

Overview of UMIE2002

April 8th, 2002 Version

UMIE2002 System Operational Committee

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1. Introduction

This document describes the details of and how to participate in the U-Mart International Experiment 2002 (UMIE2002). The latest version of this document is available at <http://www.u-mart.econ.kyoto-u.ac.jp/umie2002/>.

2. What is UMIE2002?

The U-Mart project has successfully held two domestic open experiments as contests of trading agents in Japan (Pre U-Mart 2000 and U-Mart 2001), and possibility of this approach is confirmed. The U-Mart system is also used as an effective education tool both in schools of economics and computer science in several universities in Japan.

Based on the above experience, we have decided to have an international open experiment of the U-Mart: "U-Mart International Experiment 2002(UMIE2002)" at CASOS2002 Conference held in Carnegie Mellon University in June 2002. Our web site is: <http://www.casos.ece.cmu.edu/conference2002/index.html>.

The aims of this experiment are:

- (1) to share an artificial market system as a common test bed for agent-based simulation,
- (2) to share variation of trading strategies, and methodologies for developing them for artificial market study, and
- (3) to know complex behavior of the market consisting of agents having various trading strategies.

The UMIE2002 calls for participation of trading software agents. With submitted agents, a demonstrative contest is held at the site of the conference. Also, the committee carries out

intensive experiments with the submitted agents for various market situations in advance, and the results are reported at CASOS2002 conference.

Furthermore, all the codes and documents of the submitted agents also will be shared by all the participants for further study on the artificial market.

3. Time Schedule

April 8th 2002

Publish Overview of UMIE2002

Start distributing the agent development kit (umie2002sdk)

April 21st 2002

Release the additional kit for contest and developing.

April 30th 2002

Release the network-capable development kit

May 1st – 20th 2002

Entry (Deadline of an additional entry: end of May)

June 21st – 23rd 2002

CASOS 2002 Conference at CMU

Distribution of the report & Demonstration

4. How to participate in UMIE2002

4.1 How to obtain Overview of UMIE2002

Download Overview of UMIE2002 from U-Mart Web page (<http://www.u-mart.econ.kyoto-u.ac.jp/umie2002/>), or request it via mail to umie2002@u-mart.econ.kyoto-u.ac.jp

4.2 How to obtain the agent development kit

Apply for agent development kit(umie2002sdk) from <http://www.u-mart.econ.kyoto-u.ac.jp/umie2002/kit/>. This requires your name, company (or institution), job title, address, telephone, facsimile, e-mail address, and desired obtaining method.

You receive an e-mail that notifies how to obtain the kit. It is available as e-mail attachment or HTTP download. The file size is about 1.71MB.

umie2002sdk.tgz for UNIX user

umie2002sdk.zip for Windows user

Your application for the agent development kit is automatically assumed as preliminary entry for UMIE2002, and your e-mail address is registered with our mailing list(umie2002-tech@u-mart.econ.kyoto-u.ac.jp) to exchange technical and general information.

* The development kit is available from April 8th 2002 to May 20th 2002.

4.3 Entry

To make an entry, follow the instruction on the entry form at <http://www.u-mart.econ.kyoto-u.ac.jp/umie2002/entry/>, and provide entry information, source codes of your agents (TestStrategy.java and the related codes), and explanatory documents of the agents. The format of the document is XML style text and PDF or PostScript format (US Letter or A4, one page or more for each agent), The XML FORM and sample of the explanatory documents are included in the additional kit of a distribution schedule on April 21st, 2002.

* Entry must be made between May 1st and May 20th 2002.

* The provided source codes and explanatory documents are opened to the public with the results of experiments. Note that the license for the source codes and the documents are complied with Open Source Document. See Appendix B for the details of the license.

5. Formation of Team and Agents

Entry should be made by a team of at least one person. A person cannot belong to more than one team. The entries from one team are limited to ten agents. Each agent is allowed to adopt different strategies, or all of them can adopt the same strategy with different parameter settings. While whole agents can adopt the same strategy and the same parameter setting, only one agent is allowed to participate in Experiment 1. In Experiment 2, 2', 2'', 3, and 3', the alliances between attended agents are not prohibited. Evaluation is made by each agent and by each team.

* We do not guarantee the proper operation of alliances.

* Note that Experiment 2', 3, and 3' are conducted only with selected agents.

6. Attended agents

The agent must be developed as TestStrategy.java (and its sub-classes) with "u-mart-standalon-1_3" contained in the agent development kit (umie2002sdk). The class name is assigned to each team at the entry.

To develop a network-capable client agent, use your TestStrategy.java and "for-real-u-mart-

1_3" contained in the network-capable development kit.

A client agent that independently implements SVMP is not accepted for UMIE2002. However, from technical and academic point of view, it is welcomed in network demonstration held the network demonstration session at CASOS2002.

7. Initial values of the experiments

The initial setting of U-Mart in UMIE2002 is as follows (basically compliant with Pre U-Mart 2000 and U-Mart 2001):

Trading period: 60 days,

Itayose: four times a day,

Membership fee: none,

Commission charges: none,

Underlying securities: J30,

Initial cash in hand: 1,000,000,000 yen,

Contract amount: one unit of contract amount is 1,000 times of J30,

Margin money: 300,000 yen for one unit of position,

Limit of loan from the exchange: 30,000,000 yen, and

Interest rate of the loan: 10% per annum, daily payment.

Spot data:

We use four series of spot data: ascending, descending, reversal, and oscillation series.

The data is not disclosed until the experiment is completed.

Patterns of experiments:

1) Pattern 1 (for Experiment 1, 2, 2' and 2'')

Beginning of experiment

Initialization of agents

Ascending series: repeated 50 times

Initialization of agents

Descending series: repeated 50 times

Initialization of agents

Reversal series: repeated 50 times

Initialization of agents

Oscillation series: repeated 50 times

Calculate of experiment

End of experiment

2) Pattern 2 (for Experiment 3 and 3')

Beginning of experiment

Initialization of agents

Ascending, descending, reversal, and oscillation series are randomly executed 1,000 times

Calculate of experiment

End of experiment

8. Evaluation of agents

Agents should be evaluated based on multiple indicators after repeating sufficient number of times with multiple patterns of spot data. We evaluate agents by finding Pareto-based ranking with multiple indicators. See Appendix A for the algorithm of Pareto-based ranking. The program that calculates ranking is included in the additional kit of a distribution schedule on April 21st, 2002.

Number of times: $N_g=200$ (for Experiment 1, 2, 2' and 2'') or $N_g=1000$ (for Experiment 3 and 3')

Evaluation indicators: $N_f=4$

f1: maximum bottom line profit

f2: average of bottom line asset

f3: bankruptcy ratio (the number of times the agent go into bankruptcy)

f4: ratio of making profit (the number of times the agent make bottom line profit)

Gentlemen's rules:

It is desirable to follow the rules stated below, although they are not the criteria of evaluation:

1) Agents should make transactions positively. It is desirable to place orders around 10 % of entire transactions.

2) Agents should make transactions commensurate with its asset situation. It is desirable to manage its position. Avoiding bankruptcy leads to better evaluation.

We also evaluate and analyze the volume of transaction or the traded volume of the market, although they are not used for evaluation of agents.

9. Experiments

The standard set of agents which is used in an experiment and documents are included additional kit of a distribution schedule on April 21st, 2002.

9.1 Experiment 1

1) Composition of agents:

Each attended agent + standard set of agents

1 attended agent

Standard set of agents :

2) Pattern of experiment: Pattern 1

3) Outputs:

Logs of whole simulations: standard output of each simulation for every data series

Spot data used in the experiment

Composition of agents

Records of every transaction

Analysis results of the logs (data for ranking)

List of bottom line assets: for each data series + for whole data series

f1: maximum bottom line profit

f2: average of bottom line asset

f3: bankruptcy ratio (the number of times the agent goes into bankruptcy)

f4: ratio of making profit (the number of times the agent makes bottom line profit)

Ranking of each item □ Pareto ranking □ rank for preliminary round

Price fluctuation, traded volume, statistic and quantitative analyses for asset situations (optional)

Analysis notes, comments (optional)

* Definition of the qualified agent in preliminary round:

the agent whose bankruptcy ratio (f3) is less than 10% in Experiment 1.

9.2 Experiment 2

1) Composition of agents:

All attended agents + standard set of agents

Attended agents:

Team 1

Agent 1
:
Agent 5
Team 2
:
Standard set of agents:

2) Pattern of experiment: Pattern 1

3) Outputs: same as Experiment 1

* Alliances between attended agents are not prohibited.

9.3 Experiment 2'

1) Composition of agents:

Qualified agents + standard set of agents

Attended agents:

Team 1

Agent 1

Team 2

Agent 3

:

Standard set of agents:

:

2) Pattern of experiment: Pattern 1

3) Outputs: same as Experiment 1

* Alliances between attended agents are not prohibited.

9.4 Experiment 2''

1) Composition of agents:

Agents of the team on which all the qualified agents cleared Experiment 1 +
standard set of agents

Attended agents:

Team 1

Agent 1

:

Agent 5

Team 2

:

Standard set of agents:

:

2) Pattern of experiment: Pattern 1

3) Outputs: same as Experiment 1

* Alliances between attended agents are not prohibited.

9.5 Experiment 3

1) Composition of agents:

Randomly selected agents from attended agents and standard set of agents.
50 % of whole agents are selected.

2) Pattern of experiment: Pattern 2

3) Outputs: same as Experiment 1

* Alliances between attended agents are not prohibited.

9.6 Experiment 3'

1) Composition of agents:

Randomly selected agents from qualified agents and standard set of agents. 50 %
of whole agents are selected.

2) Pattern of experiment: Pattern 2

3) Outputs: same as Experiment 1

* Alliances between attended agents are not prohibited.

10. Demonstration session in CASOS 2002

1) Demonstration

We demonstrate U-Mart in CASOS 2002. This demonstration is conducted via network

using our network server, so we welcome the participations of human agents (GUI clients) and network-capable machine agents.

2) Report of experimental result and awarding

We report the experimental result in CASOS 2002. The attended agents and their strategies are evaluated technically and academically based on the explanatory documents and UMIE2002 System Technology Committee offers the special prizes to remarkable agents. This prize may be offered to the agent that does not achieve good results. The report of the experimental result is distributed to all of the participants.

11. Others

The development kit for network-capable agent (including GUI client for human agent and related documentations) will be released by the end of April 2002. This kit enables simulation on LAN and human gaming simulation.

We will also provide a wrapper program to represent outputs from stand-alone server graphically.

12. About license

The license of this document is complied with Open Publication License. The programs developed by U-Mart project are complied with MIT license.

The attended agents in UMIE2002 and their explanatory documents are opened to the public for the limited use for academic purpose and they are complied with Open Source License.

13. Contacts

Secretariat of UMIE2002

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Appendix A. Algorithms of Pareto-based Ranking

1. Multi-purpose evaluation of agents

This method evaluates agents based on the result multiple indicators under multiple experimental conditions such as price data, agents attended in the group, institution of the market. The simulations are conducted N_g times under each experimental condition. The evaluation indicators are:

f1: the maximum bottom line profit among N_g times of simulations,

f2: the average of bottom line asset in N_g times of simulations,

f3: the ratio of times that the agent does not go into bankruptcy within N_g times of simulations, and

f4: the ratio of times that the agent make bottom line profit within N_g times of simulations.

Each agent is given a numeric number called "rank" under each experimental condition. The rank is calculated with Pareto-based ranking. Since the smaller number of rank is better, the evaluation score of each agent is given as a sum total of reciprocals of the ranks.

2. Pareto-based ranking

Pareto-based ranking is a method proposed by Goldberg to apply genetic algorithms to multi-purpose optimization problems.

It assumes that the agent A dominates the agent B if A is superior to B on every evaluation indicator. When no agent dominates an agent within a group of agents, the agent is defined as the Pareto optimum agent.

Based on this concept, the Pareto-based ranking algorithm is composed as below:

<<Pareto-based Ranking>>

1. Set rank $r = 1$.

2. Select all of the Pareto optimum agents from the group of agents, give them the rank r , and remove them from the group.
3. Set rank $r = r + 1$.
4. Repeat step 2 and 3 until every agent is ranked.

3. Algorithm of multi-purpose evaluation

The algorithm of multi-purpose evaluation is as below:

<<Multi-purpose evaluation of agents>>

1. Define N_c pieces of experimental conditions, N_f pieces of evaluation indicators, and the times of simulations N_g conducted per an experimental condition.
2. Conduct N_g times of simulations under each experimental condition and rank the agents for each environment using Pareto-based ranking. Each agent gets N_c pieces of ranks.
3. Calculate the evaluation score of each agent by adding up the reciprocals of the N_c pieces of ranks, and then place them in the order based on their evaluation scores.

Appendix B: License

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