Nomadic Beer Game on Computer Networks

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Abstract
Beer Game is one of famous business games. Indeed, it is played or learned in many universities, graduate schools, and company trainings. This game's original version requires a game board and some pieces which are substitutes for real beer boxes or bills in the original version. After that, computer versions have been already produced. The original version provides the learning environment with reality, and the computer version offers the self-learning environment. Nevertheless, facilitators still want additional improvements; this game should be easily installed, run quickly, provide a real competition environment and have no influence on installed computer. Thus, users expect "Nomadic Beer Game environment," because this game is used in a short period or part of one seminar. Existing software can partly meet such expectations. However, there is no software implemented whole these functions. This research project analysed Beer Game users' expectations and composed software meeting their needs is constructed.

1. Introduction

Beer Game is a business game which provides a learning environment of systems, supply chains, and queuing theories [2]. In addition, it is one of famous contributions of System Dynamics to the real society. Many universities, graduate schools, and company trainings use actually this business game in classes. Participants of games experience difficulties and learn feedback loops' influence from gaming.

This game was originally released as a board game by System Dynamics researchers in Massachusetts Institute of Technology (MIT) [1]. It is instructional and stimulates

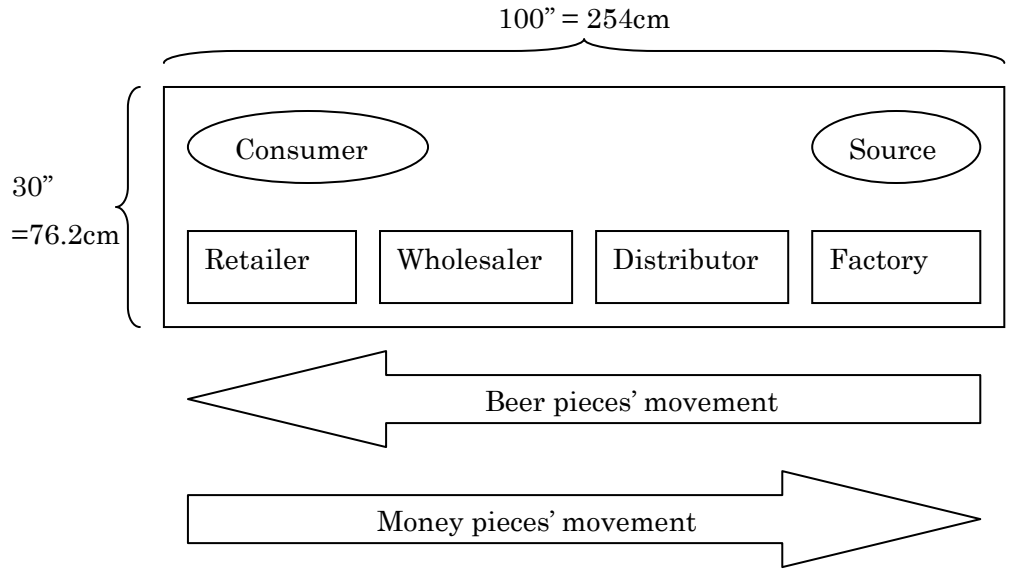


Figure 1: Game board sample size

Drawn by the authors based on System Dynamics Society's WWW page [6]

participants' interests. Indeed, the board game style effectively attracted learners' attention. The game board is large (figure 1) and has many pieces. These characteristics are needed to carry out participation of plural people (4 or more) in games.

However, these characteristics are not convenient when facilitators carry game sets. Firstly, Beer Game is mainly used in part of whole lecture series or temporary seminar; professors tend not to use this game every week in an academic term. Therefore, the portability of game sets is expected. The large board and many pieces do not meet this expectation. Secondly, large space for open the game board is required. Thirdly, 4 or more people must participate in order to do the game following the original rule. It is sometimes difficult to gather game participants especially in in-company training.

The computer version of Beer Game released by David Simchi-Levi and Phil Kaminsky can clear these points of inconvenience. This runs on Microsoft Windows computers. Users can always experience after the software is installed. Of course, it does need no space to open it, and preparation and clearing up game sets before or after gaming. These characteristics solved the problems about portability and space. Teachers or facilitators simply and merely have to take participants to computer rooms the same as other computer training. In addition, this program also provides "participants." Users have to choose what role they want to be. Therefore, users can learn by themselves without arrangements with their colleagues to play the game. This characteristic solved the third problem.

Nevertheless, teachers and students who were involved in this research found a new

problem caused by the convenience which the computer version provides “teammates.” Users feel less excited than the board game style. Interactions among participants seem to stimulate each participant’s concentration. Since this game is an educational material, the decline of concentration should be avoided.

After the release of the computer version, Michael Li and David Simchi-Levi released the Internet World Wide Web (WWW) version [2]. It provides plural people participation. In addition, it can also provide virtual member the same as the computer version. Therefore, the above-mentioned problem is solved in this version. In addition, Jörg Nienhaus also released The Beer (Distribution) Game on the Internet [7].

However, using these network version services, new problems or expectations appear. In order to use these network versions, all terminals which participants operate have to connect special servers computer in which facilitator programs are running. These servers are installed in fixed places so that the distance between participants’ terminals and the servers influence response speed. In addition, since the condition of the Internet influences gaming environments, users cannot always expect to use it without any problem. More important problem is that many computers, especially in companies, cannot connect to outside computers, including these servers, because of security reasons. Since Beer Game activities are temporary, it is inappropriate to change organizational computer security policies.

In order to meet whole expectations mentioned above, this research project releases portable Beer Game environment named “Nomadic Beer Game on Computer Networks.”

2. Methods

Expected functions or specifications of “Nomadic Beer Game” are listed below.

- Participants operate their clients and a facilitator, judge and scoring functions are implemented in a server.
- When players are less than 4 people, a server program can provide “virtual players.”
- In order to keep portability, software size is limited under 1.44 Mbytes (2HD floppy disk’s capacity).
- As a transaction protocol, TCP/IP is used for the general network environment; transactions are possible across routers.
- In order to assist participants to communicate with one another, both server and client programs have a chatting function.
- Market demand can be controlled by a human facilitator.

Other specifications are the same as the Internet version Beer Game.

Methods how to implement these specifications in the server and client can be variously suggested.

Concerning the server, one possibility is to be implemented as a tiny Hyper Text Transfer Protocol (HTTP) server (World Wide Web server). It would be associated with Common Gateway Interface (CGI) or Java Servlet. This method produces larger size programs than 1.44MB. Other media but floppy disks can be used. However, flash memories have a limitation of frequency of access, and other media (and corresponding devices) are not generally installed in most computers. Neither point is suitable for server storage.

Regarding the client, not stand-alone application software but Java applets can be selected. However, Java Runtime Environment's version is not always consistent in an organization so that there can be computers which cannot run such applets.

As consideration above, this project chose the stand an alone style for both server and client programs.

3. Implementation

In order to implement the Nomadic Beer Game software, this project used Borland Delphi and built a server and client programs as Microsoft Windows 32 bit application software.

The specifications shown in previous section are fully implemented. The size of the server program is 1.21 MB, and the client program's size is 1.11 MB. These sizes are less than 1.44MB (2HD floppy disk's capacity).

The user interfaces of the server and client programs are shown in figure 2 (server) and 3 (clients), which are images at launched time.

When games start, each player operates the client program in order to place an order of beer boxes and ship beer boxes every week (time unit). The interface for this is shown in figure 4.

After gaming, all players' results should be confirmed in order to deepen their own understanding. Both server and client programs report the total results of current gaming shown in figure 5. Using DDE of the operation system, detailed data can be carried to software which can make graphs or apply statistical analyses.

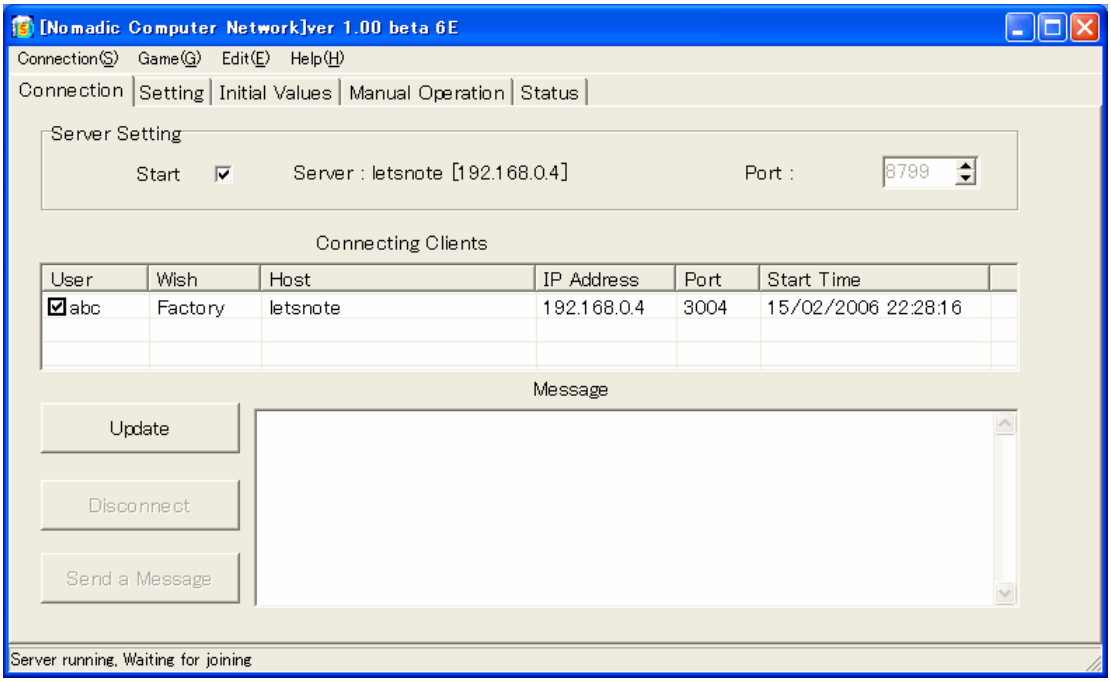


Figure 2: Server's user interface.

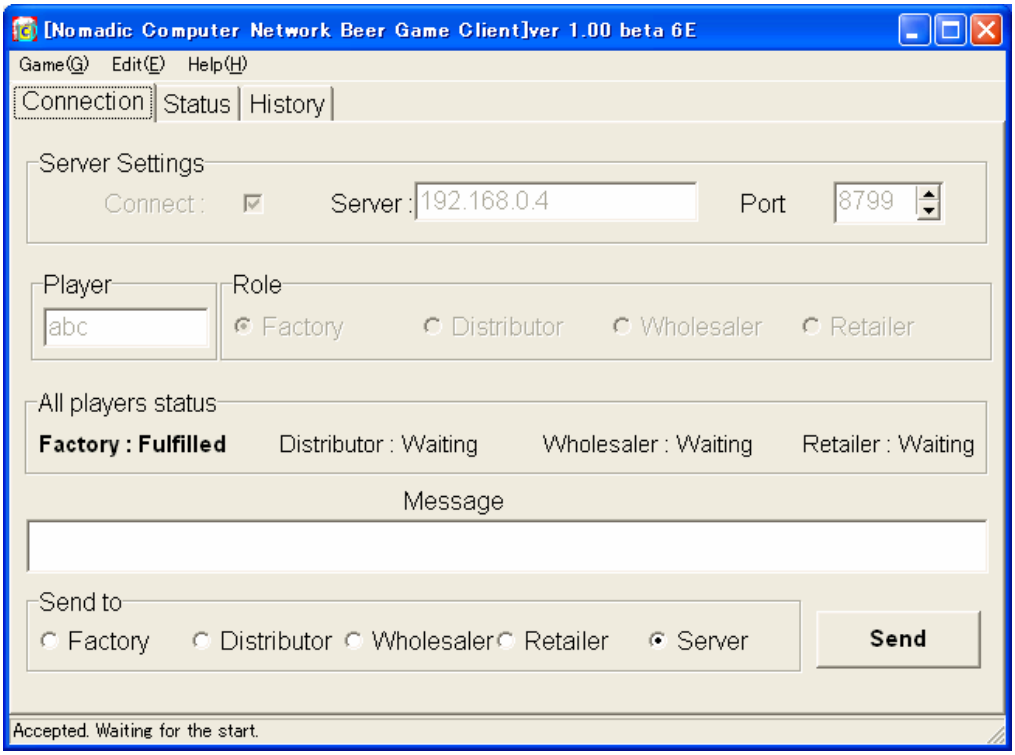


Figure 3: Client's user interface

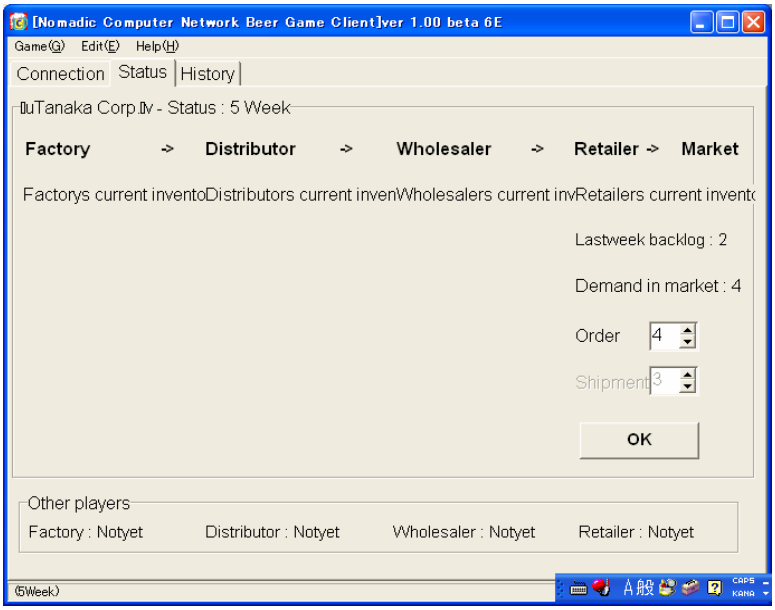
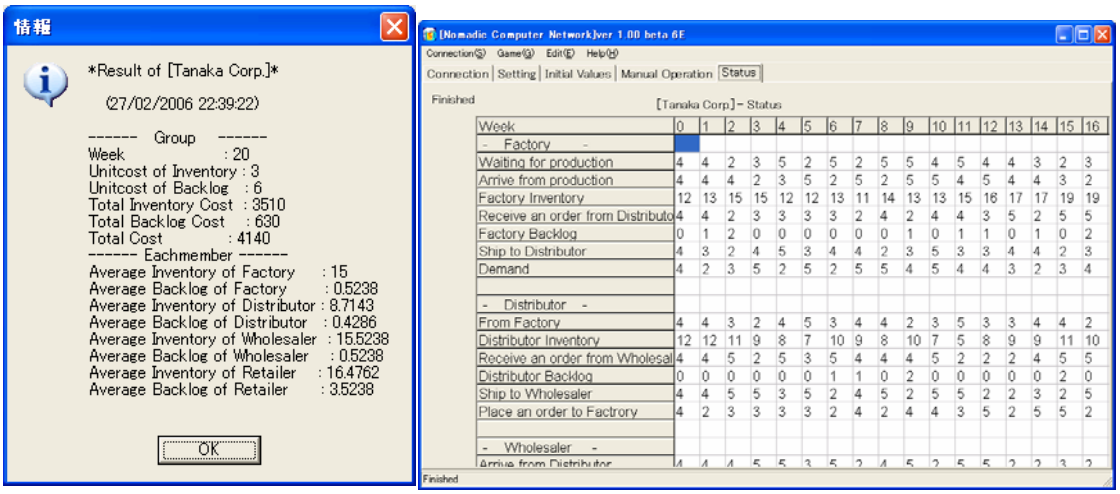


Figure 4: The Client program window during play time



Player's result window Server's detailed record

Figure 5: The result window

All settings are controlled by users through Graphical User Interface. Settings relating related to game progress is controlled only by the server program. Teachers or facilitators can adjust the degree of difficulty using it.

In addition, teams which consist of supply chains are distinguished by IP addresses and port numbers of server. Therefore, the server's location is freely determined. This can realize the workload distribution of facilitator functions implemented in the server program.

4. Discussion

These server and client programs have been practically used in a university under graduate classes of which a member of this research project has been taken charge. As a result of use, these merits are reported.

- Students can concentrate on progress of games compared with other versions, because their operation is easy and their action is quick.
- It is convenient where software installation by users is not permitted.
- Students can play games anywhere after the class. It stimulates students' interest.
- Stability is the most important merit for teachers in classrooms.
- When a server and a client run on the same machine simultaneously, players can use them as self-learning environment like existing computer version Beer Game.
- Like existing computer versions, scoring and synchronization is automatic so that students can indeed devote themselves to gaming.

On the other hand, demerits are especially not found. However, it is possible that there is scope for improvement of the client program in order to realize complete portability. In this stage, users have to go to computer facilities in order to use these programs. In particular, companies, not schools, do not have sufficient computer environment for Nomadic Beer Game on Computer Networks. Most of them have their own computers and networks, but, such computers are not for learning; if a participant does not use a computer, other employee uses it. In order to solve this problem, it is possible to make client software not for computers but for mobile phones. It can provide computer-free but computer aided Beer Game environment.

Note: Nomadic Beer Game on Computer Networks can be freely downloaded from 2006 System Dynamics Conference Proceedings' site.

References

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