->BKRW->IDRT->BIDR->DAI->USDT->
TUSD->USDT->
PAX->USDT->
USDC->USDT->
BUSD->USDT->
TRY->IDRT->BIDR->BKRW->DAI->TRY->BKRW->BIDR->DAI->USDT->
PAX->USDT->
TUSD->USDT->
USDC->USDT->
BUSD->USDT->
TRY->IDRT->BIDR->BKRW->DAI->TRY->BKRW->IDRT->BIDR->DAI->PAX->USDT->
TUSD->USDT->
USDC->USDT->
BUSD->USDT->
TRY->IDRT->BIDR->BKRW->DAI->TRY->BKRW->Find another trade? (y/n) >>

```

5. Set Asset Filter

asset filter not functioning

6. Asset Overview

You selected, 6. Asset overview

TOP ASSET NUMBER 1 BY PRICE

```

name           : 42-coin
symbol         : 42
market cap     : 2676760.0
price          : 63732.45
circulating supply : 42 42
volume24hr     : 3080.0
change1hr      : 2.39%
change24hr     : 65.91%

```

```

change7d      : 18.61%
TOP ASSET NUMBER 2 BY PRICE
name          : Project-X
symbol        : NANOX
market cap    : 1665.0
price         : 21273.84
circulating supply : 0 NANOX *
volume24hr    : 29.0
change1hr     : 18.27%
change24hr    : 4.01%
change7d      : 15.9%
TOP ASSET NUMBER 3 BY PRICE
name          : yearn.finance
symbol        : YFI
market cap    : 4.08125766E8
price         : 13618.85
circulating supply : "29,968 YFI *"
volume24hr    : 2.97636628E8
change1hr     : 2.68%
change24hr    : -2.45%
change7d      : -13.52%
TOP ASSET NUMBER 4 BY PRICE
name          : RSK Smart Bitcoin
symbol        : RBTC
market cap    : 4716200.0
price         : 12509.8
circulating supply : 377 RBTC
volume24hr    : 62014.0
change1hr     : 0.41%
change24hr    : 3.17%
change7d      : -0.5%
TOP ASSET NUMBER 5 BY PRICE
name          : The Tokenized Bitcoin
symbol        : imBTC
market cap    : 0.0
price         : 12233.88
circulating supply : ? imBTC *
volume24hr    : 3364995.0
change1hr     : 2.81%
change24hr    : 4.51%
change7d      : 6.94%
TOP ASSET NUMBER 6 BY PRICE
name          : Huobi BTC
symbol        : HBTC
market cap    : 5.8817448E7
price         : 12227.74

```

```

circulating supply : "4,810 HBTC *"
volume24hr       : 0.0
change1hr        : 1.9%
change24hr       : 4.32%
change7d         : 6.85%
TOP ASSET NUMBER 7 BY PRICE
name             : Wrapped Bitcoin
symbol          : WBTC
market cap      : 1.304154519E9
price           : 12212.79
circulating supply : "106,786 WBTC *"
volume24hr       : 8.7405727E7
change1hr        : 1.9%
change24hr       : 4.31%
change7d         : 6.84%
TOP ASSET NUMBER 8 BY PRICE
name             : Bitcoin
symbol          : BTC
market cap      : 2.25970487355E11
price           : 12199.63
circulating supply : "18,522,731 BTC"
volume24hr       : 3.46577063E10
change1hr        : 1.82%
change24hr       : 4.2%
change7d         : 6.71%
TOP ASSET NUMBER 9 BY PRICE
name             : Bitcoin BEP2
symbol          : BTCB
market cap      : 6.0824652E7
price           : 12162.12
circulating supply : "5,001 BTCB *"
volume24hr       : 14953.0
change1hr        : -3.49%
change24hr       : 5.93%
change7d         : 7.09%
TOP ASSET NUMBER 10 BY PRICE
name             : renBTC
symbol          : RENBTC
market cap      : 3.08411186E8
price           : 12116.89
circulating supply : "25,453 RENBTC *"
volume24hr       : 1.2597091E7
change1hr        : 3.2%
change24hr       : 3.32%
change7d         : 5.67%
Assets: 2483

```

Trades: 767

7. Trade Overview

```
OP TRADE NUMBER 1 BY VOLUME
  name      : BTTUSDT
  price     : 2.997E-4
  price change : 1.38E-5
  price change % : 4.827%
  volume    : 1.0803865408E10
  count     : 6951.0
TOP TRADE NUMBER 2 BY VOLUME
  name      : WINUSDT
  price     : 8.17E-5
  price change : 2.6E-6
  price change % : 3.287%
  volume    : 8.651143199E9
  count     : 8009.0
TOP TRADE NUMBER 3 BY VOLUME
  name      : BTTTRX
  price     : 0.01136
  price change : 9.0E-5
  price change % : 0.799%
  volume    : 1.7317750467E9
  count     : 5183.0
TOP TRADE NUMBER 4 BY VOLUME
  name      : WINTRX
  price     : 0.00309
  price change : -3.0E-5
  price change % : -0.962%
  volume    : 1.166388851E9
  count     : 3559.0
TOP TRADE NUMBER 5 BY VOLUME
  name      : VETUSDT
  price     : 0.01028
  price change : 6.31E-4
  price change % : 6.54%
  volume    : 9.04301149E8
  count     : 34251.0
TOP TRADE NUMBER 6 BY VOLUME
  name      : WINBNB
  price     : 2.84E-6
  price change : 0.0
  price change % : 0.0%
  volume    : 8.87818538E8
  count     : 4881.0
```



```

TOP TRADE NUMBER 7 BY VOLUME
  name      : TRXUSDT
  price     : 0.02643
  price change : 0.00105
  price change % : 4.137%
  volume    : 6.836642243E8
  count     : 35881.0
TOP TRADE NUMBER 8 BY VOLUME
  name      : RSRUSDT
  price     : 0.01169
  price change : 6.9E-4
  price change % : 6.273%
  volume    : 5.543434074E8
  count     : 27661.0
TOP TRADE NUMBER 9 BY VOLUME
  name      : BTTBNB
  price     : 1.045E-5
  price change : 1.6E-7
  price change % : 1.555%
  volume    : 5.38619843E8
  count     : 6391.0
TOP TRADE NUMBER 10 BY VOLUME
  name      : IOSTUSDT
  price     : 0.004912
  price change : 2.43E-4
  price change % : 5.205%
  volume    : 5.2335653E8
  count     : 10754.0
Assets: 2483
Trades: 767

```

8. Save Data

serialization not functioning

9. Exit

Exiting program...

Future Work

Matrix

Class Diagram

Class Descriptions

Justification

References