Workshop on Context Modeling and Decision Support

Modeling and Adapting to Contexte Changes: Case of Stock Market Decision Making

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Outline

1. Context awareness in financial decision making
2. An illustrative example
3. Context Aware Systems characteristics
   - pervasiveness
   - instability
4. Hedging as pervasiveness
5. State Space Model for instability
6. Design and implementation framework
7. Proposed Architecture
8. Concluding Remarks
1 - Context awareness in financial decision making

No mention of financial
• Deep Knowledge and common sense
2 - An illustrative example

[Graph showing stock price movement over a period from Feb 3 to May 4]
3 - Context Aware Systems characteristics

- pervasiveness
- instability
3. Current System Architecture

StockMarket (pricing and News) → Internet (Market or simulated Random Data) → Optimization agent → Investor DM → Data Base → Discretionary Display

- Risk profile Awareness
- Multi-Agent System
- Central Integrator (VB)
- Knowledge Based Agent
- Expert KB
- Strategies (kb)
- Strategies set Awareness
- Trend model Awareness
Financial analysis approaches

- Technical analysis: historical data
- Fundamental analysis: expected performance
- Sentimental analysis:
Awareness of Risk preferences of investors

- Arbireragist:
- Speculator:
- Hedging: risk control using options
1.3 Option Based Strategies

- **Covered Call**
  - Market Outlook: Bearish to Bullish
  - Risk: Safer to Riskier
  - Reward: Limited to Unlimited

- **Long Put**
  - Market Outlook: Bearish to Bullish
  - Risk: Safer to Riskier
  - Reward: Limited to Unlimited

- **Short Straddle**
  - Market Outlook: Bearish to Bullish
  - Risk: Safer to Riskier
  - Reward: Limited to Unlimited
Context Market data and News

- Real time data
- Simulated market with Random in VB
- News Before session begins from
  - expert
  - specialized bulletin boards
- Economic data announcements
Central Integrator

- Negotiation Agent or
- Coordination Agent or
- Integration agent

- Technology used: VRS KB Shell
2 An Illustrative extreme example
3 - Context aware systems

Many definitions

Situational awareness can be used to reduce the amount of explicit input a person is required to give a computer. Contextual information of what and where the user task is, what the user knows, and what the system capabilities are, can greatly simplify the user scenario.
4 – The issues of pervasiveness

The term ‘pervasive’ introduced first by Mark Weiser in 1991 [38] refers to the seamless integration of devices into the users’ everyday life.

Appliances should vanish in the background to make the user and his tasks the central focus rather than computing devices and technical issues.

“The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it.”

Pervasive systems can be generally described as proactive, highly dynamic context-aware and adaptive systems.
5 : Context : the issue of instability

Context state trajectory

\[ R_i = (a_1^R < \text{required }>, a_2^R < \text{required }>, \ldots, a_N^R < \text{optional }>) \]

Operators: \( \cap \cup \in \neg \notin \ldots \)
Assessing the context stability in tolerable fluctuation regions

Transition areas between context spaces

Transition to B

Transition to C

Space A

Space B

Space C
An approach for estimating stability

A dynamic boundary computed for the context state ($B_u$ and $B_l$).
Applying control actions when the boundary is crossed

Predicting instability based on the context state velocity and acceleration

$$dS_t = S_t - S_{t-1}$$
$$d^2 S_t = dS_t - dS_{t-1}$$

The need to add sensitivity according to distance from boundary

Attribute’s acceptable region maximum value

Attribute’s acceptable region minimum value
Experimental Run in the sensor-based pervasive scenario

Estimating instability - switched filter and unpredictable changes

Switched Filter

Boundary estimate

Kalman Filter

Switched Filter

True values
Context Stability and Boundary

<table>
<thead>
<tr>
<th>Event Date</th>
<th>Oscillator</th>
<th>Close at Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar 31, 2005</td>
<td>Long-term KST, Bearish</td>
<td>$3.24</td>
</tr>
<tr>
<td>Mar 28, 2005</td>
<td>Momentum, Bearish</td>
<td>$7.29</td>
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<tr>
<td>Mar 23, 2005</td>
<td>Momentum, Bearish</td>
<td>$7.20</td>
</tr>
<tr>
<td>Mar 23, 2005</td>
<td>Short-term KST, Bullish</td>
<td>$7.20</td>
</tr>
<tr>
<td>Mar 17, 2005</td>
<td>MACD, Bullish</td>
<td>$7.25</td>
</tr>
</tbody>
</table>

ELN-Elan Corp Ads  Bollinger Bands(20,2)  8.33, 6.21

Volume millions

05  Feb  Mar

0  60  120

contextos
Technical Analysis Methods

- long term or short term pattern formations
- indicators based on moving averages
- oscillators
7- Design and implementation framework
8 – Concluding remarks

• Are Context Aware Systems pertinent for Stock Market Portfolio Optimisation?
• Is complete automation acceptable as a pervasive property?
• Does the new architecture outperforms the market?