

Development of a Method for Reproducing Measured Orbital Data of Curling Stone by VR Technology

Kouki Ishitoya¹^a, Fumito Masui^{2,4}^b, Hitoshi Yanagi³, Michal Ptaszynski²^c
and Shimpei Aihara⁴^d

¹Graduate School of Kitami Institute of Technology, 165, Kouen-cho, Kitami, Japan

²Information Communication Group, Kitami Institute of Technology, 165, Kouen-cho, Kitami, Japan

³Common Education Group, Kitami Institute of Technology, 165, Kouen-cho, Kitami, Japan

⁴Department of Sport Science and Research, Japan Institute of Sport Sciences, Tokyo, Japan

Keywords: Curling Informatics, Stone Tracking System, Unity, VR, Meta Quest2, Argo Graphics Kitami Curling Hall.

Abstract: In this study, we report an implementation of reproducing stone trajectory data with VR technology to support curling. The "Stone Tracking System", which is used in public curling facilities in Japan, tracks an infrared transmitter attached to a curling stone using an infrared camera to obtain coordinate information and reproduce the trajectory of the stone from the time it is thrown until it stops on a sheet with a two-dimensional representation. The "Stone Tracking System" was used to measure a set of stone trajectory data. Furthermore, we constructed a process and implemented a database to convert the obtained trajectory shot data from 2D to 3D. Additionally, a curling hole was constructed in a VR space, and a system was built to display the stones, trajectory, and some of the shot information in layers. By using this method, users of the system can project multiple shots on an ice sheet in the VR space, check and compare shot results from any viewpoint, and superimpose shots, which is not possible in real space.


1 INTRODUCTION


Masui et al. are developing a project for the science of curling (Masui, F., Ito, T., Yamamoto, M., Miyakoshi, K., Kawamura, T., Takegawa, Y., Yanagi, H., Matsubara, H., 2015). The main purpose of the project is to support the tactics of curling, and they have been working on supporting technology development to realize the collection, analysis, visualization, and sharing of information about tactical elements from the multiple perspectives of information science, artificial intelligence, robotics, and sports science. Some of the research results have been applied to the "ARGO GRAPHICS Kitami Curling Hall," which opened in October 2020, to support the improvement of athletic performance.


The support systems are practical applications of Kitami Institute of Technology's winter sports science research results aimed at improving the competitive-

ness of curling athletes, and each support system provides comprehensive support for improving curling competitiveness, including the development of training methods and tactics based on sports science, for top athletes and their supporter's followers in Japan and overseas. The facility also has a Research Priority Lane (Figure:1) where research groups from six universities with projects in the science of curling conduct research on the human, tactical and physical elements of curling. The upper part of the research lane is equipped with 12 infrared cameras for stone tracking and 12 high-speed cameras for motion capture systems.

The system in operation as a competitive performance improvement support system consists of 10 systems, including a stone tracking system that visualizes the trajectory of stones based on their coordinates and a VR (Virtual Reality) simulation system that reproduces a curling hall in a VR space, as a system for measuring and analyzing tactical elements. In addition, an analysis room for analyzing "The Curling Skills Improvement Support System" is also located in the curling hall, so that data collection and analysis

^a <https://orcid.org/0009-0009-9612-9389>

^b <https://orcid.org/0000-0001-9979-8734>

^c <https://orcid.org/0000-0002-1910-9183>


^d <https://orcid.org/0000-0003-8513-0204>



Figure 1: Research Lane.

can be performed all together in the curling hall.

However, the impact on cultural, sports, and tourism activities due to the avoidance of human crowding and restriction of activities by COVID-19 measures is serious and is an urgent issue for increasing the number of people interacting with each other after the end of COVID-19. For example, in sports, it is effective to realize a support environment that facilitates training for a small number of people or individuals, an environment that allows sharing of competition information to be shared in remote areas, and an environment that allows checking competition information to be checked without having to be present at the site. In addition, when considering sports tourism, it is necessary to implement measures to increase awareness of the need to visit local areas and facilities, as the desire for tourism motives is currently declining. To this end, technologies that allow people to simulate the local experience in remote areas and mechanisms that allow them to experience sports with higher added value will be effective. Therefore, we aim to develop a technique to reconstruct and confirm competition data in the VR space. In this paper, we have implemented a technique to reconstruct the position of a moving curling stone as a trajectory in the VR space.

2 RELATED WORKS

Related research to this study includes a study on motion analysis of curling stones and motion analysis and sports support by VR. Takegawa's (Yoshinari Takegawa, 2018) research on curling stone motion analysis includes the implementation of a real-time position measurement system for curling stones.

The use of VR applications in sports training and sports science has been known since

the 1990s (Neumann, D.L., Moffitt, R.L., Thomas, P.R., Loveday, K., Watling, D.P., Lombard, C.L., et al., 2018), and in the last decade, VR-based practice learning using VR has also progressed (Yanovich, E., and Ronen, O., 2015). Hyo et al (Lee, H.T., Kim, Y.S., 2018). conducted a four-week sports VR training program focused on improving endurance and muscle function, and found that it could improve body composition and health. Stefan et al (Pastel, S, Petri, K, Chen, C.H., et al., 2022). used a movement scoring system in karate and found that virtual reality training was as effective as video training. In addition, studies analyzing the effects of sports training using VR have been reported in many other sports such as table tennis (Michalski, S. C., Szpak, A., Saredakis, D., Ross, T. J., Billingham, M., and Loetscher, T., 2019) and baseball (Gray, R., 2017).

However, there have been few studies in which athletes' movements in real space are represented in VR space, so skilled athletes should be able to train in a VR environment that allows more detailed skill analysis to improve their skills. Therefore, this research aims to construct a VR environment that provides more effective feedback with a greater amount of information available to the players by integrating a system that can take both technical and tactical approaches to improve athletes' competitiveness. A stone tracking system, which can represent the trajectory of a stone by attaching a device to the stone and tracking it with a camera, is integrated into the VR space to realize feedback in VR.

3 CURLING

Curling is a sport in which two teams play against each other on a "sheet" of ice at least 45 meters long and 5 meters wide. Each team takes turns throwing a "stone," a 20-kilogram piece of granite with a plastic handle attached, eight times to score points. In curling, the player holding and sliding the stone is called the "delivery," and the sequence of events from the delivery to the stopping of the stone is called the "shot." Points are awarded only to the team that can place its stones closer to the center of the circle, called the house. One point is awarded to the team that scores a point for each stone inside the nearest stone from the center of the house of the team that fails to score a point.

In the first end, the team with the smallest LSD (Last Stone Draw) is the last team to play, and the team with the largest LSD is the first team to play. After the second end, the team that scored in the previous end is the first team to attack, and the team that

scored in the previous end is the second team to attack. In the case of a blank end, in which neither team scores a point, the first and second teams do not switch places.

The above process is repeated, and the team with the most points at the end of the 10th end wins. If the teams are tied at the end of the 10th end, the extra end is repeated until one of the teams wins.

4 STONE TRACKING SYSTEM

The Stone Tracking System is one of the support systems installed in the ARGO GRAPHICS Kitami Curling Hall to improve athletic performance. The system consists of 12 infrared cameras installed at regular intervals vertically on the ceiling of the competition area, which is made of ice called a sheet, pointing straight down, and an analysis PC that detects the light spots of the Light Emitting Diode(LED) modules captured by the infrared cameras on the stone handles and records the location information. Below is a (Figure2) of a stone with an infrared LED module installed.



Figure 2: LED Module

The system measures the two light points of the infrared LED module attached to the infrared camera, calculates their center points, and records the stone center coordinates. The result is output as a list of 2D coordinates for each measurement time, and the measurement results are reproduced and visualized as a trajectory to make it easier for the user to grasp the shot information. (Figure3) shows the system interface screen.

4.1 Creation of a StoneTracking System Database

MySQL, a relational database, was used to store the data acquired from the stone tracking system and as an environment for data communication with the system. MySQL was chosen because it is not only large but also has superior functionality compared to SQLite, etc., as a single database integrating all data acquired from the Athletic Performance Improvement

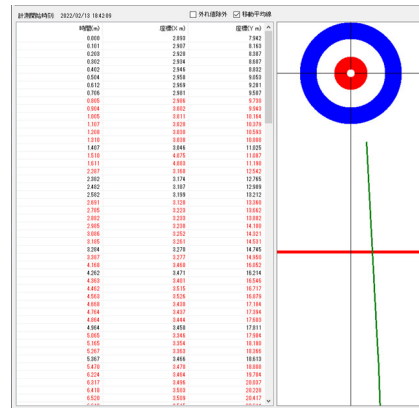


Figure 3: Stone tracking system interface screen.

Support System will be constructed in the future. In preparation for storing the data in the database, we created a Command Line Interface(CLI) program that converts the data output from the stone tracking system and automatically inserts the results into the database.

StoneTracking Database. This system is being developed using Unity (See the appendix Unity on page 7), a game development engine. Since the data of the stone tracking system is referenced and searched within Unity, it is necessary to create a database that is easy to search the data. The stone tracking database was constructed with these considerations in mind. An image 4 of the database structure is shown below.

The following is an explanation of each table shown in (Figure 4) above.

playerTable. Stores player names

The player table has three columns: id, name, and daytime, and the date and time of user registration are automatically registered when a user registers by entering a name.

data_registration_dateTable. Stores a summary of the event and date

This table is used to record the event summary and other information. This table has four columns: id, name, day, and player_id. This table stores registers the name of the camp and its date. The player_id is a foreign key and points to the primary key of the player table.

stopping_positionTable. Stores stop position and time between hog lines

This table inserts the number of throws, the coordinates of the stop position, and the result of the calculation result of the time from hog line to hog line. 7 columns are used: id, drd_id, throw_number, sp_x, sp_y, sp_z, H1toH2. A fixed value corresponding to the size of the object is in-

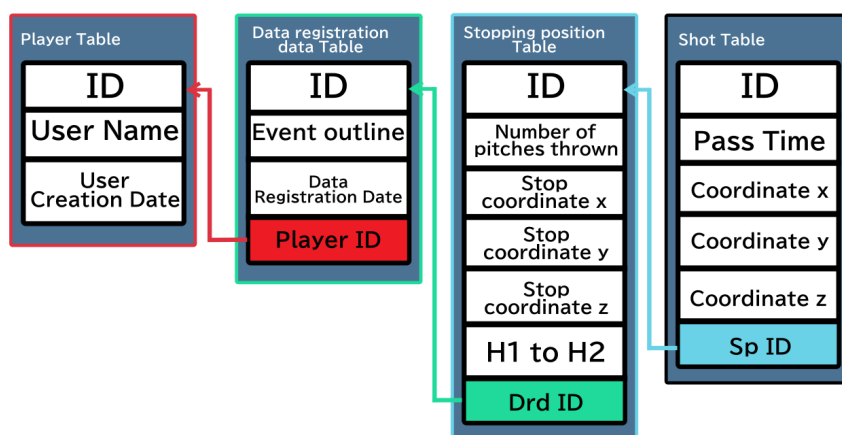


Figure 4: Database Configuration.

serted for the z-axis coordinates at the stop position. `drd_id` is a foreign key pointing to the primary key in the `data_registration_date` table.

shotTable. Stores locus coordinates

The shot table stores the coordinates of the trajectory of each shot. The columns `id`, `sp_id`, `sp_x`, `sp_y`, `sp_z`, and time are provided, and for `pos_x,y,z`, the coordinate data exported from the stone tracking system is inserted.

The IDs of these tables are all of type `bigint`, and they are set to the primary key and auto-increment. In addition, all three tables except the player table have foreign keys to maintain data integrity.

4.2 Programs to Convert Data

The stone tracking system exports the measured data as a Comma Separated Values(CSV) file. When reading the exported CSV files, the files must be placed in the folder specified in the program. The program displays a list of CSV files in the folder on the command line based on the specified path and reads the files by entering the file name in `.csv` format. The following (Figure5) shows a flowchart of data conversion on the CLI.

Data is converted by deleting unnecessary strings, dividing the data into numerical values, and storing them in variables. The last value of the coordinate data read is stored in another variable as the stop position, and some of the divided numerical data are changed or added for easy handling in the system. Specific data operations are as follows.

Details of Data Changes and Additions

- Because the coordinate data is huge, one-fifth of the total data is treated as acquisition data.
- The end of the coordinate data is used as the stop position, which is obtained from the original data.
- To calculate the time from hog line (See the appendix hog line on page 7) to hog line, the difference of the time information of the data whose y-coordinate first exceeds 11.865 and 33.86 is obtained as `HtoH`.

The data processed above is automatically assigned primary keys and foreign keys to enable searching in the database and stored in the database.

Data Storage in StoneTracking Database. `Data.MySqlClient1` is used to connect to the MySQL database when storing data. `MySqlClient` requires the user to log in to MySQL each time a method in the class is executed.

The main operations using SQL statements on MySQL databases are query-based retrieval and insertion of converted data. To perform these operations, classes are created for each table. Each class contains SQL statements such as `SELECT` that perform operations on each table, using only foreign keys and values to be inserted as variables.

When the command line is set to `True` or `False`, the data associated with the foreign key is output to the command line and a decision is made whether or not to use the existing data or not. If `False`, the command

¹<https://dev.mysql.com/doc/connector-net/en/connector-net-ref-mysqlclient.html>

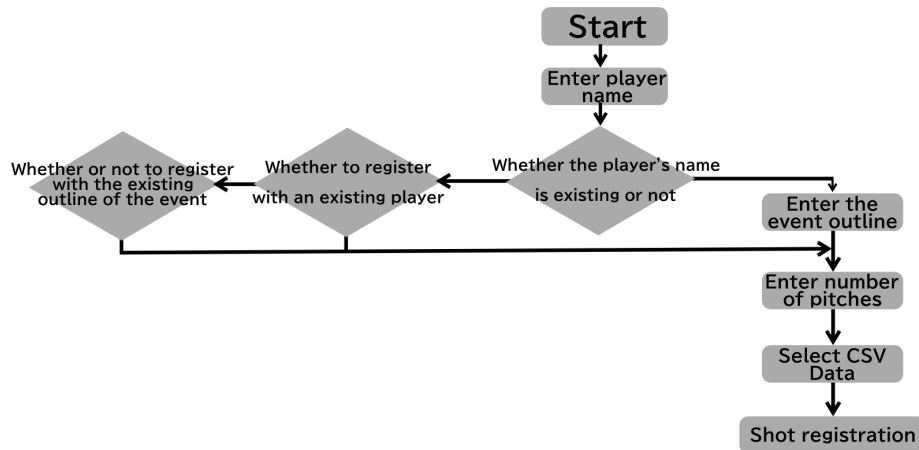


Figure 5: Flowchart of operations on the CLI.

enters the id of the existing data and saves the data to the destination specified by the id.

4.3 Establishment of Communication Environment

When acquiring data from MySQL, a relational database, from a system developed with Unity, it is not desirable to acquire data from a database built in a local environment, considering that access from the outside will be necessary in the future. For this reason, the MySQL server is managed using XAMPP (See the appendix XAMPP on page 7) and phpMyAdmin (See the appendix phpMyAdmin on page 7) on a web browser.

To retrieve arbitrary data from MySQL, it is necessary to execute SQL statements called queries. However, it is difficult to directly execute SQL statements against the MySQL server from the C# script in the Unity project, so we employed UnityWebRequest² to execute SQL statements written in PHP and reflect the data on the web browser to retrieve the results as data. The following shows a part of the actual PHP program. A part of the actual PHP program is shown below.

```

$connection = mysqli_connect("address", "user",
"password", "database name");
$sql = "SELECT * FROM player ORDER BY id DESC";
$result = mysqli_query($connection, $sql);
if($result){
    while($row = mysqli_fetch_assoc($result)){
        echo $row["id"] . ", " . $row["name"] .
", " . $row["day"] . " *";
    }
}else{

```

```

echo "Error!";
}

```

UnityWebRequest was used to communicate with an external server from a C#script in the Unity project. UnityWebRequest is a modular system that can respond to a Hypertext Transfer Protocol (HTTP) request. The UnityWebRequest system allows Unity to interact with the web browser backend and can support advanced features such as chunked HTTP requests, streaming POST (See the appendix on page 7) operations, and full control over HTTP headers and methods. The following is a (Figure6) of the operation between the systems described above.

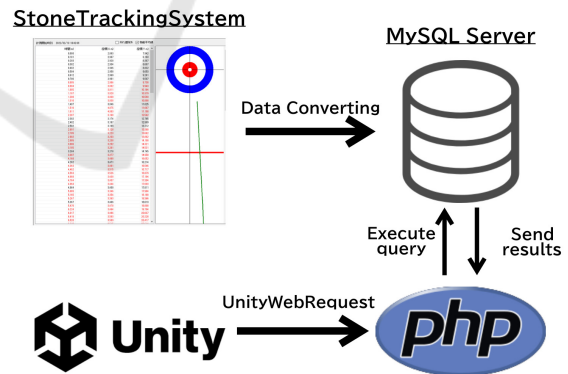


Figure 6: Image of connection between systems.

²<https://docs.unity3d.com/2020.3/Documentation/ScriptReference/Networking.UnityWebRequest.html>

5 BASIC IDEAS FOR INTEGRATING A STONE TRACKING SYSTEM AND IMPLEMENTATION OF THIS SYSTEM

The developed system consists of an ARGO GRAPHICS Kitami Curling Hole object, a search UI, and a display toggle button. The Search UI selects data obtained from the database described in the previous chapter and displays stones and stone trajectories as results. The displayed stones and their trajectories can be toggled on and off using the display toggle buttons, allowing comparison of multiple shots and single shots. The following figure shows the ARGO GRAPHICS Kitami Curling Hall object, (Figure:7), as it is displayed in the actual system.

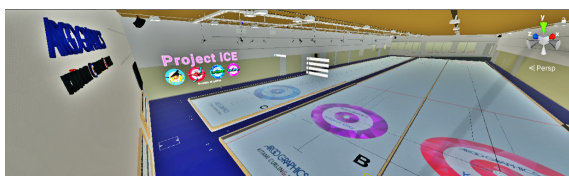


Figure 7: ARGO GRAPHICS Kitami Curling Hall Object.

5.1 Shot Data Search

DropDown (See the appendix Drop down on page 7) is used for data retrieval. By selecting the search result displayed in the DropDown, the user moves transitions to the next state, and finally, the stone and locus are displayed.

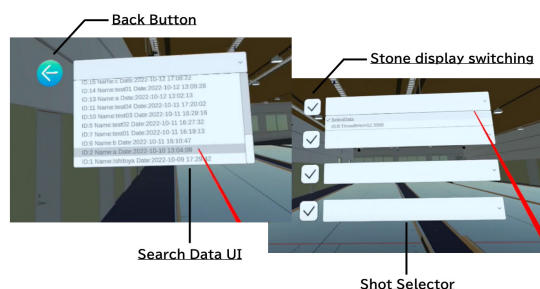


Figure 8: UI for data retrieval and shot display switching.

Data is retrieved by accessing each table and executing a query. The user selects the data displayed, passes the data to PHP based on the selected data, and PHP executes a query based on the received data to retrieve data from each table. In addition, a Back button has been created in case of an incorrect search or query. This button searches the primary key of the corresponding table based on the foreign key of the

data displayed in the dropdown and displays the results in the dropdown.

5.2 Stone Display Switching

When displaying stones and trajectories in VR space based on the coordinate data from the stone tracking system, it is expected that the stones will be displayed as overlapping. While this is a desirable behavior as a feature of the system, it can be difficult to verify the data with the stones overlapping when providing feedback to the players. For this reason, a toggle button (See the appendix Toggle button on page 7) is used to toggle the display of checkers and trajectories. The display is toggled by determining whether the stone object is active or inactive, deactivating it if it is active, and activating it if it is inactive. A locus object is a child object of the stone object, and when the stone object is activated, the locus object is automatically activated as well.

5.3 Mapping of Stones

The data used to map the stones is converted data from the Stone Tracking System. This data is coordinate data that indicates the position of the stone being tracked from the bottom right corner of the screen on the Stone Tracking System interface. In using this data in a VR space, it is necessary to solve problems such as understanding the size of the curling sheet on the VR, determining the reference point to be the coordinate point (0,0) on the VR, and displaying errors due to the size of the object. The method and its details are explained in the following sections.

Coordinate System of the Stone Tracking System.

The coordinate system of stone tracking coordinate system originates at (0,0) in the lower left corner of the interface screen. This origin will be referred to as the reference point. The stone tracking system maintains data on the position, or distance, from the reference point to the stone and time data from the start of tracking to the time of tracking. In addition, the data can be expressed up to the six decimal places, with the first digit of the integer part being 1 meter. and the decimal part being expressed to six digits.

The size of the sheet on the Stone Tracking System interface is 4.750 in width and 45.720 in height, and the centers of the houses are (2.375,5.4865) at the bottom and (2.375,40.2335) at the top of the screen, respectively.

The stone tracking system can change the order of the 12 cameras that track the stones according to the direction in which they are thrown. When the order

of tracking is reversed, the reference point on the interface is not changed, but the reference point in real space is changed and the position is measured, making it possible to check the trajectory in the same direction on the interface.

Coordinate System in VR Space. The objects of the Argographics Kitami Curling Hall used in the VR space were created based on the design documents of the actual facility, and the sheet that displays the stones in the VR space is the sheet (Figure9), that is the furthest back from the entrance.



Figure 9: Entrance side and backboard side of the house.

The size is the same as the stone tracking system, 4.750 m wide and 45.720 m long, and the center of the house is at coordinates $(-44.766, 0, -5.329)$ on the backboard side (Figure10) and $(-10.019, 0, 40.2335)$ on the entrance side (Figure10), respectively.

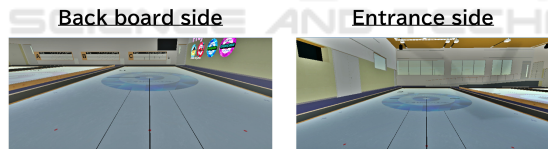


Figure 10: Sheet representing stones and stone trails.

Stone Mapping Techniques. Unity's world coordinates are represented with the origin as $(0,0,0)$ and $(1,0,1)$, which is 1m on the x axis and 1m on the z axis in terms of the world coordinates. Given the above, as a method of mapping stones in the VR space, is to set a reference point is set on the curling sheet in the VR space, and add the distance from the reference point to the stone is added to the x and z axes to map the stone to coordinates similar to those expressed by the stone tracking system.

The reference point of the sheet represented in the VR space is set at a position corresponding to the reference point of the stone tracking system, with specific coordinates of $(-50.2535, 0, -7.704)$. (Figure11) below shows the reference points in the VR space.

The coordinate data exported from the stone track-

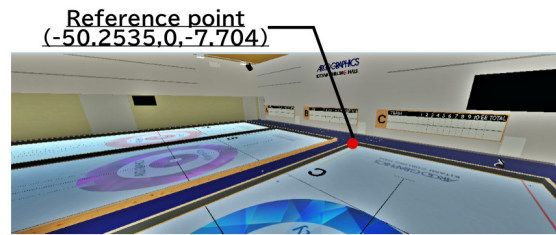


Figure 11: Reference point in VR space.

ing system is in the sixth decimal place, and the coordinate system in the VR space is floating-point data. Since the integer part of the data from the stone tracking system data has a maximum of two digits, even if a maximum of 8 bits is used for the integer part, the remaining 23 bits can be used to represent the minority part. Therefore, the VR space can represent the data exported from the stone tracking system without losing any digits. Even if a dropout occurs when data is inserted into a float type, the first integer digit is 1m, so the error is not so large that it can be seen by the human eye. (Figure: 12) below shows a VR space representation of the shot and trajectory.



Figure 12: Images of shots and trajectories in VR space.

The trajectory will be changed to an object that is easier to visualize in the future after repeated trial and error.

5.4 Use Case

The system can be used in two ways: as feedback to the player and for research purposes. The feedback to the player is expected to be the comparison and confirmation of his shot data. By reproducing stones and trajectories in VR space, players can check their shots in a realistic environment. It is expected that this will make it possible to compare one's past and current shots and to analyze whether one is throwing shots with an understanding of the ice line and

whether there is a difference in trajectory by comparing shots that were thrown accurately and shots that were thrown incorrectly.

The second is the analysis of state changes on the ice. The system measures the shots made by the rock thrower, which is used in the ARGO-Graphics Kitami Curling Hall, where shots are made in the same environment with the same angular velocity, initial velocity, and throwing position, and uses these data. If this analysis is realized and fed back to the players, it can be assumed that it will be useful to suggest tactics for ice conditions and to consider the physical effects of ice grains on the ice by using it in research.

6 DISCUSSION

In this research, we worked to development of a system that reproduces the trajectory of shots in a VR space, allowing the user to review and compare shots in real-time and to superimpose shots, which is impossible in a real space. By providing feedback on measurement data in a VR space, athletes will be able to review their data in more detail.

The stone tracking system developed by Takegawa (Chapter 4) reproduces the trajectory of a shot from measured shot data. This is similar to our system, but compared to a stone tracking system that is represented in a two-dimensional coordinate space, our system, which is represented in a three-dimensional coordinate space (VR space), is expected to provide a greater amount of information to the user. However, this system requires the data exported from conventional systems to be stored in a database before it can be used, and there are many processes involved in representing the data in a VR space. This low responsiveness needs to be improved in the future. Therefore, it is necessary to change the destination of measurement data to a database and improve the system so that data can be fed back immediately. In addition, an environment in which multiple people can view the data at the same time is necessary for more effective discussions among players. In this study, we did not construct a system that allows multiple people to access the data at the same time, so the current system is inferior to existing stone tracking systems in terms of discussion among multiple people. In addition, for multiple people to access the same VR space, it is necessary to construct a stable communication environment and server environment, as well as a user interface that clarifies which user placed which stones. In addition, since we have not yet clarified whether this system is effective in improving athletes' performance, it is necessary to evaluate and verify the sys-

tem by creating a questionnaire that is less likely to cause selection bias in the future.

Finally, as a prospect, further support for curling competitions can be expected by reproducing multiple measurement data obtained from the Athletic Performance Improvement Support System in a VR space, starting with this system. As shown in (Figure:13) below, in addition to the shots and their trajectories reproduced by this system, the results of analysis of the athlete's posture and the distribution of pressure on the sole can be integrated into a similar environment and the realization of a communication environment that allows multiple accesses is awaited for future development.

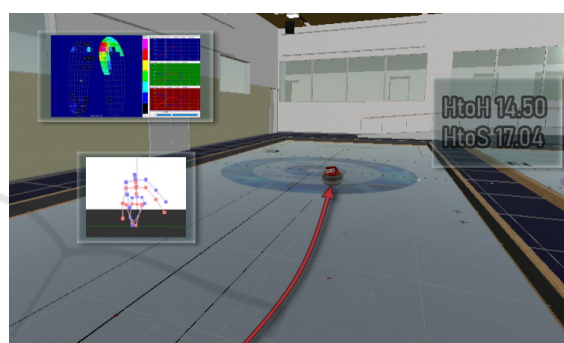


Figure 13: Image of system integration.

7 CONCLUSIONS

This paper describes the implementation of a system that reproduces measured competition data in a VR space. The system obtains the coordinate information of the stones in the shot by using a camera attached to the top of the curling seat to obtain the signal from the infrared transmitter attached to the stones in the stone tracking system and converts the data exported in CSV format from the data measured by the stone tracking system into a coordinate system corresponding to the VR space. The data is converted into a coordinate system corresponding to the VR space and saved in a database consisting of a player table, Data Registration Date table, Stopping Position table, and Shot table, and the data saved in the database is searched in the system using PHP communication. By converting the database search results to the coordinate system corresponding to the VR space, the data measured in the real space is reproduced in the VR space as the trajectory of the stones. The constructed VR space can provide feedback on the trajectory of shots delivered, and players can search the data of shots delivered in the real space in the VR space and confirm the shots delivered by themselves and other

players. In the future, we will examine the visibility, responsiveness, operability, and responsiveness of the system based on the history of curling competitions and the existence of VR experiences, and improve the system based on ideas from users. We also aim to create an environment in which feedback can be provided by multiple systems in a VR environment with interoperability. After integrating multiple systems, we also plan to analyze differences in the amount of information obtained from a single system and the amount of information obtained when the systems are integrated.

Finally, if the system described above can be implemented, it is expected that players will be able to train technically and tactically without being in the curling hall, which will lead to the further development of curling by eliminating the limitations of training content in curling, a location-restrictive sport. This will lead to the further development of curling. In team sports, it is also expected that the same training can be performed from different locations by connecting to a VR space online, without all players having to gather at the same place, and that review of games and practices can be performed simultaneously from different perspectives. This will be useful for the technical and tactical development of sports, not only in curling but also in many other sports, by eliminating location limitations and expanding the range of training.

ACKNOWLEDGEMENTS

This work was supported by the "Functional Development Project for Resilient Athlete Support" of Japan Sports Agency.

REFERENCES

- Gray, R. (2017). Transfer of training from virtual to real baseball batting. *Front.Psychool.*
- Lee, H.T., Kim, Y.S. (2018). The effect of sports vr training for improving human body composition. *J Image Video Proc*, 148.
- Masui,F., Ito,T., Yamamoto,M., Miyakoshi,K., Kawamura,T., Takegawa,Y., Yanagi,H., Matsubara,H. (2015). The science of curling project.
- Michalski, S. C., Szpak, A., Saredakis, D., Ross, T. J., Billingham, M., and Loetscher, T. (2019). Getting your game on: Using virtual reality to improve real table tennis skills. *PLoS One*.
- Neumann,D.L., Moffitt,R.L., Thomas,P.R., Loveday,K., Watling,D.P., Lombard,C.L., et al. (2018). A systematic review of the application of interactive virtual reality to sport. *Virtual Real*, 22:183–198.
- Pastel,S, Petri,K, Chen,C.H., et al. (2022). Training in virtual reality enables learning of a complex sports movement. *Virtual Reality*.
- Yanovich, E., and Ronen, O. (2015). The use of virtual reality in motor learning: A multiple pilot study review. *Advance in Physical Education*, 5:188–193.
- Yoshinari Takegawa (2018). Proposal of a real-time position measurement system for curling stones, proceeding of workshop on curling informatics. *WCi2018*, pages 10–11.

APPENDIX

Hog line. A hog line is a horizontal line drawn in front of the house. A player is disqualified if he/she crosses the hog line of the side from which the shot is made while touching the stone when throwing the stone. A stone that does not cross the hog line is disqualified and removed.

Unity. Unity is a game development platform provided by Unity Technologies, which also offers a full range of services as a development environment for VR environments.

XAMPP. XAMPP is a completely free, easy-to-install Apache distribution that includes MariaDB, PHP, and Perl.

phpMyAdmin. phpMyAdmin is a free software tool in PHP that allows you to manage MySQL on the web. phpMyAdmin ports a wide range of operations on MySQL and MariaDB, including frequently used database, table, and permission management. and other operations can be performed through the user interface, and SQL statements can be executed directly.

Drop Down. The control portion (always visible in the drop-down menu) shows the currently selected option, and clicking on it expands the list of options and allows the user to select a new option. When a new option is selected, the list closes and the newly selected option is displayed in the user interface.

Toggle Button. Toggle is a checkbox that allows the user to toggle options on and off.

POST. POST is a method used to send input from the client to the web server.