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Metaverse-based Economic Data Providing Platform

Tae-Yang Kim[1]

Abstract

This study relates to a system for providing a metaverse platform in which the weather changes according to the situation of the stock market. In more detail, it is to be provided with information related to the stock investment and to perform economic activities within the metaverse space. Also, it relates to a system for providing a metaverse platform that allows the weather in the metaverse space to fluctuate according to the situation of the stock market so that the situation of the stock market can be understood more intuitively. The system for providing a meta-verse platform in which weather changes according to the situation of the stock market is largely composed of two parts which are a meta-verse interface and a main server. First, the metaverse interface part consists of motion, avatar, and space generator. Specifically, the motion generator generates user motion information according to a signal received through a user terminal possessed by the user. The avatar generator generates a moving avatar in association with the user motion information. The space generator generates a virtual metaverse space in which at least one avatar is displayed and displays the generated space on the user terminal. Second, the main server includes object creation, investment index identification, and weather change modules. The object creation module generates a plurality of objects to be displayed and processed on the metaverse space. The investment indicator identification module sets investment indicators including domestic stock price trends, including rising, falling, and sideways, based on the 5-day moving average for the Korean stock market comprising the KOSPI and KOSDAQ. Finally, the weather change module serves to differentially adjust the amount of precipitation for the area near the object displayed in the metaverse space according to the investment index.

Keywords: *Saving Literacy, Ability to Repay Debt, Knowledge Transfer, PLS-SEM*

INTRODUCTION

Virtual reality, augmented reality, and mixed reality technologies applied with computer graphic technology are being applied and developed in various fields. We have created various computer-mediated virtual environments including social networks, video conferencing, virtual 3D worlds (e.g., VR Chat), augmented reality applications (e.g., Pokemon Go), and Non-Fungible Token Games (e.g., Upland) [1]. Virtual reality technology refers to a technology that creates a virtual space that does not exist in the real world using a computer and makes the virtual space feel like reality. Augmented reality or mixed reality technology is a technology that expresses information generated by a computer on top of the real world, and refers to a technology that allows interaction with a user in real time by combining the real world and the virtual world. Among them, augmented reality and mixed reality technologies are being used in combination with technologies in various fields such as broadcasting technology, medical technology, game technology, and so on. It is common in everyday life to see the weather map change naturally next to a weather caster who makes a weather forecast on TV, or to insert an advertisement image that does not exist in the stadium as if it actually exists in the stadium during sports broadcasts. In particular, these augmented reality and mixed reality technologies are being implemented and provided as various application services with the advent of smart phones. In fact, among the existing systems, it provides context awareness (CA), a groupware service, in real time in a metaverse-based network environment so that users can feel a realistic immersion through Avatar and personal communities, and It also discloses a service technology that enables various activities like reality in space. However, in the case of the above-described prior art, there is a limitation in that only various activities are provided in the metaverse space, but the content related to a specific subject is not provided in the metaverse space. Therefore, in order to solve the above-mentioned problems, a system capable of performing various investment and economic activities in the metaverse space in connection with a specific topic such as economic activity is required. Moving from a set of independent virtual worlds to an integrated network of 3D virtual worlds or Metaverse rests on progress in four areas: immersive realism, ubiquity of access and identity,

[1] Daejin University, Gyeonggi, Korea. (Corresponding Author/ E-mail: tyknnc@daejin.ac.kr)

interoperability, and scalability. For each area, the current status and needed developments in order to achieve a functional Metaverse are described [2]. At the same time, there is a need to develop a metaverse platform providing system in which the weather changes according to the stock market situation, which further enhances immersion by providing effects according to market conditions.

The system covered proposes three main purposes in this study. First, this system is to perform investment and economic activities in the metaverse space and provide environmental changes in the metaverse space according to the economic and market conditions so that the investment situation can be grasped at a glance. Second, it enables the users to engage in revenue generation and consumption activities in the metaverse space. Finally, this study presents a model that visualizes market conditions and investor sentiment.

MATERIALS & METHODS

The system proposed in this study is largely composed of two parts which are a meta-verse interface and a main server. First, the metaverse interface part consists of motion, avatar, and space generator. Specifically, the motion generator generates user motion information according to a signal received through a user terminal possessed by the user. The avatar generator generates a moving avatar in association with the user motion information. The space generator generates a virtual metaverse space in which at least one avatar is displayed and displays the generated space on the user terminal.

Second, the main server includes object creation, investment index identification, and weather change modules. The object creation module generates a plurality of objects to be displayed and processed on the metaverse space. The investment indicator identification module sets investment indicators including domestic stock price trends, including rising, falling, and sideways, based on the 5-day moving average for the Korean stock market comprising the KOSPI and KOSDAQ. Finally, the weather change module serves to differentially adjust the amount of precipitation for the area near the object displayed in the metaverse space according to the investment index.

The investment index includes attributes including the domestic trend and the trend of other countries including rising, falling and sideways based on the 5-day moving average of the stock market of neighboring countries, the conservatism and reliability index for stock investment. The main server includes a user index identification module, which includes a user index identification unit that receives remuneration and reliability indices from users based on surveys, and a user index identification unit that sets user investment indicators based on domestic trends, neighboring country trends, and user reliability indicators. It also includes an average identifier for the average value of each of the conservative and reliability indices input from multiple users, a trend identifier for the long-term trend of the domestic and neighboring stock markets, and a comparison index for the comparison and comparison of user indicators. In addition, the weather change module is characterized by a function of differentially adjusting the precipitation to the area near the object displayed in the metaverse space according to the height and low of the comparison value.

The attributes mentioned above include objective indicators including domestic trends and trends in neighboring countries, and subjective indicators including conservatism and reliability indicators. The comparison determination module includes a length correction unit that variably processes the length of the extension line corresponding to the attribute included in the subjective index according to the attribute weight set for the subjective index.

Figure 1 is a conceptual diagram showing the schematic configuration of this system. Referring to FIG. 1, a metaverse platform providing system in which the weather changes according to the situation of the stock market includes a user terminal and a main server.

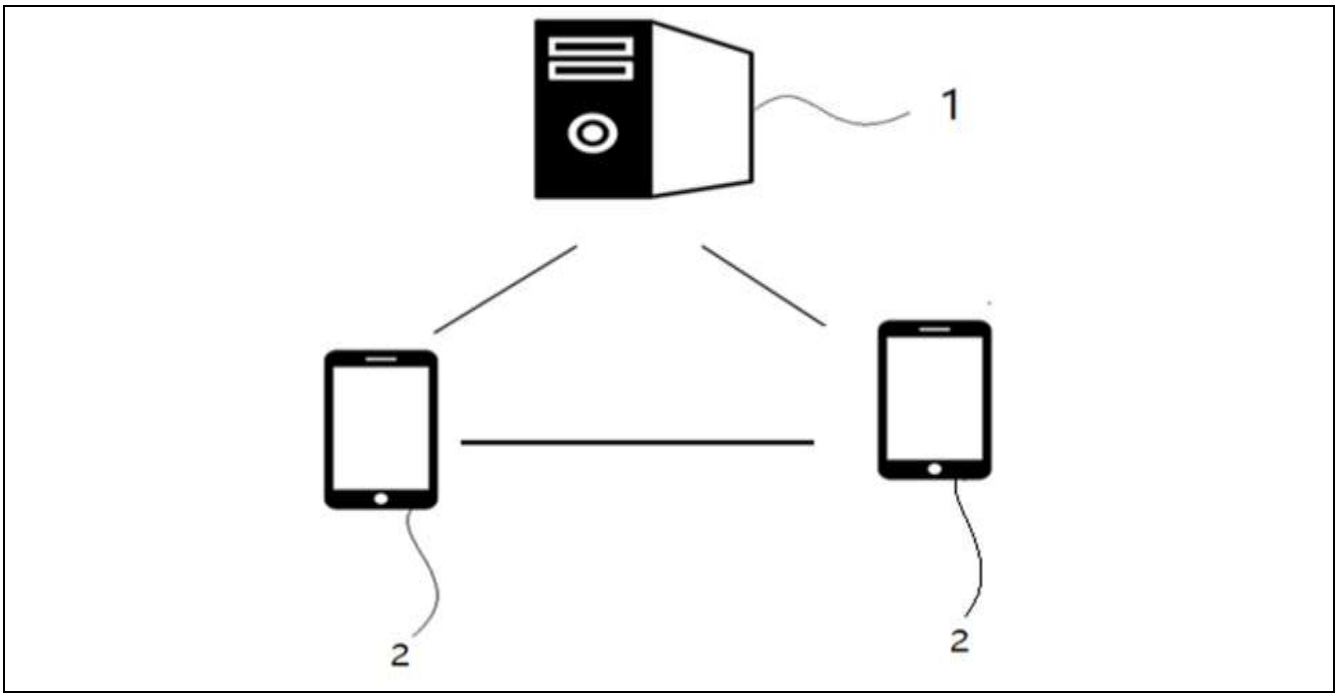

Figure 2. Conceptual Diagram for the overall system

The user terminal 2 has a screen on which the generated metaverse space is displayed, and the user terminal 2 may be a smartphone, a tablet PC, a desktop computer, a laptop, or the like. The user terminal 2 has a screen on which the generated metaverse space is displayed, and the user terminal 2 may be a smartphone, a tablet PC, a desktop computer, a laptop, or the like. Furthermore, the user terminal 2 basically includes a touch screen itself, or includes a mouse or other input tools, enabling signal input. In other words, it includes a means for generating a signal that is the basis for generating motion information for moving an avatar or changing a gaze in a metaverse space. In addition, the terminal possessed by the user is referred to as the user terminal (2), but an expert who meets the investment advisory requirements also has the user terminal 2, so the expert can access the metaverse space. In this case, it goes without saying that the user terminal 2 possessed by the expert may be referred to as the expert terminal 3 in order to distinguish it from the user terminal 2.

The main server 1 serves as a management for the metaverse interface that creates the metaverse space, while also manage the objects generated in the metaverse space and control the weather of the metaverse space. In other words, the subject of the metaverse platform providing system may be the main server. The main server (1) can be said to be the subject of implementing the system, and unless otherwise stated, the system and the main server (1) are considered to be the same in this study. The main server 1 is a series of subjects for implementing the present system and includes a server PC and a network communication network. In addition, the main server (1) can run this software by installing programs, or software, that can be performed on the central processing unit on a hardware base with central processing units (CPUs) and storage means such as memory and hard disks. A series of specific configurations for such software are modules, unit, part, and so on.

This module, unit, interface, or part refers to a configuration of software or hardware such as FPGA or ASIC that runs through CPU and memory while being installed and stored in the storage means of the main server 1. In this case, each configuration of them is not limited to hardware, but may be configured to be on an addressable storage medium or to play one or more processors. For example, the module, unit, interface includes software components, object-oriented software components, class components, and task components, processes, functions, attributes, procedures, segments of program code, drivers, firmware, microcode, circuits, data, database, data structures, tables, arrays, and variables. The functions provided in these modules, units, or interfaces may be combined with a smaller number of the components or may be further separated into the

additional components.

In addition, the main server 1 refers to all types of hardware devices including at least one processor. According to an embodiment, it may be understood as a meaning including a software configuration operating in a corresponding hardware device. For example, a computing device as an example of a server can be understood to include, but is not limited to, smartphones, tablet PCs, desktops, laptops, and user clients and applications running on each device. Based on the configuration of the main server, the metaverse platform providing system, in which the weather changes according to the stock market situation in this study, will be described with the drawings as follows.

Figure 2 is a block diagram showing the overall configuration of the system, and the metaverse platform providing system of this study is characterized by including a metaverse interface and a main server.

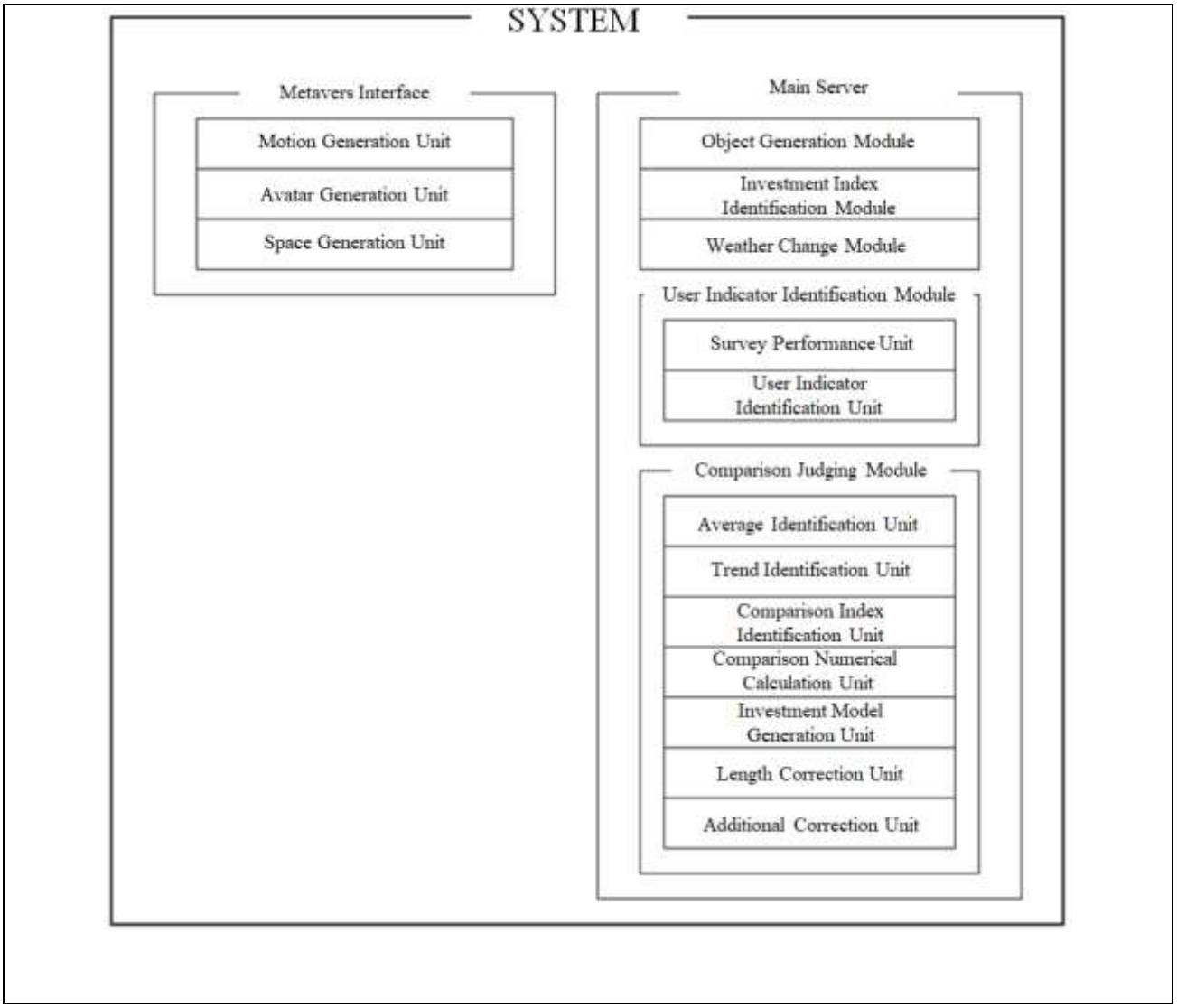

Figure 2. Configuration with overall system.

RESULT

The metaverse interface generates a metaverse space and provides it to the user terminal 1, and includes a motion generation, an avatar generation, and a space generation unit. The motion generator generates user motion information according to the signal received through the user terminal 1, which includes the user's movement, direction, and degree of movement, depending on the user terminal 1's manipulation signal on the touch screen display or an input signal using a mouse or keyboard. Touch or drag-and-drop operation through a touch screen display, mouse movement or click, and keyboard direction key operation can all be signals. At this time, the intensity of the touch, the degree of movement of the mouse, the number of clicks, the number and direction of drag and drop, the number and direction of direction key manipulation are all signals, and the direction and intensity of the movement may vary. Accordingly, the motion generation unit generates user motion information on the movement or behavior of the avatar according to the signal received through the touch screen display, keyboard, mouse provided in the user terminal 1. The avatar generation unit generates an avatar that moves in conjunction with the generated user motion information, and the avatar may have a human shape or a 3D animation character or animal shape. These avatars move in conjunction with the user's motion information, which is like avatar generation and avatar manipulation in a game. The space generation unit generates a metaverse space in which the avatar is displayed and displays the generated metaverse space on the user terminal 1. At this time, the metaverse space is a three-dimensional space, and many of avatars are displayed on the metaverse space.

The metaverse platform providing system of this study includes a main server, which basically includes an object generation module, an investment indicator identification module, and a weather change module. The object generation module functions to generate objects including various topographic objects or buildings displayed on the metaverse space and display them on the metaverse space. As shown in the drawing, the object basically includes a virtual building, and each virtual building built on a virtual city-type metaverse space can all be an object. There are no restrictions on these types of buildings, residential buildings, or apartments, and buildings such as public institutions can also be formed in the metaverse space in the form of objects.

The investment indicator identification module is to identify domestic trends including ups and downs of the domestic stock market and set investment indicators including domestic trends. It can be said that the domestic trend is to determine whether it shows an upward trend, a downward trend, or a lateral trend that stays at a certain level based on the KOSPI and KOSDAQ indexes. Domestic trends included in investment indicators may be judged by scores, and the most negative on a 5-point scale (the larger the KOSPI/KOSDAQ falls), the closer it is to 1 point, the closer it is to 3 points if it shows a neutral domestic trend, and the more positive the KOSPI/KOSDAQ rises. In other words, the domestic trend included in the investment index may appear as a value of 1 to 5 points depending on the width of positive and negative. In this case, the value of the domestic trend displayed on the 5-point scale may be set by the system manager. In this study, domestic means the Korean market, and neighboring countries are based on the stock market of the United States, Japan, and China that affect the Korean market. Among them, the stock market in neighboring countries may mean the U.S. stock market, especially the NASDAQ market, which has the greatest impact on the domestic stock market.

The weather change module performs a function of differentially adjusting precipitation for an area near an object displayed on the metaverse space according to an investment index. In this study, since the metaverse space is in the same form as a virtual village or a virtual city, the object refers to each topographical feature and building constituting the village. Therefore, controlling the precipitation in the area near the object means controlling the weather in the virtual village (virtual city), which is a metaverse space. In other words, if the investment index is judged positively, the weather in the metaverse space can be adjusted to a sunny weather without rain or snow by controlling the precipitation less. On the contrary, if the investment index is judged negatively, the weather in the metaverse space can be adjusted due to heavy rain or snow by adjusting the precipitation high.

The investment indicators mentioned in this study may include various information, that is, attributes, in addition to the domestic trend. At this time, the attributes included in the investment index may include trends in neighboring countries, and a conservative and reliability index for stock investment. The conservatism index is a value that can be input from the user through the user indicator identification module, indicating the user's

conservatism in stock investment, and conversely, a measure of aggression. This conservative index can also be entered on a 5-point scale, and can be set to 5 points if you take risks in stock investment, have an aggressive tendency to invest, and have a conservative tendency to invest as stably as possible. The stability index is a value that can be input from a user through the user indicator identification module, and represents a measure of the user's reliability in stock investment. This reliability index can also be entered on a 5-point scale, and it can be set to close to 5 points for those who invest with high confidence in the long-term upward trend of the stock market, and 1 point for those who have low confidence in the long-term upward trend of the stock market. In terms of each attribute included in the investment index, the domestic trend and neighboring country trend can be said to be objective indicators, and the conservatism index and reliability index can be said to be subjective indicators as attributes related to the user's investor sentiment.

Based on investment indicators including objective and subjective indicators, the weather change module can differentially control precipitation in the area near the object, and the additional configuration of the main server involved for this is as follows. The main server may include a user indicator identification module to identify each user's reliability index and serviceability index and to identify investment indicators specialized for the user based on them. In this case, the user index identification module includes a survey execution unit and a user index identification unit.

The survey execution unit performs a function of receiving a water retention index and a reliability index from a user using a metaverse space based on a questionnaire. The conservatism index and reliability index entered as 1 to 5 points for the conservatism index and reliability index, respectively, are reflected in the calculation of user indicators, which are investment indicators specialized for users. The user index identification unit performs a function of setting a user index, which is an investment index specialized for a user, based on the calculated domestic trend, neighboring country trend, and the user's conservatism index and reliability index. The user index can be said to be an investment index that reflects the user's investment sentiment, the conservatism index and the reliability index, in the domestic trend and the trend of neighboring countries. These user indicators may change in value according to changes in domestic trends and trends in neighboring countries, and furthermore, even if the user's conservatism index and reliability index change, the value of the user indicator may change. Accordingly, the value of the user indicator may vary depending on the analysis date.

When the user index is generated in this way, the precipitation for the area near the object may be differentially adjusted according to the change of the user index. More preferably, however, identifying the flow of the stock market takes precedence over identifying volatility, so it may be more advantageous to identify volatility if there is a comparison group to perform comparisons with user indicators. For this situation, an algorithm including a comparison judgment module can be set to generate a comparison index to be compared with a user index, and to perform comparison processing between the comparison index and the user index. The comparison determination module may include an average determination unit, a trend determination unit, a comparison index determination unit, and a comparison numerical calculation unit.

The average grasp unit identifies the average value of the conservatism index and reliability index input from a plurality of users, and performs the function of calculating the average value of the conservatism index and the average value of the reliability index input from all users using the metaverse space. The trend identification unit performs the function of identifying long-term trends in the domestic stock market and neighboring stock markets on the basis of the 20-day moving average. The comparison index identification unit functions to set comparison indicators based on the average value of the conservative index, the average value of the reliability index, and the long-term trend of the domestic and neighboring stock markets. The comparison value calculation unit performs a function of calculating a comparison value by comparing and processing the user index and the comparison index. Basically, the comparison numerical calculation unit does not impose any restrictions on the method of calculating the comparison numerical value through comparison processing between the user index and the comparison index, but it can generate an investment model and calculate the comparison numerical value based on it. Accordingly, the comparison determination model may include an investment model generator.

The investment model generator sets the values of each attribute included in the user index and the comparison

index to length, connects the extension radially from the arbitrarily set center point, and connects the ends of each extension to the connection line. In this case, since the number of extension lines includes four attributes, the number of extension lines may be four. Therefore, the four extensions extend radially based on the arbitrarily set center point, and each extension has a value of each attribute as its length. Based on the 5-point scale, the value of each attribute is proportional to the length of the corresponding extension line.

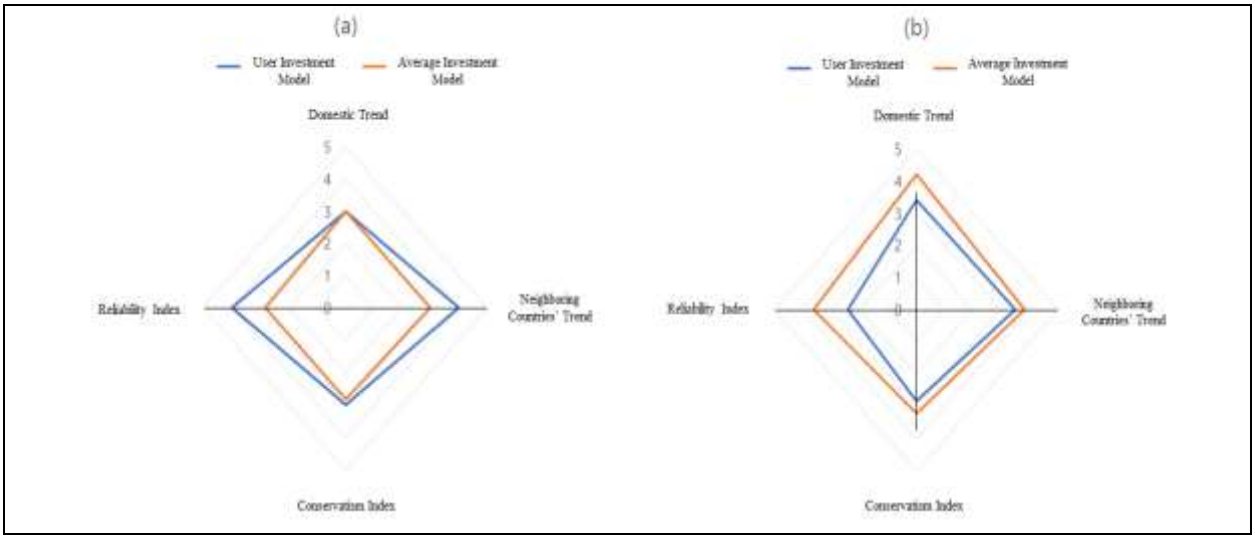

Figure 3. Conceptual diagram of the investment model

As shown in Fig. 3(a), when the average investment model surrounds the user investment model, the average investment model has a larger area than the user investment model, so it can be judged that the investment sentiment is stable, positive, and the market situation is good. Therefore, a user investment model may be illustrated based on user indicators and an average investment model based on comparison indicators so that a user investment model and an average investment model may be visually compared. Furthermore, when the investment model is illustrated, the comparison numerical calculation unit performs a function of calculating the area difference between the user investment model and the average investment model as a comparison numerical value. In other words, the areas of the user investment model and the average investment model are compared and processed with each other to calculate the area difference as a comparative value. Based on the calculated comparison value, the precipitation amount for the area near the object displayed in the metaverse space can be differentially adjusted.

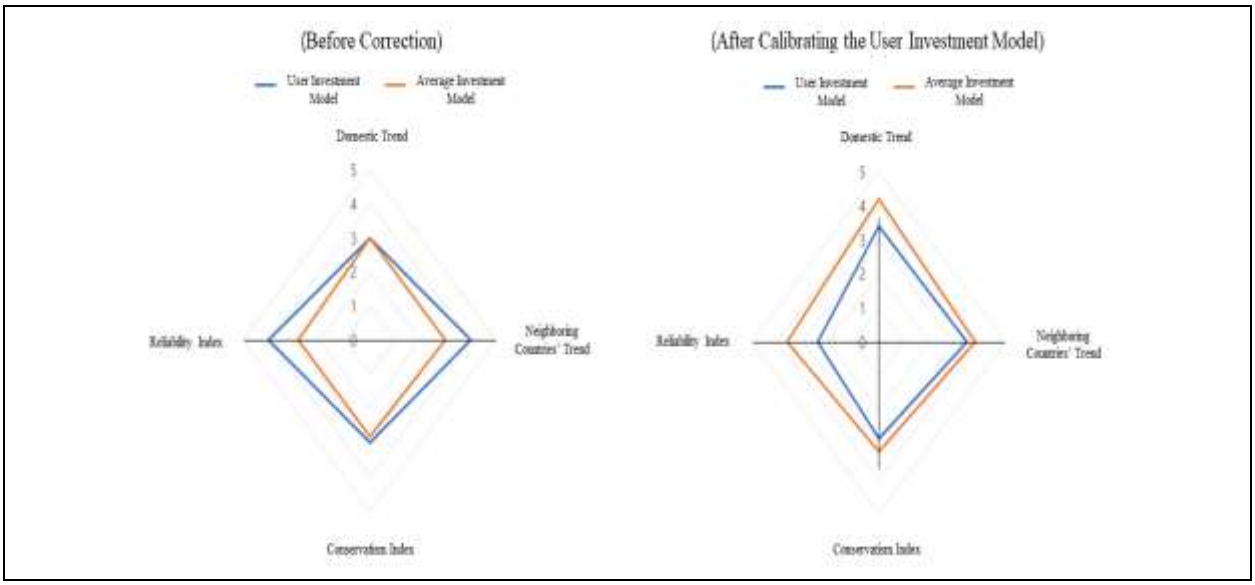

Figure 4. Conceptual diagram of post-calibration investment model

Referring to FIG. 4, as another embodiment for calculating a comparative value, the investment model itself may be variably processed by applying an attribute weight to the investment model itself instead of correcting the attribute weight to the area difference. Objective indicators are generally trended according to market trends, so they are objectively indexed, but subjective indicators may not be uniform or may vary significantly because they are determined by users' investor sentiment. Therefore, according to the attribute weight set for the subjective index, the length of the extension line for the attribute included in the subjective index in the investment model may be variable. In this case, in the variable processing of the extension length through the length correction unit, not only the attribute weight but also the priority weight may be further reflected. Therefore, through this method of correction processing, each attribute included in the subjective index can be weighted differently and the investment model can be corrected, thereby reflecting more detailed investment sentiment and importance on the index. In a more preferred embodiment, the length correction unit may vary the length of the extension line by reflecting the attribute weight and the priority weight for the following calculation formula.

$$L' = L \times a \times [\frac{\sinh^{-1}(\frac{O_m}{O_n})^p}{\tanh(\frac{O_m}{O_n})^p}]$$

L' denotes the length of the extension corrected for a particular attribute, L denotes the length of the extension before the correction of a particular attribute, p denotes the priority weight set for a particular attribute, a is the property weight set for a subjective indicator, O_m denotes the value of the highest priority attribute, and O_n denotes the lowest priority attribute. The length of the extension line before the correction of a specific attribute is the same as the value before the correction of the attribute, and the value of the attribute included in the user indicator can be determined as the length of the extension line before the correction. This is because the investment model can be said to be a type of graph, and the length of the extension line becomes a value of the attribute.

In the case of such an extension length correction, it is closely related to changes in investor sentiment. Considering that changes in investment sentiment may occur rapidly due to an increase or decrease in the benchmark interest rate, the system's comparison determination module can further correct the length of the extension by reflecting changes in the benchmark interest rate compared to three months ago. At this time, the additional correction of the length of the extension line may reflect changes in the three-month base rate. The length of the additionally corrected extension line may be calculated according to Equation 2.

$$M = L \times a \times (1 + r) \times [\frac{\sinh^{-1}\left(\frac{o_m}{o_n}\right)^p}{\tanh\left(\frac{o_m}{o_n}\right)^p}]$$

M is the length of the additionally calibrated extension, *L* is the length of the extension before the correction of a particular attribute, *p* is the priority weight set for a particular attribute, o_m is the value of the highest priority attribute, o_n is the value of the lowest priority attribute, and *r* is the change (%) from three months before the yield of the Korean benchmark interest rate. This is similar to Equation 1, but reflects the fluctuation value of the base interest rate compared to three months ago. The benchmark interest rate rises, freezes, and falls every month, but its direction is generally determined based on three months, indicating a change from the time before three months based on the calculation date. Therefore, it reflects the fluctuation value compared to three months before the base rate, and reflects the fluctuation value of the Korean base rate based on Korea, which is believed to have the largest number of investors. The fluctuation value of this Korean benchmark interest rate compared to three months ago may have a negative or positive value.

By variably processing the length of the extension line calculated through the two equations to correct the investment model, the investment model can be corrected by more precisely reflecting the investment sentiment and predicting changes in the investment sentiment.

DISCUSSION

The metaverse platform providing system in which the weather changes according to the stock market situation in this study can have the following effects. 1) Through the composition of weather fluctuations in the metaverse space implemented in the form of various buildings and virtual cities, users can understand the stock market quickly and easily understand their profits and losses. 2) The functions of existing metaverse can be expanded to the economic sector by enabling profit generation and consumption activities through education, broadcasting, and stock trading in the metaverse space. 3) Through the investment model city, platform users can grasp market conditions and changes in investment sentiment at a glance, allowing them to respond quickly to rapidly changing market conditions and investment sentiment. Although the positive effect of the system reflecting the rapidly changing economic situation in the metaverse environment was explained, it can be changed according to various changes without departing from the technical idea of the concept and explanation of this study.

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