REUSABLE WEB DESIGN PATTERNS FOR ONLINE DERIVATIVES TRADING

Prof. P. Niranjan  
Head, Dept. of CSE,  
Kakatiya Institute of Technology & Science,  
Warangal, A.P. INDIA  
npolala@yahoo.co.in

Dr. Jayadev Gyani  
Head, Dept. of CSE,  
Jayamukhi Institute of Technology & Sciences,  
Narsampet, A.P. INDIA  
jayadevgyani@yahoo.com

P. Shireesha  
Assistant Professor,  
Kakatiya Institute of Technology & Science,  
Warangal, A.P. INDIA  
rishapakala@yahoo.co.in

ABSTRACT

Design patterns are gaining popularity because they support modifiability and flexibility of designs. Design patterns are solutions to frequently recurring problems in design. Reverse engineering of source code primarily focuses on the software architecture. Understanding software architecture in terms of design patterns simplifies the process of identifying some key properties such as coupling, flexibility and maintainability. This paper presents a novel approach to extract design patterns using structural metrics of object-oriented programs. It involves two steps. In the first step, structural metrics are extracted from the source code. In the second step, these metrics are matched with the properties of structural design patterns of Gang-of-Four to identify a design pattern. Our approach is demonstrated by extracting design patterns from a Java program using our pattern extraction tool.

Keywords: Design pattern, extraction, structural metrics, matching

1. INTRODUCTION

Online share trading mainly deals with selling and buying of shares electronically. Online share trading is categorized into two types. One deals with the equity trading and the other deals with derivatives trading. Our focus is on derivatives trading. Online derivative trading involves share broker, stock exchange and customers. Share broker is responsible for opening the new account for the user and providing the interface to the user for trading. Stock exchange maintains a list of shares along with their prices. Companies that are registered with the stock exchange can only be traded. Most often, this list expands to involve new companies. Derivative trading is of two types. One is future trading and the other one is option trading. A derivative contract expires at a specified date in a month after which it will not exist. In both the cases the number of shares to be traded is fixed and it is called a “lot size”. For performing trading, necessary fund can be transferred to the trading account using online fund transfer. Whenever the necessary amount is to be withdrawn it can be done through payment request. We propose six design patterns for online derivative trading namely derivative search, derivative lot size, derivative buy/sell,
payment request, online fund transfer and derivative watch list. All these design patterns are user interface design patterns and they can be conveniently implemented in any scripting language.

2. RELATED WORK

The concept of design pattern was conceived by Christopher Alexander in the field of urban architecture in 1970’s and was recently adapted for object-oriented software. In this field a catalogue of design patterns has been successfully defined and shared among software developers. Moreover several software patterns have been defined which concern different aspects of design and specific application domains.

Alexander proposed a description template for design patterns that included the name, the problem statement, the context, the forces, the solution, the resulting context, the rationale and the related patterns. In 1987, Ward Cunningham and Kent Back, while designing user interfaces with the programming language Smalltalk, suggested small catalogue of five patterns for novice programmers[2].

Major progress in design patterns was presented as a catalogue in [3]. A pattern language for online auctions management was suggested in [8]. Few online shopping process patterns were suggested in[5]. A pattern language for online share trading was suggested in[9]. Sharing design patterns as a means for reusing design experience can be defined as a communication paradigm. Patterns enhance communication between designers by providing a sharing vocabulary [1]

Web design patterns evolved from the software engineering idea of pattern and have been adapted by the hypermedia community to off-line and on-line hypermedia applications. Reusing other designer’s experience is useful in improving the productivity of development in other words “reuse consists in taking advantage of any of the efforts done for previous works to reduce the needed effort to achieve a new one” [4]. Few navigational patterns were suggested in [7]. Few e-commerce design patterns were suggested in [10].

The main benefits of using web design patterns are quality of design, time and cost of design and time and cost of implementation [6].

3. PROPOSED WORK

3.1 Design patterns for online derivatives trading

We propose six design patterns for derivatives trading which are essential interface designs namely derivative search, derivative lot size, derivative buy/sell, payment request, online fund transfer and derivative watch list.

3.2 Derivative search
Context
Online derivatives trading deals with the buying and selling of derivative contracts of various companies. A derivative contract implies selling and buying of shares with a fixed multiple quantity called lot size. These contracts can be traded at a premium without paying full amount. To know the current premium levels of a script there should be user interface for derivatives searching.

Problem
How can a derivative contract be searched?

Forces
- There will be several companies in derivatives trading.
- There will be several contracts even for a single company.

Solution
Details of all contracts will be maintained in a remote database. User will be asked to select or enter the details of company name, strike price, type of contract and expiry date. Entire database will be searched for finding the contracts.

Example
This pattern is available in many trading sites. For example in www.kotaksecurities.com the user finds a contract as shown in Figure 1.

![Figure 1 Internet Trading](image-url)
Consequences

- The user can find a contract very easily instead of looking at all the contracts one after the other.
- It is very useful to look at the contract details at the earliest because the price variation will be too high in stock markets.

Implementation

User interface can be developed in any scripting language and the database will be stored in a remote server.

Related Patterns

The Derivative watch list pattern is another way of looking at a contract.

3.3 Derivative lot size

Context

In derivatives trading, all the contracts are made with a fixed quantity of shares called lot size. These lot sizes are fixed based upon the total trade value. The concerned authorities make changes to the lot sizes whenever required. This information must be immediately reflected in the website so that the user can check by looking at the lot size before trading.

Problem

How the customer knows about the lot size of a company?

Forces

- It is necessary to look at the lot size to know the trading limits.
- Lot sizes can vary after some time period.

Solution

Lot sizes of all companies are to be stored in a database. Whenever the user requests for this information, display it to the user.

Example

This pattern is available in many trading sites. One such example is taken from www.kotaksecurities.com. It is shown in Figure 2. For the first company ABB, the minimum tradable lot size is 200.

Figure 2 Kotak Securities
Consequences
• User can guess the trade limits by looking at the lot size. The trade value is lot size*price of the stock.
• User can use it as a ready reference instead of remembering all of them.

Related Patterns
It is used before derivative buy/sell pattern.

3.4 Derivative buy/sell
Context
When the user watches the contracts he may be interested in buying or selling of such contract. In this case a user interface with buying and selling option must be provided.

Problem
How the user can able to trade a derivative contract?

Forces
• An interface must be provided for selling or buying of derivative contracts.
• Expiry date of contract, price, lot size, company name must be taken in to consideration.

Solution
Provide the user with the option of selecting a company name, number of lots and price and contract type. When the user makes a selection confirm it and store in the order book database for trading possibility.

Example
This pattern can be found in many trading sites. One such site is [www.kotaksecurities.com](http://www.kotaksecurities.com). It is shown in Figure 3. The current contract is for the company SATYAM for a call option.

![Figure 3: Trading Site](image)

Consequences
• User can sell or buy derivative contracts.
• The trading limits are set based on the user account balance.
3.5 Payment request

Context
It is often required by the user to request for the profit that he makes in trading. A user interface for such request is necessary to simplify the pay out process.

Problem
How the user’s pay out request can be taken?

Forces
- User should able to request for money from his account.
- Online requests will take less time to process.

Solution
Provide the user interface for accepting required amount and to the required bank account. Store the details and prepare a cheque.

Example
Pay out process is an essential part of trading. It can be seen in many web sites. For example in [www.kotaksecurities.com](http://www.kotaksecurities.com) this pattern is implemented as shown in Figure 4.

![Figure 4: Request for Money repayment option](https://i.imgur.com/3J5.png)

Consequences
- It saves time because of direct communication.
- It can be used as a reference in future.
- There is surplus balance in the trader’s account.
3.6 Online fund transfer

**Context**
User should be able to transfer funds from his bank account to the trading account. It is very common for the traders to transfer funds.

**Problem**
How the fund transfer request from the user can be taken?

**Forces**
- There must be a user interface for taking the request of fund transfer.
- Transfer time should be as less as possible.

**Solution**
Provide the user interface for getting the details of amount to be transferred and the bank account. Use the bank’s payment gateway to transfer the funds.

**Example**
Fund transfer is an efficient and fast method of transferring the funds. It can be seen in many web sites. For example in www.kotaksecurities.com this pattern is implemented as shown in Figure 5.

![Figure 5: Method of transferring the funds](https://arade.kotakstreet.com - Online Payment - Microsoft Internet Explorer)

**Consequences**
- It saves time by avoiding cheque clearance delay.
- The balance can be immediately reflected in the traders trading account.

3.7 Derivatives watch list

**Context**
It is often useful for the user to look at all the contracts of a company in one view. It helps the user in understanding the bullish or bearish trend of the script in the stock market.
Problem
How the user will be given the information about all the contracts of a company?

Forces
• User would like to look at all the contracts of a company.
• It reflects the trend of a company.

Solution
Provide an interface for selecting a script and retrieve the details of all the contracts of that company and display it the user.

Example
Many websites are providing using this pattern. One such example can be seen in www.nseindia.com which is shown in Figure 6.

All contracts of TATA STEEL

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<tr>
<th>Instrument Type</th>
<th>Underlying</th>
<th>Expiry Date</th>
<th>Option Type</th>
<th>Strike Price</th>
<th>High Price</th>
<th>Low Price</th>
<th>Prev Close</th>
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Figure 6 NSE India

Consequences
• User can compare all the contracts in one view.
• User can understand the trend of a company by observing all the contracts.
4. CONCLUSIONS AND FUTURE WORK

The proposed interface patterns are very useful in understanding and implementing online derivative trading websites. These are addressing the major issues of online derivatives trading. We are working on mining some more design patterns in online derivatives trading. We would like to develop a complete pattern language for online derivatives trading.

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