Method for Providing Exercise Instruction that Allows Immediate Feedback to Trainees

Kohei Arai[1], Kosuke Eto[2], Mariko Oda[3]
Department of Information Science, Saga University, Saga City, Japan[1]
Graduate School, Kurume Institute of Technology, Kurume City, Japan[2]
Applied AI Laboratory, Kurume Institute of Technology, Kurume City, Japan[3]

***Abstract*—Method for providing exercise instruction that allows immediate feedback to trainees is proposed. The purpose of this research is to combine artificial intelligence technology and motion analysis methods to build an effective vocational training support program aimed at supporting the employment of children with disabilities. Specifically, we develop a system that uses DTW (Dynamic Time Warping) to calculate the similarity between the trainee's motion and the model motion, and scores the results based on the results. This system will enable optimal instruction for each disabled child, and is expected to improve motion skills and promote learning motivation. Furthermore, by providing scored feedback, we aim to improve the traditional evaluation that relies on the subjectivity of the instructor and provide an intuitive and easy-to-understand means of confirming results for trainees. In this research, we use skeletal detection technology to record the trainee's three-dimensional coordinate data and perform quantitative evaluation. In addition, we will design a program that allows trainees to visually check their own progress through a motion evaluation function and maximize the learning effect. Through experiment, it is found that the proposed method does work for motion trainings at supporting the employment of children with disabilities. Also, it is found that immediate feedback is better than conventional delayed feedback.**

Keywords*—*Motion training; immediate feedback; DTW (Dynamic Time Warping); children with disabilities; skeletal detection

I. Introduction

Employment support for children with disabilities plays an important role in their mental and social development. Children with disabilities require individualized instruction because their physical characteristics and growth stages are different [1]. For example, children with Autism Spectrum Disorder (ASD) often have sensory processing difficulties and delayed motor functions, and it is said that it is necessary to promote sociality and emotional stability through exercise therapy and work-study classes. Furthermore, in Japan, employment support and social independence support for children with disabilities are emphasized.

In support schools and special support classes, employment support is incorporated into the learning program, but traditional instruction relies mainly on the teacher's experience and intuition. Such teaching methods are not optimized for individual children, and the subjective nature of effectiveness measurement is a challenge.

On the technical side, the development of analytical methods such as skeletal detection technology and Dynamic Time Warping (DTW) has expanded the possibilities for objective evaluation in various fields [2]. By utilizing these technologies, it is expected that effective instruction and feedback can be provided to each child with a disability, solving the problems in the field of support.

The purpose of this research is to combine artificial intelligence technology and motion analysis methods to build an effective vocational training support program aimed at supporting the employment of children with disabilities. Specifically, we develop a system that uses DTW to calculate the similarity between the learner's motion and the model motion and scores the results.

This system will enable optimal instruction for each disabled child and is expected to improve their motor skills and promote their motivation to learn. Furthermore, by providing scored feedback, we aim to improve the traditional evaluation that relies on the subjectivity of the instructor and provide learners with an intuitive and easy-to-understand means of confirming results.

In this research, we use skeletal detection technology to record the learner's three-dimensional coordinate data and perform quantitative evaluation. In addition, we will design a program that allows learners to visually check their own progress through a motion evaluation function and maximize the learning effect.

The key thing is immediate feedback to trainees. Delayed feedback is not effective in comparison to the immediate feedback. To provide feedback on a real time basis, motion prediction is necessary. Although there are so many prediction methods, Recursive Least Squares (RLS) method is the most accurate and efficient one [3]. Therefore, the proposed method and system utilizes the DTW with RLS prediction method in comparison between model motion and trainees' motion.

In the next section, related research works are to be reviewed followed by the proposed method. Then, experiments with a small number of samples are described. After that, conclusion is described together with some discussions.

II. Related Research Works

Many of the research proposals to date have used skeletal detection technology to analyze motion and assist programs. For example, in a study of physical therapy using Microsoft's Kinect sensor, a system has been developed that records the motions of people with disabilities and evaluates their motor skills. In addition, a motion analysis system specialized for children with disabilities has attempted to objectively monitor growth by quantifying the children's motor skills.

"Recognition and Scoring Physical Exercises via Temporal and Relative Analysis of Skeleton Nodes Extracted from the Kinect Sensor" [4].

This paper describes a method for recognizing and scoring motions using skeletal joint data from the Kinect sensor. By extracting features from the joints and generating relative descriptors to quantify the relationships during motion, high accuracy in labeling and scoring is achieved.

On the other hand, research is also underway on motion similarity evaluation using DTW. DTW is a method for efficiently calculating the similarity between time series data and has a track record of application in speech recognition and the medical field in addition to physical therapy. For example, it has been used to perform accurate movement analysis in patient rehabilitation, and efforts have been reported to quantify the results of motor learning.

While these studies have confirmed the effectiveness of technology, not enough research has been done on its adaptability to children with disabilities or on methods of providing real-time feedback of movement evaluation results to children and students. A scoring system that allows children and students to intuitively understand their progress in acquiring movements could contribute to improving their motivation to learn, but there are few concrete examples of its implementation.

The following publications contain important research findings on the methods, effects, and application of immediate feedback during training.

Continuous concurrent feedback degrades skill learning is discussed with implications for training and simulation [5]. Meanwhile, augmented visual, auditory, haptic, and multimodal feedback in motor learning are reviewed [6]. Harnessing and understanding feedback technology in applied settings is discussed [7].

Evidence for biomechanics and motor learning research improving golf performance is introduced [8]. On the other hand, information feedback for motor skill learning is reviewed [9]. The roles and uses of augmented feedback in motor skill acquisition are discussed [10].

The effects of augmented auditory feedback on psychomotor skill learning in precision shooting are clarified [11]. Meanwhile, understanding the role of augmented feedback (The good, the bad, and the ugly) is discussed [12].

The paper examines the effects of immediate feedback in athletic instruction and effective methods of immediate feedback. The authors clarified that immediate feedback during exercise is effective in improving athletic technique and performance, and cited clarity, immediacy, simplicity, and positive expressions as effective methods of immediate feedback [13].

The systematic review summarizes past research on the effects of immediate feedback in athletic instruction. The authors show that immediate feedback is effective in improving athletic skills and performance, and point out that the content, timing, and method of feedback are important factors that affect its effectiveness [14].

The meta-analysis integrates and analyzes past research on the effects of immediate feedback in athletic instruction. The authors show that immediate feedback is moderately effective in improving athletic skills and performance, and point out that the content, timing, and method of feedback are important factors that affect its effectiveness [15].

The study experimentally examined the effect of feedback frequency on the learning effect in motor skill learning and suggests that providing feedback (perceptual information) in near real time is advantageous for acquiring and adjusting a movement [16].

The study systematically reviews the role of feedback in education in general and is also useful for deepening understanding of the significance and effectiveness of immediate feedback in the skill acquisition process, such as in motor instruction [17].

The study reports on the development of a system that uses sensors and real-time processing technology to instantly analyze a trainee's movements and provide feedback, and an evaluation of its usefulness [18].

An example of an evaluation of how a method of providing immediate feedback during motor learning in a Virtual Reality (VR) environment affects learning outcomes and shows an example of a teaching method utilizing the latest technology [19].

This research is an example of the development of a system that uses wearable sensors to instantly analyze and evaluate a trainee's movements and provide feedback. An approach based on real-time motion capture and analysis technology is presented [20].

From the above, current employment support systems often depend on the experience of the instructor, and optimal instruction is not provided for each learner. In addition, because the evaluation results are subjective, it is difficult to quantitatively grasp the progress and improvement points of the learner.

Furthermore, several systems that combine skeletal detection technology and DTW have been proposed, and their effectiveness has been demonstrated, but there is still insufficient development of application examples specific to children with disabilities and systems that provide visual and audio feedback on the results of movement evaluation.

III. Proposed Method

A. Research Approach

In this study, we took the following steps to build a program to support vocational training for children with disabilities. These steps comprehensively cover everything from acquiring the subject's movement data to providing feedback and aim to effectively design and implement the entire system.

1) Use of skeletal detection technology.

2) Recording of model movements.
3) Calculation of similarity using DTW.
4) Judgment of movement quality.
5) Feedback by scoring.
6) Support for repeated learning.

B. Technical Issues

These are the following technical issues: Skeletal Detection and Motion Similarity Measurement as well as Analysis and Motion Prediction.

1) Skeleton detection technology is a technology that detects the major joints and parts of the human body in real time and records them as three-dimensional coordinate data. In recent years, this technology has been applied in the following areas.

a) Rehabilitation: It is used to monitor the rehabilitation process of patients and evaluate the accuracy of their movements and areas for improvement. Sensors such as Microsoft Kinect and Intel RealSense have realized simple and highly accurate skeletal detection.

b) Sports analysis: It is used to analyze athletes' movements and is useful for improving performance and preventing injuries. Methods that maximize training effects by evaluating the efficiency of movements based on skeletal detection data are becoming widespread.

c) Education and entertainment: In games and interactive educational content, skeletal detection technology is also useful for building systems that recognize user movements and respond in real time.

In this study, we focused on the ThreeDPose library. ThreeDPose Tracker is an image recognition and pose estimation AI technology developed in-house by Digital Standard Co., Ltd. By using the coordinates output by the TDPT system to manipulate the bone angles of the avatar, the app enables full-body tracking using only a camera, without the need for trackers on the body. This app is widely used by many people, including as a VTuber or for expressing the whole body in the metaverse.

Another candidate is MedeaPipe. Mediapipe is an open-source skeleton detection library provided by Google that can detect human skeletons in real time from camera footage and obtain the 3D coordinates of each joint with high accuracy. Due to its light weight and high accuracy, we decided that it would be the ideal choice for our employment support program for children with disabilities.

2) DTW is a method to calculate the similarity between time series data. This method can accurately compare time series data of different lengths by minimizing the distance between data while taking into account the time axis shift.

a) Speech recognition: DTW is widely used in speech recognition to compare speech data while correcting for differences in different speakers and speech rates.

b) Medical field: DTW is used to compare patients' motion data and identify rehabilitation progress and abnormal movements. Using DTW, it is possible to quantitatively evaluate the effectiveness of rehabilitation.

c) Physical therapy support: DTW is considered important as a basic technique for comparing model movements and the learner's movements and providing individualized instruction, especially in physical therapy for disabled children and the elderly.

In this study, we aim to use DTW to evaluate the similarity between the learner's movements and the model movements and quantitatively measure the effectiveness of employment support. This makes it possible to provide feedback based on objective data rather than relying on traditional subjective evaluations.

3) Analysis and prediction of motion time series data using the RLS method, a type of machine learning algorithm.

C. Procedure of the Proposed Method

The steps of the proposed method are as follows.

1) Analyzing the learner's movements using skeletal estimation: Extract the learner's three-dimensional coordinate data using skeletal estimation technology.

2) Creating exercise movements using a 3DCG character: Create an animation of the exercise movements of a 3DCG character to present a model of physical training exercises.

3) Calculating the similarity between the ideal movements and the learner's movements: Determine the ideal movements in work and the learner's skeletal movements and calculate the similarity using Time Warp.

4) Judging the quality of the learner's physical movements: Judgment the quality of the learner's work movements from the similarity obtained in (3) and the learner's skeletal coordinate data.

5) Predicting the learner's movements using RLS: Predict abnormal movements in advance using the RLS method based on the similarity obtained in (3).

IV. Experiment

A. Experimental Set-Up

As examples of physical movement practice to be learned, we chose basic movement’s characteristic of Japanese people, such as bowing, correct posture, and standing upright. We built a system that allows students to check sample movements (Fig. 1(a)) and their own movements (Fig. 1(b)), and to analyze and evaluate the students' physical movements. Furthermore, we set up the system to provide feedback in real time based on the evaluation results.

The learner's skeletal coordinate information is extracted, and the extracted coordinate information is compared with the data of the sample movement to judge the movement. This mode provides real-time feedback to the learner based on the judgment results. Unlike the comparison confirmation mode where you review the data later, feedback is given at each stage during training. By achieving these, the goal is to "develop a system that provides efficient employment support." The procedure is as follows.

1) Recognize the learner with a camera

2) Extract skeletal coordinated information

3) Based on the extracted skeletal coordinate data

(a) Model motion (b) Trainee motion

Fig. 1. Example of pictures for training bowing.

Calculate the similarity between the model movement and the learner's movement.

4) Judgment result based on the similarity.

5) Real-time feedback, for example, "Please lower your head a little more," "Stretch your back," "Put both hands on your thighs," etc.

As for the skeleton extraction, MediaPipe does work so well. An example is shown in Fig. 2. Green colored lines show the skeleton of the actual trainee on the right side of the picture.

Fig. 2. Example of the extracted skeleton of the trainee.

B. *Preliminary Experiment for Confirmation of Effect of the Feedback Ways (Real-Time or Post-Exercise)*

Preliminary experiment is conducted for confirmation of effect of the feedback ways (Real-Time or Post-Exercise). We investigated and analyzed the learning effects of real-time feedback and post-exercise feedback on learners. Six university students from Kurume Institute of Technology participated in this study.

Students who participated in the experiment were asked to perform two types of stretching exercises to prevent back pain.

1) Watch video A for stretching exercises to prevent back pain.

2) Perform exercise A without real-time feedback.

3) Receive feedback after exercise A.

4) Repeat (1) to (4) until exercise A is mastered.

As for exercise B

5) Watch video B for stretching exercises to prevent back pain.

6) Perform exercise B while receiving real-time feedback.

7) Repeat (1) to (3) until exercise B is mastered.

8) Conduct a survey to analyze the difference in the effects of the two types of feedback.

Both exercise A and B are in the YouTube site of https://www.youtube.com/watch?v=koelvnexy3g. Examples of exercise A and B are shown in Fig. 3(a) and (b), respectively.

(a) Exercise Model A (b) Exercise Model B

Fig. 3. Examples of the model exercise A and B.

The results of the feedback survey are as follows. Six students were targeted; feedback after the exercise was performed, and real-time feedback, where feedback is given while the student is performing the exercise. Table I shows the impact that these two methods had on the students.

The results showed that "stretching with real-time feedback" was easier to understand and maintained motivation compared to "stretching with delayed feedback." It was also found that the number of times required to master the movements was fewer with real-time feedback than with post-exercise feedback. Therefore, a real-time feedback system is intended to create.

TABLE I. RESULT FROM THE EXPERIMENT FEEDBACK EFFECTS COMPARISON BETWEEN REAL-TIME AND POST-EXERCISE

	Post Feedback	**Real-Time Feedback**
Ease of conveying instructions	0 人	6
Maintaining motivation	0 人	6
Average number of times required to learn	2.7	1

Mediapipe was started via a camera or video, and the learner's movements were converted into time-series data of the coordinates of each joint after skeleton detection. The similarity between the example and the learner was evaluated using a similarity judgment system based on DTW, and feedback was given if the similarity was low.

Comparisons of time-series data were made using the same method used to measure the distance and similarity between the time-series data of the joint coordinates of the example and the learner. An example of the comparison of two time-series data, Data 1 and 2 is shown in Fig. 4. At this time, the distance between each point of the two-time series was calculated in a brute-force manner as a concept of time warp, and the combination with the smallest distance among all patterns was found to be the similarity.

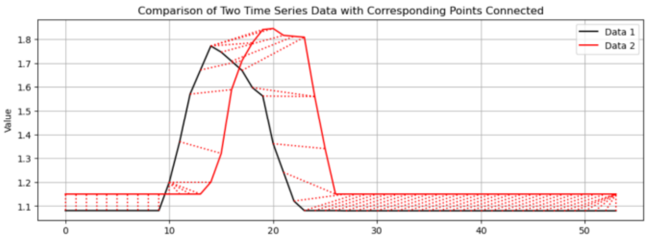
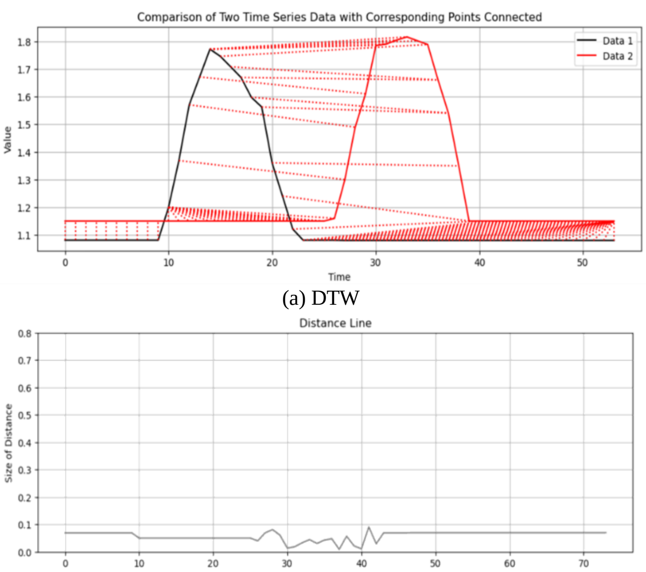


Fig. 4. Example of the comparison of two time-series data, Data 1 (Black) and Data 2 (Red).

We thought that time warping would make it possible to evaluate movements because it can find "similar" movement patterns even if there is a time lag. The graph in Fig. 4 shows the DTW when the correct movement is made. As a result of matching the movements, we can see that the movements are exactly the same.

Also, even if the bow is the same as the previous one, and the timing of the learner's and the model's movements are out of sync (Fig. 5(a)), it can still be matched like this and evaluated as a correct movement. Fig. 5(b) shows a graph of the similarity in this case. The smaller the fluctuation here, the more similar the movements are. Here, the fluctuation is small, and it can be recognized as a bow with the same movement.

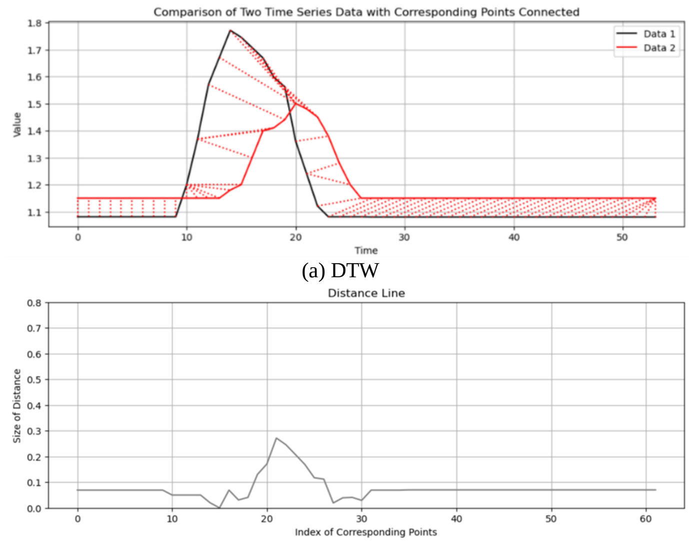


(a) DTW

(b) Similarity

Fig. 5. Example of delayed bowing motion.

Also, when the learner is performing the movement itself, but the movement is shallower than the example, the fluctuation range becomes slightly larger, indicating that the movement is insufficient as shown in Fig. 6. When the movement performed by the learner is significantly different, the fluctuation range of the graph below also becomes larger, indicating that the movement is different.



(a) DTW

(b) Similarity

Fig. 6. Example of the case when the bow is shallow.

To make it easier for students to understand the evaluation of their own movements, we have made it possible to score the similarity using DTW. In addition to the similarity, we have incorporated other factors such as the depth of the movement and the time it takes to start the movement into the scoring criteria, allowing for detailed scoring.

The screenshot of the display of the developed system is shown in Fig. 7. In the display, there are scores, the comments (in this case "Well done"), the radio bottom to the trainee (Try Again, Read the Comments and Return).

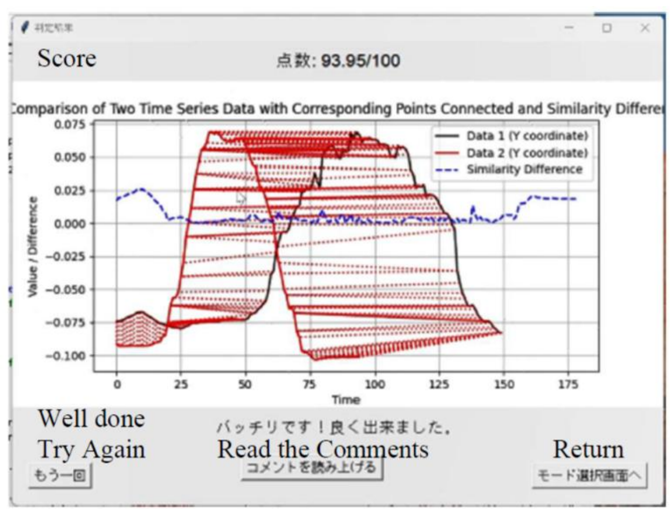
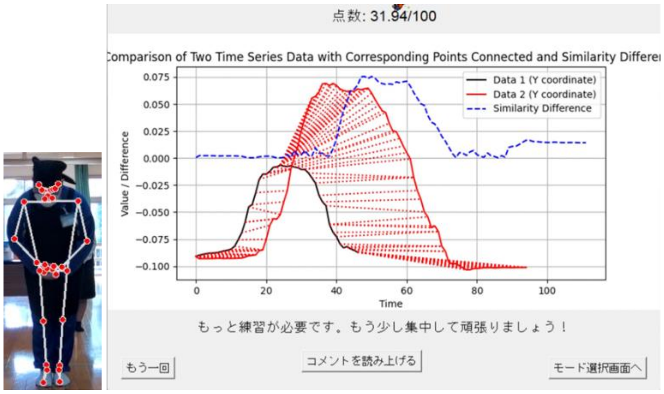
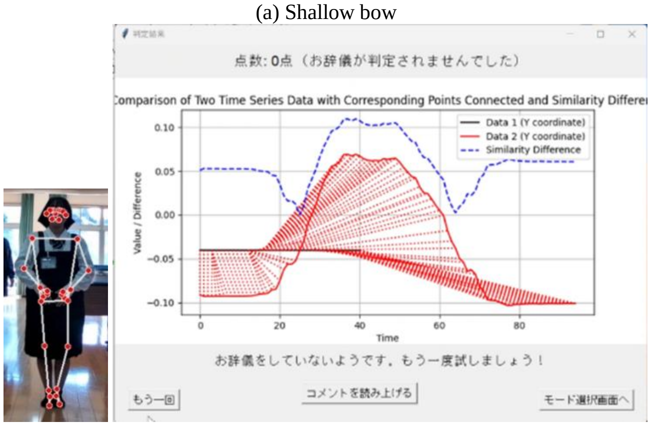


Fig. 7. Screenshot of the display of the developed system.

Two examples, a shallow bow and a straight bow, are shown in Fig. 8(a) and (b), respectively.



(a) Shallow bow



(b) Straight bow

Fig. 8. Examples of a shallow bow and straight bow.

Fig. 9 shows the students using this experimental system to practice physical movements (practicing bowing). As a result, it was found that students can be expected to maintain their motivation by continuing to practice while having fun as if it were a game. In addition, they were seen to try again and again on their own initiative, and all three students who participated in the experiment were able to achieve a score of 90 or more.

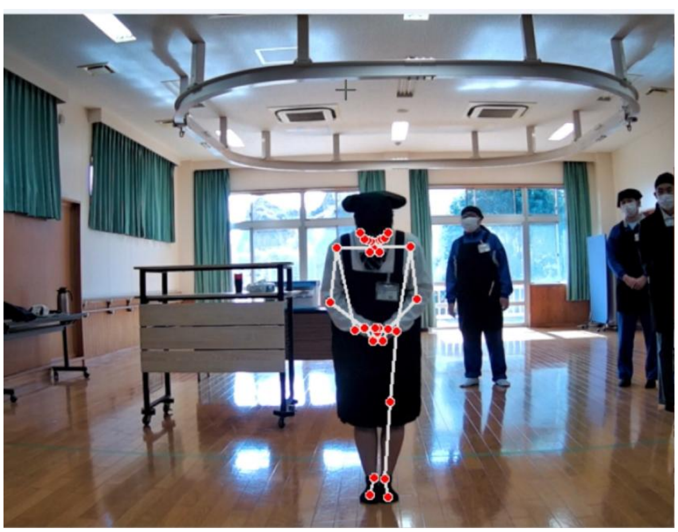


Fig. 9. Photo of the students using this experimental system to practice physical movements (practicing bowing).

As mentioned in the experiment, the trainees tried again and again to get a score of 90 or more, suggesting that the program is effective in maintaining the students' motivation. The trainees who participated in the experiment were highly satisfied, and the trainers commented that they enjoyed playing the game. They received particularly high marks in the categories "Was today's content easy to understand?" and "Do you think this lesson helped you improve your movements?" The reasons for this may be that the graph visualized the movements, allowing the students to intuitively grasp how different their own movements were from the model, and that the ability to objectively evaluate their own movements by scoring them allowed them to correct their movements and make improvements.

V. Conclusion

We develop a system that uses DTW to calculate the similarity between the trainee's motion and the model motion, and scores the results based on the results. This system will enable optimal instruction for each disabled child, and is expected to improve motion skills and promote learning motivation. Furthermore, by providing scored feedback, we aim to improve the traditional evaluation that relies on the subjectivity of the instructor and provide an intuitive and easy-to-understand means of confirming results for trainees.

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Future Research Work

Further experimental studies are required for validation of the proposed system for children with autism spectrum disorder (ASD) often have sensory processing difficulties and delayed motor functions, and it is said that it is necessary to promote sociality and emotional stability through exercise therapy and work-study classes.

References

[1] Ryoikubiz-What is physical therapy?, [online] https://ryoikubiz.com/contents/1/94, accessed March 17, 2025.

[2] DTW [online] https://dynamictimewarping.github.io/python/, accessed on March 17 2025.

[3] Kohei Arai, Kaname Seto: "Applicability limit of RLS method in parameter estimation of Kalman filter", Photogrammetry and Remote Sensing 39(1) p.48-54, 2000.

[4] Raana Esmaeeli,Mohammad Javad Valadan Zoej,Alireza Safdarinezhad,Ebrahim Ghaderpour : "Recognition and Scoring Physical Exercises via Temporal and Relative Analysis of Skeleton Nodes Extracted from the Kinect Sensor", Sensors Volume 24 Issue 20 p18, 18 Oct 2024.

[5] Schmidt, R. A., & Wulf, G., "Continuous concurrent feedback degrades skill learning: Implications for training and simulation". Human Factors, 39(4), 509-525, 1997.

[6] Sigrist, R., Rauter, G., Riener, R., & Wolf, P., "Augmented visual, auditory, haptic, and multimodal feedback in motor learning: A review". Psychonomic Bulletin & Review, 20(1), 21-53, 2013.

[7] Phillips, E., Farrow, D., Ball, K., & Helmer, R., "Harnessing and understanding feedback technology in applied settings". Sports Medicine, 43(10), 919-925, 2013.

[8] Keogh, J. W., & Hume, P. A., "Evidence for biomechanics and motor learning research improving golf performance". Sports Biomechanics, 11(2), 288-309, 2013.

[9] Swinnen, S. P., "Information feedback for motor skill learning: A review". Advances in Motor Learning and Control, 37-66, 1996.

[10] Magill, R. A., & Anderson, D. I., "The roles and uses of augmented feedback in motor skill acquisition". In N. J. Hodges & A. M. Williams (Eds.), Skill Acquisition in Sport: Research, Theory and Practice (pp. 3-21). Routledge, 2012.

[11] Konttinen, N., Mononen, K., Viitasalo, J., & Mets, T., "The effects of augmented auditory feedback on psychomotor skill learning in precision shooting". Journal of Sport and Exercise Psychology, 26(2), 306-316, 2004.

[12] Wulf, G., & Shea, C. H., "Understanding the role of augmented feedback: The good, the bad, and the ugly". In A. M. Williams & N. J. Hodges (Eds.), Skill Acquisition in Sport: Research, Theory and Practice (pp. 121-144). Routledge, 2004.

[13] Sasaki, Y., Togashi, K., Nishijima, K., Hoshino, T., Yokoyama, S., and Arakawa, H. "Effects and methods of immediate feedback in athletic instruction," Health Sciences, Vol. 15, No. 1, pp. 1-8, 2014.

[14] Keogh, J. W. L., & Abernethy, B. D. "The role of immediate feedback in athletic instruction: a systematic review of the literature," Journal of sports sciences, Vol. 25, No. 13, 2007, pp. 1235-1244, 2007.

[15] Schmidt, R. A., Wegner, M., & Lee, J. "Meta-analysis of the effects of immediate feedback in athletic instruction," Journal of sports sciences, Vol. 28, No. 14, 2010, pp. 1405-1414, 2010.

[16] Winstein, C. J. & Schmidt, R. A., Reduced Frequency of Knowledge of Results Enhances Motor Skill Learning, Journal of Experimental Psychology: Learning, Memory, and Cognition, 16(4), 677–691, 1990.

[17] Shute, V. J., Focus on Formative Feedback, Review of Educational Research, 78(1), 153–189, 2008.

[18] Okumura, K., Sato, Y., Tanaka, H., Development and Evaluation of an Exercise Instruction System Utilizing Real-Time Feedback, Transactions of Information Processing Society of Japan, 48(1), 195-203, 2007.

[19] Takahashi, M., Yamada, S., The Effect of Immediate Feedback on Motor Learning Using VR, Transactions of the Institute of Electronics, Information and Communication Engineers, 93(2), 289-298, 2010.

[20] Lee, E. H., Kim, M. J., Lee, S. M., Development of a Real-Time Motion Analysis System Using Wearable Sensors for Exercise Guidance, IEEE Transactions on Neural Systems and Rehabilitation Engineering, 25(9), 1477–1485, 2016.

AUTHORS' PROFILE

Kohei Arai, he received BS, MS and PhD degrees in 1972, 1974 and 1982, respectively. He was with The Institute for Industrial Science and Technology of the University of Tokyo from April 1974 to December 1978 also was with National Space Development Agency of Japan from January 1979 to March 1990. During from 1985 to 1987, he was with Canada Centre for Remote Sensing as a Post-Doctoral Fellow of National Science and Engineering Research Council of Canada. He moved to Saga University as a Professor in Department of Information Science in April 1990. He was a counselor for the Aeronautics and Space related to the Technology Committee of the Ministry of Science and Technology during from 1998 to 2000. He was a councilor of Saga University for 2002 and 2003. He also was an executive councilor for the Remote Sensing Society of Japan for 2003 to 2005. He is a Science Council of Japan Special Member since 2012. He is an Adjunct Professor at Brawijaya University. He also is an Award Committee member of ICSU/COSPAR. He also is a lecturer at Nishi-Kyushu University and Kurume Institute of Technology Applied AI Research Laboratory. He wrote 121 books and published 742 journal papers as well as 577 conference papers. He received 98 of awards including ICSU/COSPAR Vikram Sarabhai Medal in 2016, and Science award of Ministry of Mister of Education of Japan in 2015. He is now Editor-in-Chief of IJACSA and IJISA. http://teagis.ip.is.saga-u.ac.jp/index.html

Kosuke Eto, He received BE degree in 2023. He is currently working on research that uses image processing and image recognition in Master's Program at Kurume Institute of Technology.

Mariko Oda, She graduated from the Faculty of Engineering, Saga University in 1992, and completed her master's and doctoral studies at the Graduate School of Engineering, Saga University in 1994 and 2012, respectively. She received Ph.D(Engineering) from Saga University in 2012. She also received the IPSJ Kyushu Section Newcomer Incentive Award. In 1994, she became an assistant professor at the department of engineering in Kurume Institute of Technology; in 2001, a lecturer; from 2012 to 2014, an associate professor at the same institute; from 2014, an associate professor at Hagoromo university of International studies; from 2017 to 2020, a professor at the Department of Media studies, Hagoromo university of International studies. In 2020, she was appointed Deputy Director and Professor of the Applied of AI Research Institute at Kurume Institute of Technology. She has been in this position up to the present. She is currently working on applied AI research in the fields of education.