P-ISSN: 1992-0091
E-ISSN: 2708-3454

Modern Sport
Vol.21 No.1 ,2022

Published 31/03/2022 Open Access

DOI: https://doi.org/10.54702/msj.2022.21.1.0001

Using Artificial intelligence to evaluate skill performance of some karate skills

Mazin Hadi Kzar[1], Muhammad Asim Muhammad Ghazi[2], Abeer Dakhil Hatem Al-Selmi[3], Hayder Nazar Jawoosh[4]
1,4 Physical Education and Sport Sciences Department, Al-Mustaqbal University College, 51001 Hillah, Babil, Iraq
2Phd. in Curriculum and Instruction Physical Education (Karate) Egypt
3College of Physical Education and Sport Sciences for Women, University of Baghdad, Iraq
4School of Educational Studies, University Science Malaysia (USM), 11800 Penang, Malaysia

mazin_kzar@mustaqbal-college.edu.iq[1] Gfx20044@Hotmail.Com[2] abeer@copew.uobaghdad.edu.iq[3]
Hayder@mustaqbal-college.edu.iq[4]

Received: 03/01/2022, Accepted: 07/03/2022

Abstract

Human beings are starting to benefit from the technology revolution that witness in our time. Where most researchers are trying to apply modern sciences in different areas of life to catch up on the benefits of these technologies. The field of artificial intelligence is one of the sciences that simulate the human mind, and its applications have invaded human life. The sports field is one of the areas that artificial intelligence has been introduced. In this paper, artificial intelligence technology Fast-DTW (Fast-Dynamic Time Warping) algorithm was used to assess the skill performance of some karate skills. The results were shown that the percentage of improvement in the skill performance of Mai Geri is 100%.

Keywords | **Artificial intelligence, skill performance karate game.**

Introduction:

The rapid change and scientific progress in all aspects of life have forced educational and training institutions to adopt modern learning methods and modern training through the mathematical analysis system. To a high degree that qualifies to meet the challenges of the times, and among these modern means there are some programs based on artificial intelligence. (2: 45)

Artificial Intelligence is an important branch of the computer science field that focuses on developing hardware and software systems that contribute to solving problems and accomplishing tasks that, if accomplished by humans, would be considered a kind of intelligence. As the theories and applications in the field of artificial intelligence led to developing a wide range of smart tools artificially, capable of solving or helping to solve many problems. Thus, the importance of artificial intelligence for students, teachers and the educational system in general (1: 15)

From this point of view, artificial intelligence-based teaching and training programs were created to support and confirm the importance of artificial intelligence in analyzing and evaluating skills and to present needs that cannot be met by the traditional methods used for traditional computerized teaching programs. (3: 28)

The development in kinetic learning prompted an attempt to explore alternative models for the art of teaching and learning and the methods that are followed, so that this fine art can be advanced under the laws and conditions that may often be contrary to the current curriculum (4: 1)

Abu Bakr (2013) confirms that artificial intelligence is a relatively recent field that has arisen as one: Simulation of the human mind. Computer science is concerned with studying and understanding the nature of human intelligence

P-ISSN: 1992-0091
E-ISSN: 2708-3454
Modern Sport
Vol.21 No.1 ,2022
Published 31/03/2022
Open Access

and simulating to create a new generation of smart computers that can be programmed to accomplish many tasks that require high ability from inference, deduction, and perception, which are qualities that humans enjoy and fall within the list of intelligent behaviors for them that could not have been acquired by a machine before.

Some studies refer to applying artificial intelligence in physical education sciences such as the study of Kul Asim (2021), Assem (2021), and Al-Saqri. Asim (2020), indicate that the use of artificial intelligence technology in teaching and training physical education sciences, especially in educational skills in the field of physical education and sports. applying artificial intelligence technology in Karate skills gives the right indications in teaching skills and evaluating the technical aspects of those skills. The integration of smart teaching systems and the development of feedback mechanisms to simulate the natural educational environment contribute to the development of learning and training systems and take into account each of the individual needs and requirements. The feedback should be compatible as much as possible with the learner's personality and special needs.

Problem of study:

This technique can solve the problems of objective evaluation. It will help the ordinary teacher to develop his abilities and will fill any deficiency he has through feedback. But it must be pointed out here that artificial intelligence is not supposed to replace innate or natural intelligence. The purpose is not to replace the coach or to do without him entirely, but for the human brain to work side by side with the artificial mind in a perfectly calculated combination. Multiple techniques, software, methods and applications of artificial intelligence can also contribute to limiting its effects, which is represented by this information explosion and the steady technical and cognitive development, in the educational process of teaching and learning skills and the ability to correctly measure those skills.

Objectives of the Study:

The study aims to design a proposed model for the skill performance of some skills in karate using artificial intelligence, through:

-Identifying the specific technical characteristics of the specific technical performance of some skills in Karate (Mae Geri)

Study Questions:

What is the proposed model for evaluating some skills in karate (Mae Geri)

Study Terms:

A model based on artificial intelligence: the researcher defines procedurally as a model that is programmed to be able to study and analyze programming codes in order to detect common logical errors included in the skill while providing solutions to those errors for the programmer student

Study Variables

1 .Independent variable: the proposed model (artificial intelligence).

2 .Dependent variable: Skill performance evaluation scores

3 .Study subject: A model based on artificial intelligence

Study Procedures

Study Methodology: The researcher used the descriptive approach to suit the nature of this study

Study Population: The study population is the karate players who are registered on the Federation's Players Affairs database

Study Sample: Experimental sample: Five students were deliberately chosen from those enrolled in the Egyptian Karate Federation and with a degree of brown belt (1), in order to apply

P-ISSN: 1992-0091
E-ISSN: 2708-3454

Modern Sport
Vol.21 No.1 ,2022

Published 31/03/2022 Open Access

some skills in karate (Mae Geri). To extract the (stability) coefficient of the evaluation form

Equipment and Tools Used in the Research: The researcher used the following research methods, devices and tools:

Innovative electronic device

•Determine the main objective of the model
•Designing the proposed design for the model

•Create a list of logical errors that the model handles

•Designing algorithms for detecting errors in programming

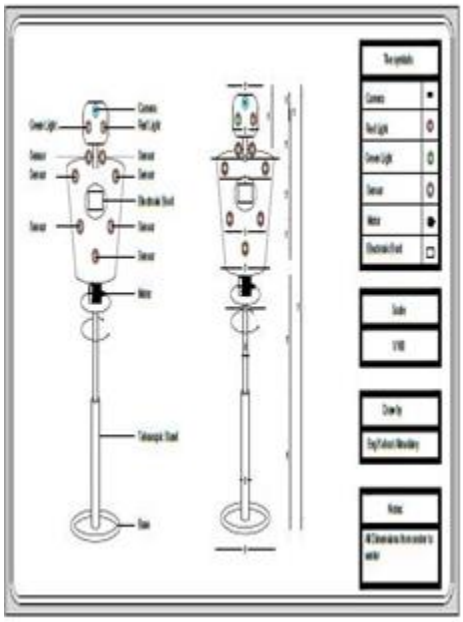
•Programming the model using the Java programming language

•Test the workability of the model

•Presenting the form to the relevant experts and reviewing it

• Direction and final design of the model

Practical demonstration of the proposed model



Data Collection Tools: The researcher used several tools to collect data for this research, and they were as follows:

-Content analysis of some skills in karate (May Geri)

What is the strategy for building the proposed model in assessing skill performance using artificial intelligence?

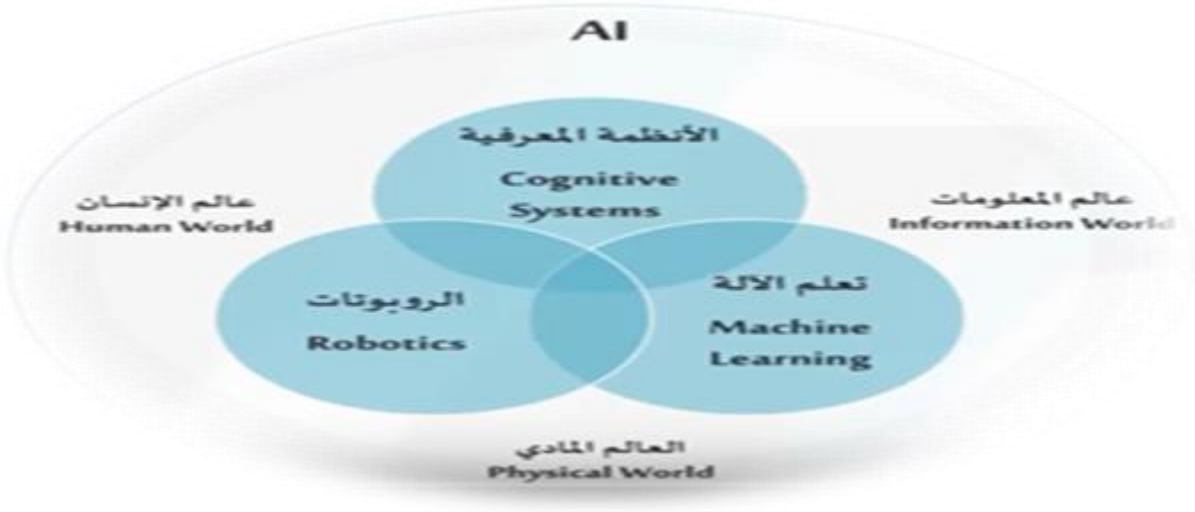
Ashok K. Goel confirms (2018 AD): Conducting research in the field of human-centered computing, artificial intelligence and cognitive science, with a focus on computational design, discovery, and creativity. His research goals are to understand human creativity in the theoretical design of complex systems as well as scientific problem solving, to develop interactive tools to assist people in these creative tasks, and to devise creative computational systems themselves. His research explores analogue thinking, systems thinking, visual thinking, and meta-thinking as fundamental processes of design, discovery, and creativity. His current projects explore

P-ISSN: 1992-0091
E-ISSN: 2708-3454

Modern Sport
Vol.21 No.1 ,2022

Published 31/03/2022 Open Access

analogue thinking and systems thinking in biologically inspired engineering design, visual reasoning in IQ tests, and meta-thinking in game-playing agents. A related project focuses on Systems Thinking and Meta-Reflection in Ecosystem Learning in Middle School Science and Biological Systems in Interdisciplinary Education in a Biologically Inspired Design (Goel, 2020: 3)



Jules indicated in the schematic system that artificial intelligence techniques include:

A - The material world (robots) is an innovative electronic device in the performance of the study.

B - The world of information (machine learning) flashes used in assessing skill performance.

C - The human world (cognitive systems) arithmetic equations to assess skill performance.

The inputs (the hits and kicks in question (Mae Geri) are the coordinates of all the joints of the body in three-dimensional space (X, Y, Z) captured from the Kinect. Before processing any of the obtained data, it was necessary to perform some Preprocessing. One of the challenges in motion capture from Kinect was data normalization. Normalization: The data obtained from Kinect cannot be used directly. During data capture, there will be different body proportions (height, scale, etc.) or a controlling factor in the data. That's why this method used normalization to make all features in the data use the same scale. So that no feature in the data is dominant. The proposed normalization algorithm

Operations (arithmetic rates programmed on the database of the electronic program)

Processing and Algorithms

After pre-processing the data, Fast-DTW (Fast-Dynamic Time Warping) was used to manage the different speeds of the movements made by the performers using the Kinect and to provide them with real-time feedback as accurately as possible. Fast-DTW is an algorithm for measuring the similarities between two signals, each signal may have a different speed than

-Outputs 0 (results and measurements through graphs and arithmetic figures) and output. Which will be categorized as:

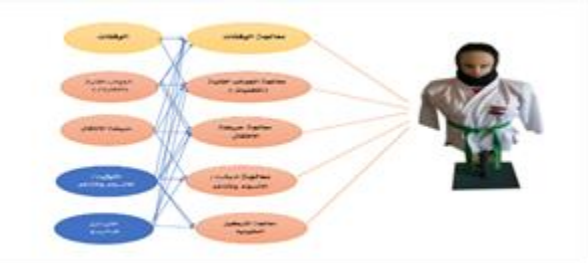
-Results screen: This screen will tell the user whether or not his/her performance the movement correctly, with a percentage of how well he/she performed the movement correctly. If the percentage is acceptable and the transfer is done correctly, the screen will inform the user and show the percentage of health. If the practitioner performed the movement the wrong way, the monitor will show them what they did incorrectly regarding the movement and how to perform it correctly to report.

P-ISSN: 1992-0091
E-ISSN: 2708-3454

Modern Sport
Vol.21 No.1 ,2022

Published 31/03/2022 Open Access

- Report: The second part of the output will be the report. The report will benefit the student and the instructor. Because this report will contain fully detailed statistics on how accurately the practitioner performs the movements and errors and how to improve performance.

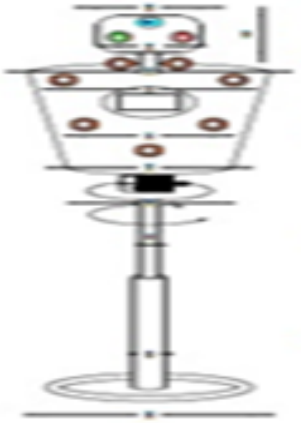


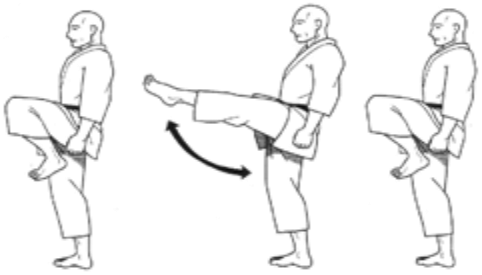
$$X = \frac{VALUE - \mu}{\sigma}$$

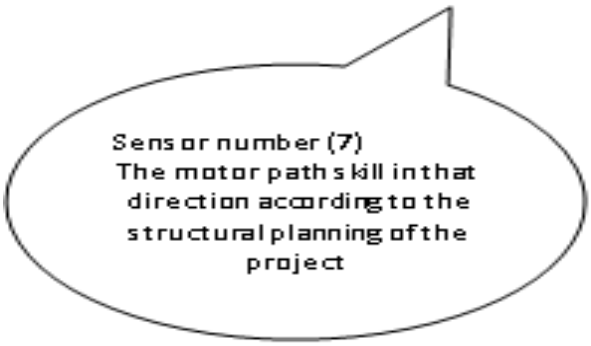
-Results

As mentioned in Section 3.4, a dataset from [11] containing Kata 1 movements including “Age-Uke”, “Mae- Geri”, “Gedan-Barai” and “Soto-Uke” was used to evaluate the system. All joint positions in motion are categorized. Then the confusion matrix was calculated. As shown in Table 1. The average accuracy calculated from the confusion matrix is 90%.

(Mae Geri skill)







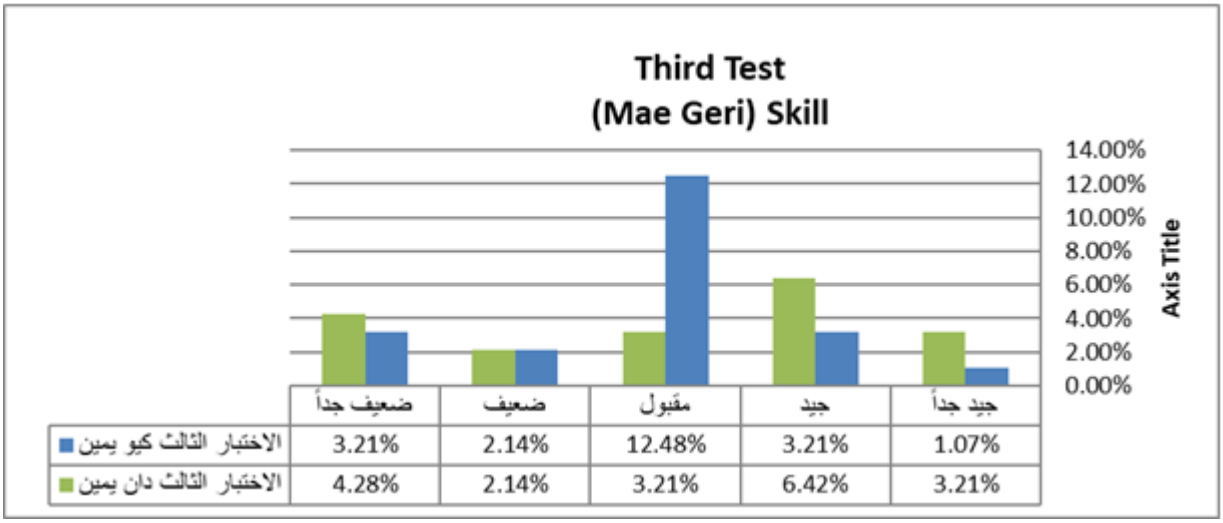
Mae Geri skill levels

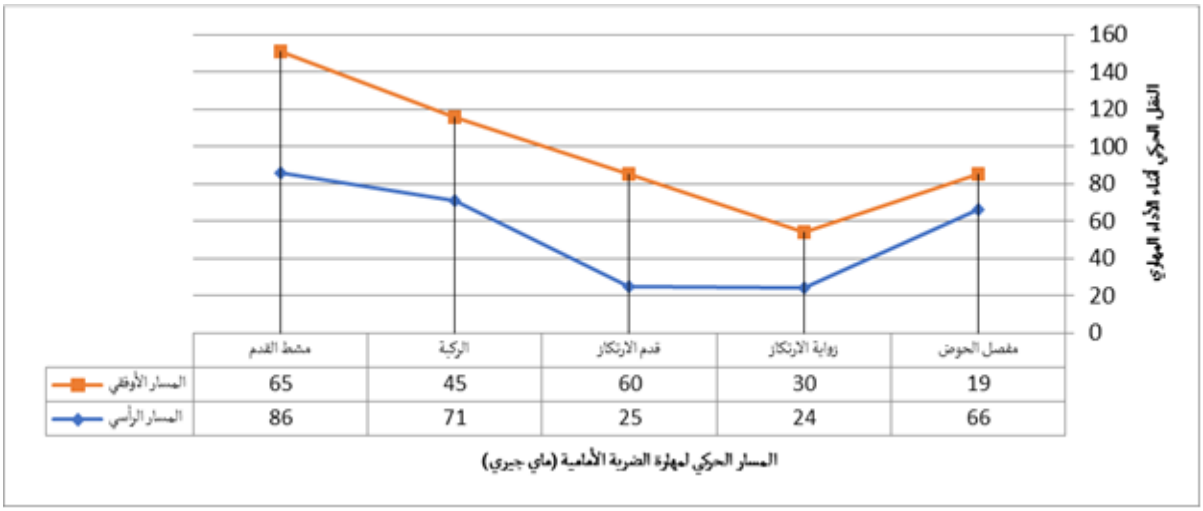
Chart No. (7)

P-ISSN: 1992-0091
E-ISSN: 2708-3454

Modern Sport
Vol.21 No.1 ,2022

Published 31/03/2022 Open Access





Demonstrates motor transfer during the skill performance of a skill (Mae Geri)

Figure No(8) .

In Figure No. (1), it is clear that the results of both the second degree (Q) are between (3.21%: 1.07%) and the first degree (Dan) is between (4.28%: 3.21%), which is a percentage indicating the normal distribution with different forms (skewness). And flatness) in the graph also indicates the kinetic transfer of the skill in its sequential form, and agrees with Nahid Muhammad Ali (2008): that the kinetic flow represents one of the important manifestations of kinetic compatibility during the kinetic learning process and its impact on the speed of reaction during performance, which leads to improving the skill (5: 41)

-As mentioned in Figure (1) and Table (2), a data set from [11] containing Kata 1 movements including Mae- Geri was used to evaluate the system. All joint positions were categorized the confusion matrix was then calculated as shown in Table 1. The average accuracy calculated from the confusion matrix is 90% (Emada, 2020: 1)

RESULTS

P-ISSN: 1992-0091
E-ISSN: 2708-3454

Modern Sport
Vol.21 No.1 ,2022

Published 31/03/2022 Open Access

Improvement Percentage				Results
%	Error Percentage	Correction Percentage	Simulation	Skill
%100	0	10	10	Mae- Geri

The percentage of improvement in the skill performance of Mai Geri is 100%

Recommendations

Urging the use of artificial intelligence techniques in other skills

The pursuit of using artificial intelligence in physical education sciences

ACKNOWLEDGMENT

We would like to thanks all the team that works on this research and especially the Dean of Al-Mustaqbal University College represented by. Prof. Dr.Hassan Shakir Majdy for the financial support provided to complete this research

Arabic References

1 .Al-Tai M. , Assem, M. (2020). Artificial Intelligence in Physical Education Sciences. Amman: House of Methodology for Publishing and Distribution.

2 .Ghazi, M. (2021). Digital Techniques in the Development of Physical Education. Amman: Dijla House for Publishing and Distribution.

3 .Ghazi, M. (2021). Artificial Intelligence in Training and Teaching Karate. Amman: Dar Al Wefaq for Publishing and Distribution.

4 .Ahmed, M. (2010). Building a Proposed Model for Evaluating Basic Motor Skills Using Some Qualitative Motor Analysis Models. Saudi Arabia: College of Sports Sciences and Physical Activity - King Saud University.

5 .Mohammed, N. (2008). Kinetic Rhythm Between Theory and Practice. Zagazig: Journal of the Faculty of Physical Education for Girls.

English References

6 .Emada, B. (2020). The 11th International Conference on Ambient Systems, Networks and Technologies (ANT). Warsaw, Poland.

7. Goel, A. K. (2020, 1 20). DESIGN & INTELLIGENCE LAB. Retrieved From DESIGN & INTELLIGENCE LAB: Http://Dilab.Gatech.Edu/Ashok-K-Goel/