Constructing an AI Intelligent Strategy Algorithm for the Identification of Talented Rowers

Jing-Wei Liu

National Taiwan University of Sport

SHENG-HSIANG CHEN (✉ harvestpaleale@gmail.com)

National Taiwan University of Sport <https://orcid.org/0000-0002-1125-1791>

Che-Hsiu Chen

National Taiwan University of Sport

Tsung-Han Huang

National Taiwan University of Sport

Research Article

Keywords: AI Intelligent Strategy Algorithm, AHP, TOPSIS, Rowing

Posted Date: April 22nd, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-425676/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Version of Record: A version of this preprint was published at Soft Computing on July 28th, 2021. See the published version at <https://doi.org/10.1007/s00500-021-06050-3>.

Constructing an AI Intelligent Strategy Algorithm for the Identification of Talented Rowers

Jing-Wei Liu¹, Sheng-Hsiang Chen^{2*}, Che-Hsiu Chen³, and Tsung-Han Huang⁴

¹Department of Sport Information and Communication, National Taiwan University of Sport,
Taichung, Taiwan

²Department of Sport Information and Communication, National Taiwan University of Sport,
Taichung, Taiwan

³Department of Sport Performance, National Taiwan University of Sport, Taichung, Taiwan

⁴Graduate Institute of Recreational Sport Management, National Taiwan University of Sport, Taichung,
Taiwan

*Corresponding author: Chen, Sheng-Hsiang
e-mail: harvestpaleale@gmail.com
ORCID: 0000-0002-1125-1791

Declarations

1. Conflicts of interest/Competing interests

The authors declare that they have no obviously competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

2. Ethics approval

This article does not contain any studies with human participants or animals performed by any of the authors.

3. Authors' contributions

Jing-Wei Liu: Writing-original draft, Conceptualization, Constructing experimental model and Methodology. **Sheng-Hsiang Chen:** Methodology, Validation, Writing - review & editing. **Che-Hsiu Chen:** Data Curation. **Tsung-Han Huang:** Project administration, Data Curation.

Constructing an AI Intelligent Strategy Algorithm for the Identification of Talented Rowers

Abstract

Taiwan's rowing has achieved well performance in the Asian Games, but it has not in the Olympics. To get good results, in addition to the hard work and solid and effective training on weekdays, the qualification of the players is one of the key factors. Therefore, this research attempts to construct an artificial intelligence (AI) evaluation algorithm for rowing athletes to obtain advantages in the sports field, and can start from the athletes. The AI algorithm involves the hierarchical analysis method (AHP) is adopted to invite experts and scholars in the rowing field to answer the expert questionnaire. The TOPSIS (technique for order performance by similarity to ideal solution) method is then applied to calculate the ranking of material selection indicators, aiming to construct an evaluation model for rowers. The main research result shows that physicality is considered as the highest priority among the four main criteria of talent identification, following in a descending order by specialism, reaction and psychological elements. The propose model established by the most beneficial decision model for identification of talented rowers in the future.

Keywords: AI Intelligent Strategy Algorithm, AHP, TOPSIS, Rowing

1. INTRODUCTION

The rowing athletes of Taiwan have achieved well performance in the rowing of the Asian Games. However, such a scenario is very different from that in the Olympic Games. Indeed, although the Taiwanese rowers were successively qualified into the last four Olympics, they were all unable to win the medals. The fact that Jiang Qianru was ranked 17th in the women's single scull competition in the 2004 Athens Olympics and Wang Minghui was ranked 23rd in the men's single scull in the 2008 Beijing Olympics remains the best women's and men's rowing performance for Taiwan in Olympics. Comparing with weightlifting, taekwondo, and archery that have the Olympic strong medal-winning ability for Taiwan, as Tang (1996) noted, rowing in Taiwan still has a lot of room for improvement.

Different sports require different body shapes and athletic abilities to achieve well performance. Therefore, understanding the physique requirements of rowing athletes can optimize the process of selecting and/or identifying potential rowers. In recent years, many scholars have extended researches to athlete selection in numerous sports through various methods. Zheng (2017) used the physical fitness differences of excellent male college football players in different positions in China to conduct tests of specific physical fitness tests in different positions to construct a material selection model. Yuan (2017) investigated the body shape and palm dermatoglyphics of the women's volleyball open group in the southern region of Taiwan. The research results were compared with the relevant studies of other scholars, using for the selection of female volleyball players in the future. A baseball coach adopted the Delphi method to construct the basis for the selection of baseball pitchers at the junior high school (Shen 2017). Cao, Zhang, and Gao (2013) referred to the relevant literature on basketball talent selection and collected the recommendations of basketball experts and scholars to establish the professional ability assessment of basketball players. The model provides

selection of basketball players. Salimi et al. (2012) used AHP (analytic hierarchy process) and TOPSIS (technique for order performance by similarity to ideal solution) to construct a decision-making model for sports venues selection, including nine weighted criteria. Indeed, Mavi, Mavi, and Kiani (2012) combined AHP and TOPSIS algorithms to measure and evaluate the performance of the national football team players. Moreover, Chen, Lee, and Tsai (2014) developed a decision-making model for the coaching team to choose a starting pitcher scheduling strategy by applying AHP and TOPSIS. Furthermore, Nurjaya et al. (2020) adopted AHP to value some main criteria that help to identify talented rowers.

The literatures above indicate that the criteria for sports talent identification are primarily formed through the relevant literature review and the experience of sports experts and scholars. Also, the body shape and special physical fitness requirements are the two main criteria included in most studies of sports talent identification. Current researches in Taiwan on the identification of rowing athletes are also based on the data of the body shape of excellent male and female rowers, and are further compared the data with that of other international excellent rowers. These researches are used AI intelligent strategy algorithm to discover potential rowing talents, but they rarely put focus on the quality of various special abilities of rowing (Gong et al. 201; Huang et al. 2013). Therefore, this research not only refers to the literature in relation to rowing, but also includes the special abilities required by rowers into consideration. In addition, based on the AI evaluation algorithm of AHP and TOPSIS, the model of identifying potential rowers is constructed.

2. AI INTELLIGENT STRATEGY ALGORITHM

Saaty (1980) proposed the AHP model to solve complex decision problems. The AHP is also a measurement theory that prioritizes the hierarchy and consistency of judgment data provided by a group of decision makers. TOPSIS was first proposed by Hwang and Yoon (1981). The underlying logic of TOPSIS is to define the ideal and negative ideal solutions. The ideal solution is the solution that maximizes the benefit criteria and minimizes the cost criteria; whereas the negative ideal solution maximizes the cost criteria and minimizes the benefit criteria. In this stage, we construct an AI intelligent strategy algorithm for evaluation international excellent rowers, the AI intelligent strategy algorithm are:

Step 1: Establish a Hierarchy of Experts

The AHP incorporates the evaluations of all decision makers into a final decision, without having to elicit their utility functions on subjective and objective criteria, by pairwise comparisons of the alternatives (Saaty 1990). The AHP applied to a diverse array of problems, using the following calculation procedure (Xitlali et al. 2010; Zhang et al. 2010).

Step 2: Development of an Expert Questionnaire for Evaluating Rowers

Establish a pairwise comparison matrix A . Let $C_1, C_2, \dots, C_n$ denote the set of criteria, while a_{ij} represents a quantified judgment on a pair of elements C_i, C_j . The relative importance of the two criteria is rated using a scale with the values 1, 3, 5, 7, and 9, where 1 refers to “equally important”, 3 denotes “slightly more important”, 5 equals “strongly more important”, 7 represents “demonstrably more important” and 9 denotes “absolutely more important.” This yields an n -by- n matrix A as follows:

$$A = [a_{ij}] = \begin{matrix} & \begin{matrix} C_1 & C_2 & L & C_n \end{matrix} \\ \begin{matrix} C_1 \\ C_2 \\ L \\ C_n \end{matrix} & \begin{bmatrix} 1 & a_{12} & L & a_{1n} \\ \frac{1}{a_{12}} & 1 & L & a_{2n} \\ M & M & M & M \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & L & 1 \end{bmatrix} \end{matrix} \quad (1)$$

Where $a_{ij} = 1$ and $a_{ij} = \frac{1}{a_{ji}}$, $i, j = 1, 2, \dots, n$.

Step 3: Calculate the Weights of the Criteria and Sub-criteria

In matrix A , the problem becomes one of assigning to the n criteria $C_1, C_2, \dots, C_n$ a set of numerical weights $W_1, W_2, \dots, W_n$ that reflect the recorded judgments. If A is a consistency matrix, the relations between weights W_i and judgments a_{ij} are simply given by $\frac{W_j}{W_i} = a_{ij}$ (for $i, j = 1, 2, \dots, n$). Saaty (1990) suggested that the largest eigenvalue λ_{max} would be

$$\lambda_{max} = \sum_{j=1}^n a_{ij} \frac{W_j}{W_i} \quad (2)$$

If A is a consistency matrix, eigenvector X can be calculated by

$$(A - \lambda_{max}I)X = 0. \quad (3)$$

Saaty proposed utilizing the consistency index ($C.I.$) and the consistency ratio ($C.R.$) to verify the consistency of the comparison matrix. $C.I.$ and $R.I.$ are defined as follows [13]:

$$C.I. = \frac{\lambda_{max} - n}{n - 1}, \quad (4)$$

$$C.R. = \frac{C.I.}{R.I.} \quad (5)$$

Where $R.I.$ represents the average consistency index over numerous random entries of same order reciprocal matrices. If $C.R. \leq 0.1$, the estimate is accepted; otherwise, a new comparison matrix is solicited until $C.R. \leq 0.1$.

Step 4: Calculation TOPSIS Decision Matrix

The ranking of alternatives in TOPSIS is based on the relative similarity to the ideal solution, which avoids the situation of both ideal and negative ideal solutions being similar. The calculation processes of the method are as follows:

$$D = \begin{matrix} & \begin{matrix} X_{11} & X_{12} & L & L & X_{1j} & X_{1n} \end{matrix} \\ \begin{matrix} A_1 \\ A_2 \\ M \\ A_i \\ M \\ A_m \end{matrix} & \begin{bmatrix} X_{21} & X_{22} & L & L & X_{2j} & X_{2n} \\ M & M & M & L & M & M \\ X_{i1} & X_{i2} & M & M & X_{ij} & X_{in} \\ M & M & M & L & M & M \\ X_{m1} & X_{m2} & L & L & X_{mj} & X_{mn} \end{bmatrix} \end{matrix} \quad (6)$$

where A_i denotes the possible rows, $i = 1, \dots, m$; X_j represents criteria related to alternative performance, $j = 1, \dots, n$; and X_{ij} is a crisp value indicating the performance rating of each row A_i with respect to each criterion X_j .

Calculate the normalized decision matrix $R (= [r_{ij}])$. The normalized value r_{ij} is calculated in equation (7):

$$r_{ij} = \frac{X_{ij}}{\sqrt{\sum_{j=1}^n X_{ij}^2}}, j = 1, \dots, n; i = 1, \dots, m. \quad (7)$$

A set of weights $w = (w_1, w_2, \dots, w_n)$, $\sum_{j=1}^n w_j = 1$ from AHP is the accommodated weight.

This matrix can be calculated by multiplying each column of R with its associated weight w_j . Therefore, the weighted normalized decision matrix V is equal to equation (8).

$$V = \begin{bmatrix} V_{11} & V_{12} & L & V_{1j} & L & V_{1n} \\ M & M & & M & & M \\ V_{i1} & V_{i2} & L & V_{ij} & L & V_{in} \\ M & M & & M & & M \\ V_{m1} & V_{m2} & L & V_{mj} & L & V_{mn} \end{bmatrix} = \begin{bmatrix} w_1 r_{11} & w_2 r_{12} & L & w_j r_{1j} & L & w_n r_{1n} \\ M & M & & M & & M \\ w_1 r_{i1} & w_2 r_{i2} & L & w_j r_{ij} & L & w_n r_{in} \\ M & M & & M & & M \\ w_1 r_{m1} & w_2 r_{m2} & L & w_j r_{mj} & L & w_n r_{mn} \end{bmatrix} \quad (8)$$

Step 5: Calculate the Most Ideal Solution and the Negative Ideal Solution

The ideal solution is computed based on the following equations (9) and (10):

$$A^* = \{(\max V_{ij} \mid j \in J), (\min V_{ij} \mid j \in J'), i = 1, 2, \dots, m\}, \quad (9)$$

$$A^- = \{(\min V_{ij} \mid j \in J), (\max V_{ij} \mid j \in J'), i = 1, 2, \dots, m\}, \quad (10)$$

where

$$j = \{j = 1, 2, \dots, n \mid j \text{ belongs to benefit criteria}\},$$

$$j' = \{j = 1, 2, \dots, n \mid j \text{ belongs to cost criteria}\}.$$

Calculate the distance between the ideal and negative ideal solutions for each row, see equations (11) and (12):

$$S_i^* = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^*)^2} \quad i = 1, 2, \dots, m, \quad (11)$$

$$S_i^- = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^-)^2} \quad i = 1, 2, \dots, m, \quad (12)$$

Step 6: Calculate the Comprehensive Evaluation Value of Each Player

Calculate the relative closeness to the ideal solution of each row,

$$C_i^* = \frac{S_i^-}{S_i^* + S_i^-} \quad i = 1, 2, \dots, m, \quad (13)$$

where $0 \leq C_i^* \leq 1$, that is, a row i is closer to A^* as C_i^* approaches 1.

A set of rows can be preference ranked according to the descending order of C_i^* .

3. RESULTS

In this study, eight best rowers are selected from twelve rowers. According to Saaty (1980), it is best not to exceed seven, so as not to affect the consistency of the hierarchy. Therefore, when there are not too many elements in the rowing level, AHP can only achieve the weight value of each criterion and sub-criteria, and then use the TOPSIS method to conduct comprehensive evaluation and ranking of players. This study based on AHP and TOPSIS to construct the rowing player AI evaluation algorithm as shown in Figure 1. First, then, measure the data of the rower's sub-criteria, and then multiply the weights calculated by the AHP by the rower's sub-criteria. Finally, the TOPSIS calculation process is used to calculate the ranking of the rowers, and the rowers are selected by the ranking. The evaluation steps are as follows:

Step 1: Establish a Hierarchy of Experts to select rowers

Xu pointed out that the selection of sports science is actually a combination of many sports-related disciplines, including anatomy-related body shapes and physiques; physiological functions and physical fitness elements covered by sports physiology; sports ability included in sports biomechanics technology and movement; and mental intelligence and various psychological related qualities in the field of psychology can be used as an effective assessment of whether athletes have high-level performance, and genetics is closely related to these sports science related disciplines (Xu 2006). The key factors that influence the selection of rowers through the literature are several important analysis aspects, which are the four analysis aspects of body, response, special and psychological elements, 16 evaluation criteria, four aspects and criteria The following are: body elements (body mass composition, muscle composition, sitting posture and shoulder width), reaction elements (explosive force, coordination, speed, and muscle endurance), special elements (flexibility, rhythm, pull strength, kick strength) , Psychological factors (stress resistance, concentration, self-confidence and goal setting). According to the literature, the four facets and 18 selection criteria for evaluating the selection of rowers' materials were sorted out, and the four facets and 18 selection criteria for the selection of rowers' materials were analysed using the AHP method. The method is divided into three levels, the selection of the first layer of rowers' material selection, the second layer is the four facets of the rower's material selection, and the third layer is the 18 criteria and mathematical code (Huang 2019), see Table 1, AHP architecture diagram, see Figure 2.

Figure 1 Construction of the AI Evaluation algorithm for Rowers

Table 1 Criteria and Sub-Criteria for Evaluating Rowers

Criteria	Criteria Code	Sub-Criteria	Sub-Criteria Code
Body	C1	Body Mass Composition (BMC)	C11
		Muscle Composition(MC)	C12
		Sitting Height(SH)	C13
		Shoulder Width(SW)	C14
		Upper Limb Length(ULL)	C15
Reaction	C2	Explosive Force	C21
		Coordination	C22
		Speed	C23
		Muscular Endurance(ME)	C24
Profession Item	C3	Flexibility	C31
		Pulling Force(PF)	C32
		Kick Strength	C33
		Dynamometer Results(DR)	C34
Psychological	C4	Compression Resistance	C41
		Concentration	C42
		Self-confidence	C43
		Target Setting(TS)	C44

Figure 2 Evaluation Rower Players Architecture

Step2 Development of an Expert Questionnaire for Evaluating Rowers

According to step 1, a pairwise comparison is developed, and an expert questionnaire is developed to evaluate the main and sub-criteria. Taking the evaluation criterion as an example, the questionnaire of the expert pairwise comparison, see Table 2.

Table 2 Expert Questionnaire for Evaluating Rowers

<div><div>Absolutely Important</div><div>←</div><div>Quite Important</div><div>Equally</div><div>Quite Important</div><div>→</div><div>Absolutely Important</div></div>																		
Assessment Scale	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Assessment Scale
Body																		Reaction
Body																		Profession item
Body																		Psychological
Reaction																		Profession item
Psychological																		Profession item

Step 3: Calculate the Weights of the Criteria and Sub-criteria

Use formulas (2) and (3) to calculate the weights of the criteria and sub-criteria, see Table 3.

Table 3 Expert Weights

Criteria	Weight	Sub-criteria	Weight
C1	0.401	C11	0.452
		C12	0.282
		C13	0.147
		C14	0.085
		C15	0.034
C2	0.211	C21	0.083
		C22	0.315
		C23	0.143
		C24	0.459
C3	0.311	C31	0.127
		C32	0.147
		C33	0.163
		C34	0.466
		C35	0.097
C4	0.077	C41	0.471
		C42	0.292
		C43	0.143
		C44	0.094

Step 4: Calculation TOPSIS Decision Matrix

Using formula (6) to formula (8), multiply the weight value of the criteria and sub-criteria by the measurement value of each row, which is the weighted measurement value of each player, and use this value as the initial calculated value of TOPSIS's decision matrix, see Table 4.

Table 4 Weighted Normalization Rower Players Matrix

	C1					C2				C3				C4			
	C11	C12	C13	C14	C15	C21	C22	C23	C24	C31	C32	C33	C34	C41	C42	C43	C44
R1	0.449	0.434	0.453	0.602	0.441	0.418	0.459	0.583	0.380	0.247	0.640	0.415	0.429	0.324	0.681	0.488	0.458
R2	0.416	0.424	0.448	0.577	0.446	0.511	0.438	0.557	0.498	0.082	0.483	0.481	0.471	0.199	0.363	0.317	0.438
R3	0.444	0.516	0.462	0.552	0.485	0.418	0.469	0.591	0.380	0.461	0.598	0.492	0.440	0.473	0.636	0.561	0.399
R4	0.431	0.436	0.448	0.539	0.447	0.418	0.426	0.569	0.552	0.741	0.588	0.464	0.443	0.598	0.727	0.439	0.478
R5	0.492	0.418	0.424	0.577	0.414	0.463	0.443	0.560	0.398	0.412	0.548	0.373	0.452	0.523	0.772	0.391	0.458

Step 5: Calculate the Most Ideal Solution and the Negative Ideal Solution

Use formula (9) to formula (12) to calculate and calculate the most ideal solution and the negative ideal solution, see Tables 5 and 6.

Table 5 The distance between the ideal solution

	C1					C2				C3				C4			
	C11	C12	C13	C14	C15	C21	C22	C23	C24	C31	C32	C33	C34	C41	C42	C43	C44
R1	0.000	0.023	0.001	0.000	0.001	0.008	0.003	0.001	0.054	0.027	0.000	0.036	0.004	0.070	0.000	0.010	0.000
R2	0.015	0.026	0.002	0.002	0.001	0.000	0.010	0.005	0.000	0.048	0.049	0.005	0.000	0.129	0.093	0.035	0.002
R3	0.003	0.000	0.000	0.004	0.000	0.008	0.000	0.000	0.054	0.000	0.013	0.000	0.003	0.000	0.013	0.000	0.006
R4	0.008	0.023	0.002	0.005	0.001	0.008	0.013	0.003	0.025	0.036	0.016	0.013	0.003	0.059	0.013	0.017	0.002

R5	-	0.019	0.028	0.006	0.002	0.002	0.004	0.008	0.005	0.046	0.006	0.028	0.056	0.002	-	0.023	-	0.027	0.024	0.000
----	---	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	---	-------	---	-------	-------	-------

Table 6 The Distance Between the Negative Solution

	C1					C2				C3				C4			
	C11	C12	C13	C14	C15	C21	C22	C23	C24	C31	C32	C33	C34	C41	C42	C43	C44
R1	0.015	0.003	0.001	0.004	0.000	0.000	0.007	0.004	0.000	0.021	0.049	0.000	0.000	0.059	0.093	0.024	0.006
R2	0.000	0.000	0.000	0.002	0.000	0.008	0.000	0.000	0.054	0.000	0.000	0.031	0.004	0.000	0.000	0.000	0.004
R3	0.013	0.026	0.002	0.000	0.001	0.000	0.010	0.005	0.000	0.048	0.036	0.036	0.001	0.129	0.080	0.035	0.000
R4	0.007	0.003	0.000	0.001	0.000	0.000	0.004	0.002	0.079	0.084	0.032	0.022	0.001	0.188	0.106	0.017	0.007
R5	0.034	0.002	0.003	0.002	0.001	0.004	0.002	0.000	0.008	0.042	0.020	0.020	0.002	0.153	0.119	0.010	0.006

Step 6: Calculate the Comprehensive Evaluation Value of Each Player

Use formula (13) to calculate the comprehensive evaluation value of each rower, see Table 6. R3 = 0.749 is the best rower player.

Table 6 Outcome of the Rank of Rower Players

Rower Players	d^+	d^-	TOPSIS A_i^*	Rank
R1	0.103	0.126	0.549	4
R2	0.180	0.063	0.259	5
R3	0.058	0.173	0.749	1
R4	0.084	0.248	0.746	2
R5	0.096	0.204	0.680	3

4. CONCLUSION AND DISCUSSION

This research mainly contributes to the establishment of an AI Intelligent Strategy Algorithm for selecting rowers. First, the study assembled four main criteria and seventeen sub-criteria by using the AHP to collect the recommendations of experts. The weights and importance of the main criteria and sub-criteria are then evaluated. When the TOPSIS selects rowers for the second stage, it will be used as the evaluation index for rowers. In the future, the empirical analysis will be used to verify the availability of the model for selecting rowers.

REFERENCES

- Cao, J. Z., Zhang, Y. G., and Gao, J. J (2013). Excellent basketball player special ability evaluation model construction. *Jiada Sports Health and Leisure Journal*, 12 (3), 109-122.
- Chen, C. C., Lee, Y. T., and Tsai, C. M. (2014). Professional baseball team starting pitcher selection using AHP and TOPSIS methods, *International Journal of Performance Analysis in Sport*, 14 (2), 545-563.
- Gong, T. Y., Huang, T. Y., Yang, S. G., Chen, W. L., and Hong, R.C. (2012). Research on the body shape data of excellent male rowers in Taiwan-Take Wang Minghui as an example. *Proceedings of the Symposium on Sports Training across the Taiwan Straits 2012*, pp. 197-199.
- Huang, Y. Z. (2019). Research on the selection model of rowers. Master's thesis, Institute of Leisure Sports Management, National Taiwan Sports University, Taichung City.
- Huang, X. Z, Huang, T. Y., Liu, Y. Q, Zhou, J. Z., and Gong, T. Y. (2013). Research on the body data of Taiwan's outstanding rowers-take Qiu Juyu as an example, *Proceedings of the cross-strait sports training scientific seminar 2012*, pp. 1-5.
- Hwang C. and Yoon K. (1981). Multiple attribute decision making: methods and application, New York: Springer Publications.

- Mavi, R. K., Mavi, N. K., and Kiani, L. (2012). Ranking football teams with AHP and TOPSIS methods, *International Journal of Decision Sciences, Risk and Management*, 4 (1-2), 1753-7177.
- Nurjaya, Dede & Abdullah, Ade, and Ma'mun, Amung & Rusdiana, Agus. (2020). Rowing talent identification based on main and weighted criteria from the analytic hierarchy process (AHP). *Journal of Engineering Science and Technology*. 15. 3723-3740.
- Saaty, T. L. (1980). *The analytic hierarchy process*, McGraw Hill Publications.
- Saaty, T.L. (1990). How to mark a decision: the analytic hierarchy process. *European Journal of Operational Research*, 48, 9-26.
- Salimi, M., Soltan, H. M., Shaabani, and Bathar, GH.R. (2012) Site Selection of Sport Facilities Using Incessant and Cessation Spatial Methods Based on Combination of AHP & TOPSIS Models, *Sport Management Studies*, 4 (13), 157-180.
- Shen, B. C. (2017). The key factor of applying Delphi method to construct the talent selection of middle school baseball sports pitchers (Master Thesis). Aletheia University, New Taipei City.
- Tang M. X. (1996) The development history of the centenary of the Olympics. Taipei City: Chinese Taipei Olympic Committee.
- Xitlali, D. G., Rafael, P. G., Joaquín, Izquierdo., and Jesús, M. R., (2010). An analytic hierarchy process for assessing externalities in water leakage management, *Mathematical and Computer Modelling*, Vol. 52, Np. 7-8, pp. 1194-1202.
- Xu, S. Y. (2006). The current situation and prospects of Taiwan sports, *National sports quarterly*, 35 (1), pp. 17-18.
- Yuan S. G. (2017). Survey on the body shape of the women's volleyball open group in the college of southern Taiwan (Master Thesis). National Kaohsiung University, Kaohsiung City.
- Zhang, L., Wen, H., Li, D., and Fu, Z., and Cui, S. (2010). E-learning adoption intention and its key influence factors based on innovation adoption theory. *Mathematical and Computer Modelling*, Vol. 51, No. 11-12, pp. 1428-1432.
- Zheng, S. J. (2017). Construction of talent selection model for different positions of excellent college football players (master thesis). Fu Yan University, New Taipei City.

Figures

Figure 1

Construction of the AI Evaluation algorithm for Rowers

Figure 2

Evaluation Rower Players Architecture