Web Portal for
Professional Financial Services

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Abstract. The financial services industry offers great opportunities both for the investors and for the companies providing services to the investors. Most of the existing Web sites offer similar services such as stock/index/options quotes, markets overview, most active issues, etc. On other side, there are various tools for technical analysis, charting, and stocks screening. The paper presents a newly developed *Web portal for Professional Financial Services* called *MFinance* that offers for the retail investors the services mentioned over. It provides a detailed explanation of the business cases and the essential functionalities of the portal and the way of their realization based on Java server-side technologies. Special attention is dedicated to the definition and evaluation of trading strategies and to stock screening based on these trading strategies.

1. Introduction

There are many Web sites offering financial services to retail and institutional investors. Almost every brokerage firm operates its' own Web site and offers online trading and other online services [1, 2]. The financial services industry offers great opportunities both for the investors and for the companies providing services to the investors. Speculating in the stock markets is very popular in the United States and Europe, where the number of retail investors (i.e., online traders) is increasing every year. The demand for services offered to the retail investors is also growing.

Most of the existing Web portals offer similar services. For the stock market the investors can find similar information on almost every financial Web site, such as stock quotes, index[1] quotes, markets overview, indices news [3], most active issues, etc. As well, there are some stock screening tools and community services like message boards, chat, financial/investor clubs, events, investment games, etc.

On other side, there are various tools (most of them not available on-line) for technical analysis, charting, online research and stocks screening [1, 3, 4]. Based on our personal experience as retail investors, we develop a *Web portal for Professional Financial Services* called *MFinance* that offers services rear to be found on any other existing financial Web site and, in the same time, very useful to the retail investor. The traditional market overview and stock trading simulation is combined with some technical analyses via Web typical for advanced desktop tools. For the moment, the portal includes managing user's profiles,

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[1] An index is a single descriptive statistic that summarizes the relative change in an underlying group of variables [3]

definition and evaluation of trading strategies, strategies stock screening, and E-mail and wireless alerting.

The paper is focused mainly to the stock screening based on user's trading strategies and its implementation based on Java server-side technologies. After a review of modern stock trading simulations and technical analysis indicators, it provides a description of functionalities for user definitions of stock market screens based on custom trading strategies. For the purpose of defining custom trading strategies, the system allows the usage of predefined set of technical indicators like simple moving average, exponential and weighted moving averages, and candlestick patterns. Screens are executed at the back office system at the end of the trading day. For every stock that triggers a buy/sell signal, the user receives an e-mail or SMS alert. Finally, the paper presents the software architecture of MFinance and technologies used for its development.

2. Functionalities of financial tools

2.1. Simulated stock trading via Web

There are various Web site offering customers simulated stock trading. Users are able to create and manage virtual portfolios. In order to be realistic and useful for the retail investors, user portfolios follow a lot of requirements. The portfolio summary contains as well the beginning cash value, the current market value of the assets, and the percent of return on the investment, and the S&P 500[2] or other benchmark [3, 4] return. The position on the portfolio may include: name/ticker of the asset, trade date, quantity of shares, cost and current price, current value, percent change, percentage of equity and option to close the current position.

Normally, users are able to retrieve stock quotes, place orders in a particular portfolio, review executed trades, their history and the portfolio performance. Orders are executed by a back office system. Positions are managed and updated by the back office system. The back office system uses real-time or delayed market data delivering stocks' quotes values in a reasonable timeout. After confirmation, the back office executes the order (at real-time prices) and place the position is the respective portfolio. Portfolios are evaluated every time it is presented to the user.

2.2. Technical analysis and off-line analysis tools

The *technical analysis* itself is a form of market analysis that studies demand and supply for securities and commodities based on trading volume and price studies. Using charts and modeling techniques, technicians attempt to identify price trends in a market. Technical analysis tools provide markets indicators such as trading range (the difference between the high and low prices traded during a period of time), trend line (a line drawn that connects either a series of highs or lows in a trend), etc. Among the most popular technical methods used in desktop tools available today, there are:
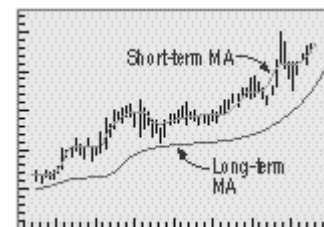

Fig. 1: Simple moving average

[2] The S&P 500 Index consists of 500 stocks chosen for market size, liquidity, and industry group representation [4]

➢ moving averages – the Moving Average (MA) is a mathematical procedure to smooth or eliminate the fluctuations in data and to assist in determining when to buy and sell [1]. MA's emphasize the direction of a trend, confirm trend reversals and smooth out price and volume fluctuations or "noise" that can confuse interpretation of the market (fig. 1), the sum of a value plus a selected number of previous values divided by the total number of values

➢ MEM (Maximum Entropy Method) - both a tool for spectrum analysis and a method of adaptive filtering and trend forecasting

➢ candlestick patters - they are to be found on candlestick charts (fig. 2), where the high and low are plotted as a single line and are referred to as shadows. The price range between the open and the close is plotted as a narrow rectangle and is referred to as the body. If the close is above the open, the body is white, otherwise it is black

➢ stochastic methods - the raw stochastic is computed as the position of today close as a percentage of the range established by the highest high and the lowest low of the time period you use

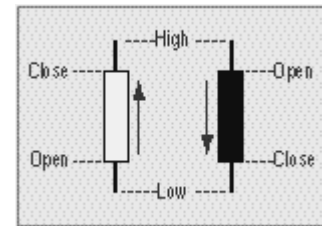Fig. 2: Candlestick charts

➢ others

The strength of the tools for technical analysis is used by investors and technicians on their attempt to identify price trends in a market [5, 6]. Unfortunately, such powerful tools as those of MarketPlayer.com are not available on the Web. Our goal was to develop a financial portal offering both simulating stock trading and services like stock screening and, of course, market reviews. Next, there are discussed the functionalities of this portal.

3. Financial services of MFinance

3.1. Management of user profiles

In the financial portal, user profiles are used for identification and for customization purpose. Users can register for the services offered. The system maintains profiles for each user. Users are able to update the information stored in the profile. A single user is able to manage multiple portfolios. Users can delete existing or create new portfolio at any time.

Fig. 3 presents view of a sample stock screening portfolio management. As stated before, users can have more than one portfolio. The logged user has defined three portfolios with normal types - one frozen and two with active status. The user has clicked on the link of the last portfolio called bb20020206 and now has its view in the bottom of the figure. The bb20020206 portfolio contains only one finance symbol scanned for all the 61 candlestick patterns available in the portal. The user can edit this portfolio by clicking on the link bellow - he can add/delete/update symbols and patterns.

3.2. Simulated stock trading

The stock trading simulation is implemented in accordance with the principles stated in 2.1. Users may retrieve stock quotes (reviewing the market), define orders, check pending orders, and review executed trades, gains/losses and trades history.
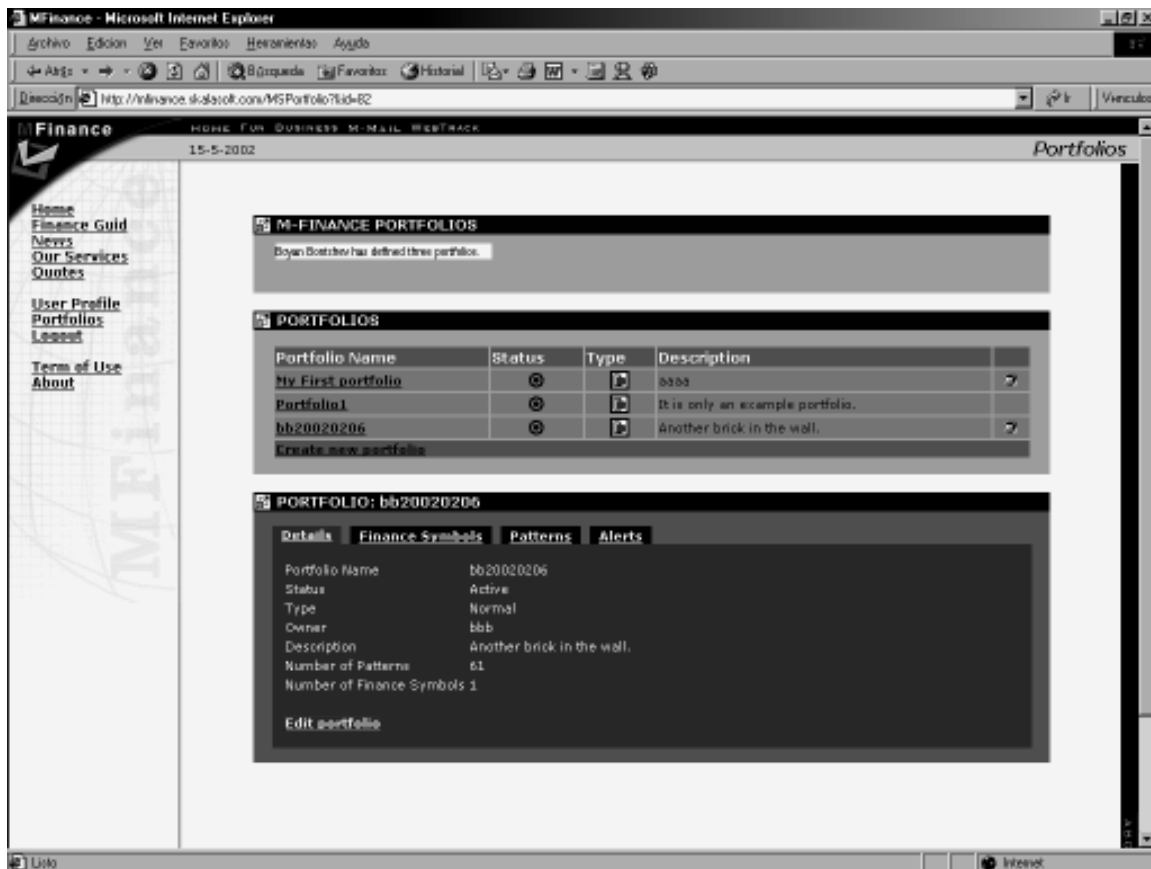
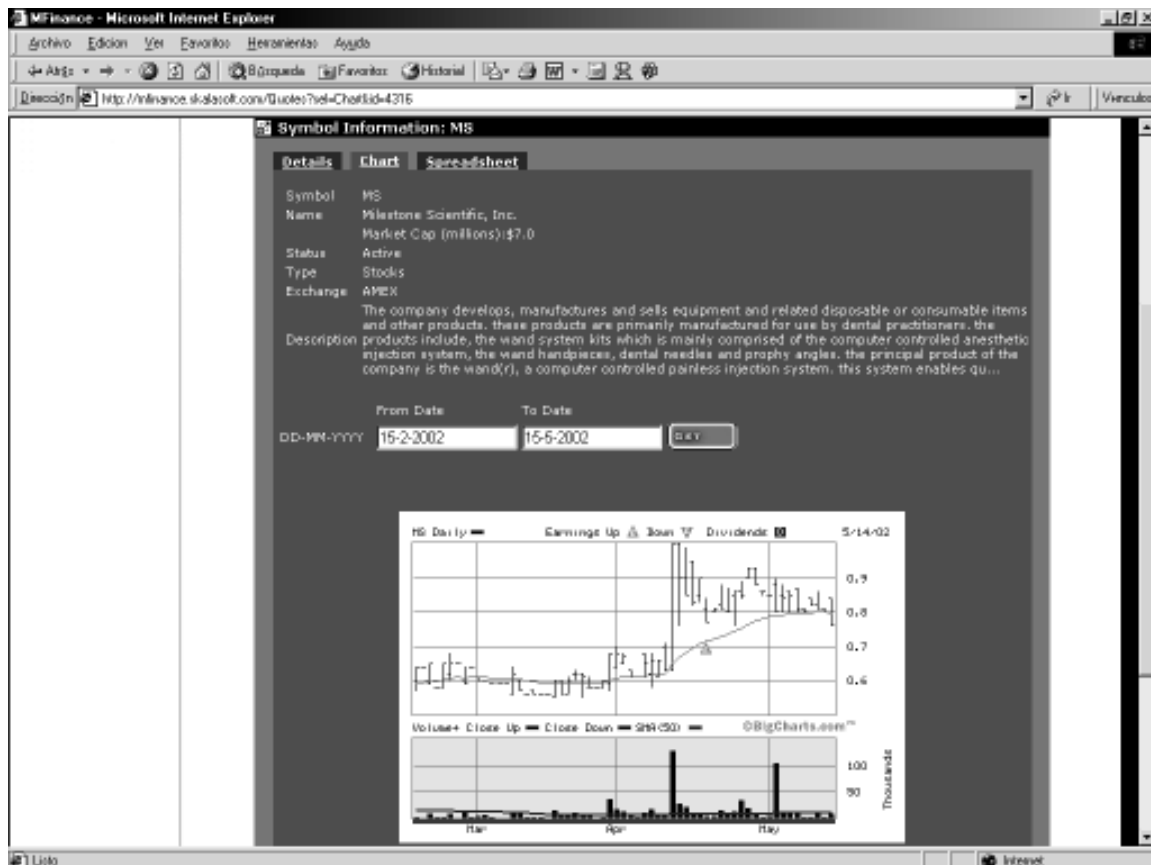Fig. 3: Sample stock screening portfolio management

Fig. 4: Historical charts of a stock symbol

While doing simulated stock trading users can consult any historical data about symbol quotes and volumes in order to be assisted in taking their decisions. Fig. 4 shows a view of historical data of the MS stock symbol of NYSE including its status, type, description and closes/simple moving average charts and the volume chart, for a given period. Users can view historical data as charts or as spreadsheets.

More interesting than the stock trading simulation are the stock screening services, as they can be used for a successful stock trade. The stock screening services allow to analyze market symbols and to issue a signal to the user, when given symbol matches a selected trading strategy. Such a signal can be used to trigger a sell/buy order in a simulated or real stock trade.

3.3. Stock screening based on user's trading strategies

While there are a lot of stock/bonds/funds on-line screeners based on some criteria's like share price, performance, profitability, etc. [6], our stock screener is based on trading strategies screening. Thus, the user is able to define stock market screens based on predefined or custom trading strategies. Screens are executed by the back office system at the end of the trading day. For every stock that triggers a signal the user receives an e-mail or SMS alert. Users may select candlestick patters from a pattern list (the link Patterns in fig. 3) and use them as a set of predefined trading strategies. Users apply these strategies to set of symbols (the link Finance Symbols in fig. 3) and evaluate the strategy performance. Single strategy can be evaluated against a set of symbols and companies should be rated on the performance of the strategy. Another approach is to use a set of strategies against a set of (or single) symbols. In both the cases users receive alerts (e-mails or SMS) issued when a chosen symbol matches a selected strategy (i.e., a candlestick pattern). They can review their alerts using the link Alerts (fig. 3). Fig. 5 shows one of all the 61 predefined patterns available for symbol screening. When adding this pattern to the portfolio (through the link Patterns in fig. 3), users can see its trend, name, way of identifications, definition and chart.

Moreover, users can define their own custom strategies. For the purpose of defining custom trading strategies the system allow the usage of set of technical indicators like Simple Moving
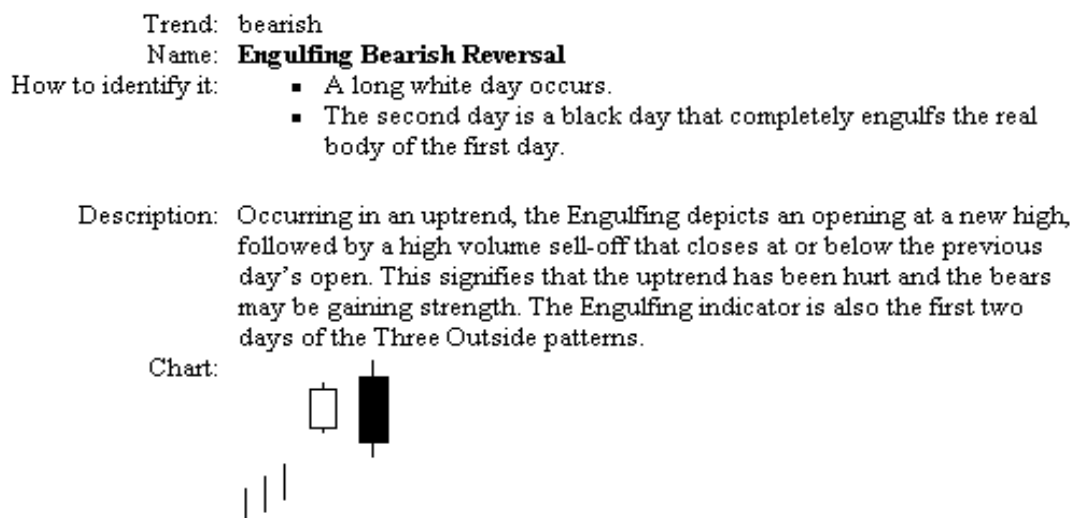

Trend: bearish
Name: **Engulfing Bearish Reversal**
How to identify it:
- A long white day occurs.
- The second day is a black day that completely engulfs the real body of the first day.

Description: Occurring in an uptrend, the Engulfing depicts an opening at a new high, followed by a high volume sell-off that closes at or below the previous day's open. This signifies that the uptrend has been hurt and the bears may be gaining strength. The Engulfing indicator is also the first two days of the Three Outside patterns.

Chart:

Fig. 5: The Engulfing Bearish Reversal candlestick pattern

Average (SMA) - see fig. 1, Exponential[3] and Weighted[4] Moving Averages (EMA and WMA), and candlestick patterns. Custom trading strategies are evaluated the same way as the predefined strategies - against a set of symbols, or the entire market. Once developed by the user, a strategy can be tested in the simulated stock trading.

4. MFinance software architecture

4.1. Architecture overview

The software architecture of our financial portal includes two main subsystems: a candlestick pattern scanner and the Web portal application itself. They communicate each other through a common Oracle database. As well, the portal application invokes through a scheduler a pattern scanner for download symbol quotes from Internet free financial sites. After each download, the pattern scanner proceeds with screening the symbols based on the chosen strategies (candlesticks patterns). Both download and symbols screening are executed after a predefined timeout. MFinance users manage their portfolios, do a simulated stock trading and explore historical data and charts using any modern Web browser. The portal application has an alert deliverer, which sends SMS or/and e-mail messages to the interested users. The global architectural view of the MFinance is given in fig. 6.
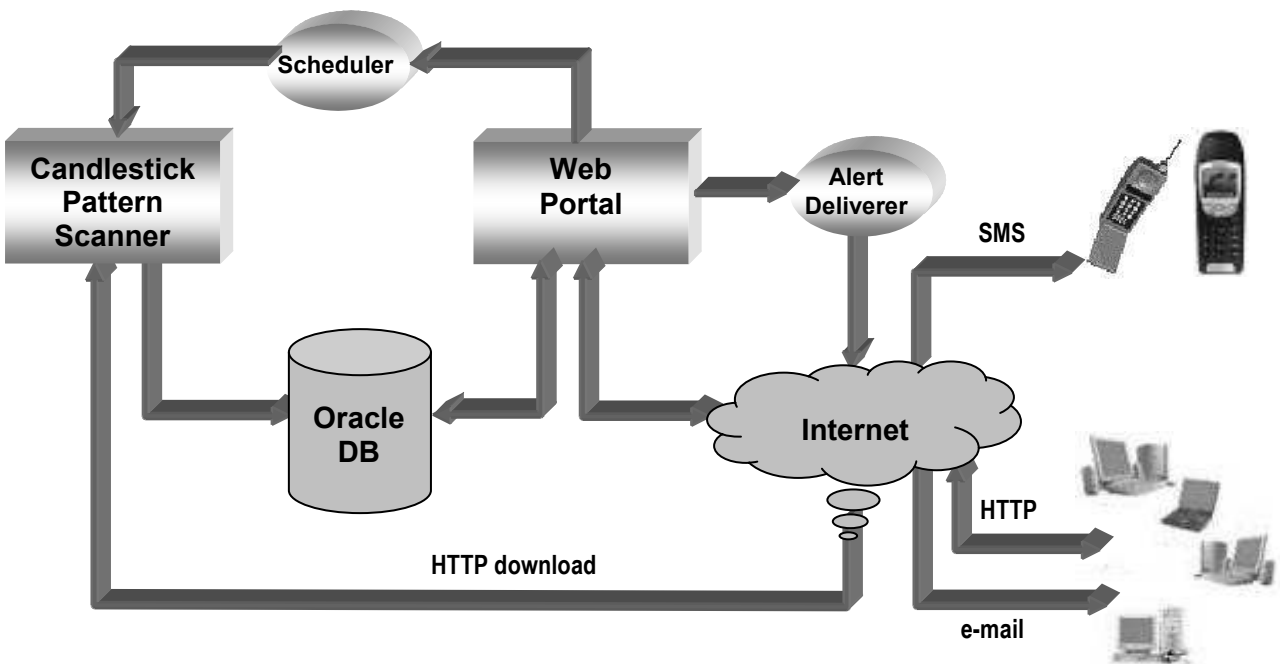

Fig. 6: The overall software architecture of MFinance

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[3] The EMA for day D is calculated as: $EMA_D = \alpha PR_D + (1-\alpha)EMA_{D-1}$ where PR is the price on day D and alpha is a smoothing constant $(0 < \alpha < 1)$. Alpha may be estimated as 2/(n+1), where n is the simple moving average length. Another form of the formula is $EMA_D = EMA_{D-1} + \alpha(PR_D - EMA_{D-1})$

[4] WMA is a moving average that puts more weight on recent prices. A three-day weighted moving average would add a multiple of 1 to the first date, 2 to the second date and 3 to the third date.

4.2. The candlestick pattern scanner

The candlestick pattern scanner is a backend subsystem based on the Java 2 Standard Edition platform. The scanner is a multithreaded Java system (fig. 7), where inter-process communication is implemented by means of IBM TSpace [7, 8]. TSpace is a Java communication middleware, which enables communication between applications and devices in a network of heterogeneous operating systems, and provides group communication services, database services, and event notification services.

   The architecture of the candlestick pattern scanner uses publisher/subscribe paradigm. The downloader retrieves regularly quotes from free Internet servers, then parses and publishes them into the TSpace and stores them into the database. The candlestick patterns are subscribed for quotes and try to match asynchronously any quote published by the Publisher. In case of successful match, the correspondent pattern publishes an alert into TSpace. The Publisher Callback is subscribed for receiving alerts, thus, it is called asynchronously (through an EventListener) from the TSpace each time when an alert is published into the TSpace. It stores the alert into the database.
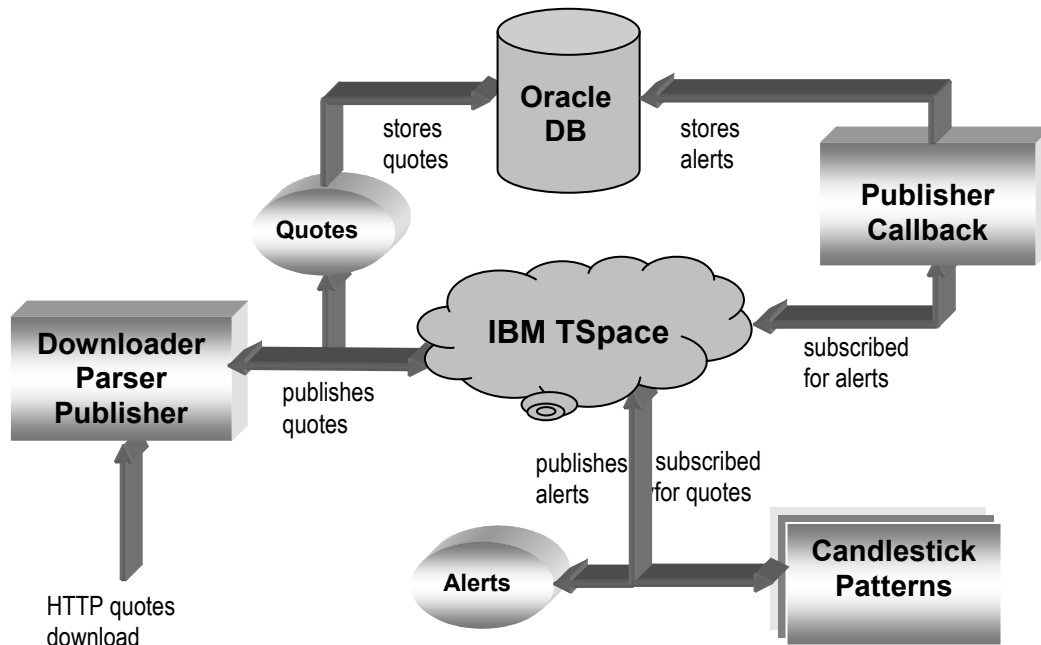

Fig. 7: The candlestick pattern scanner architecture

4.3. The Web portal architecture

Java server technologies like servlets, JSP (Java Server Pages) and EJB (Enterprise Java Beans) are widely used for creation of to interactive Web pages because of the advantages of Java as a programming language. The Web portal follows the MVC pattern [9], i.e. separation of the *data model* (relational DB, file system, etc.) from the *controller* (a dispatcher servlet) and from the presentations (i.e., the JSP *views*). The mapping between the action specified in the HTTP request and its correspondent action handler is provided by XML configurations files. The action handlers access request, session and application contexts and, based on that

information, verify the user input and invoke business components to perform certain operations for that action [10]. The business components have access to the data model through a persistency manager and to a resource pool through a resource manager.

Finally, the dispatcher calls correspondent view handler with its specific parameters using again mapping information (action-view handler) from the configuration file. In case of error or unexpected situation the dispatcher forwards the control towards a different view handler. The view handler invokes a JSP, which populates data from the beans on proper positions. JSP is not aware where data comes from, i.e. it does not make any difference between database values and internationalization strings read from property files.

5. Summary

The work for creation of the MFinance portal was started in order to provide customers with two main services: market overview, simulated stock trading and advanced stock screening. The simulated stock trading allows customers to execute virtual trades and monitor the performance of their trading strategies. Retail investors will have a plenty of benefits from using the advanced stock screening services. Users can define and program their own trading strategies. Strategies can be back tested against a particular stock or against a set of stocks. Stocks can be ranked based on performance for a given strategy. The system performs market screening and sends alerts to the customers automatically via e-mail or on a mobile device.

For the future, the system will provide output from back testing the strategy - historical trades, and charts with the historical trades. Users will test their investment strategies on the simulated stock trading.

The provider of the services can benefit from subscription fee for the services offered. Most of the services should be offered for free, but the alerting should be offered only to subscribed users. There could be entry for stock competition games, that will award winners with cash prizes. The Web site can be operated by online stock brokers. The product can be offered both to the retail investors and online brokerage firms.

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