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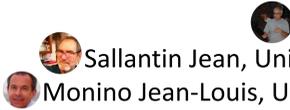
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Multicriteria analysis of the force ratio between two judokas in delayed real time


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Introduction

Since 2016, at the UFRSTAPS of Montpellier, 3rd year students (judo specialty) analyze in a multicriteria way judo combats to optimize their coaching, refereeing, teaching, journalism. One of their works was to analyze a combat on the computer in real time (without pause, visual or auditory signals). This requires knowing and differentiating several criteria: attack and defend at the same time; acting to create uncertainty in the opponent (suggesting that one is going to attack in one direction, to attack in another direction); manage the uncertainties created by the opponent; reflex counterattack (training helps develop this type of skills) [Potdevin, 2007]; manage the score

Aim of the study

To observe students analyzing a recorded video of a judo combat, without replay [Knoblauch et al. 2006], as if they were live, as a coach or referee.

The task for students consisted in assessing or evaluating the interactions of the two judokas to determine if the observed judoka was:

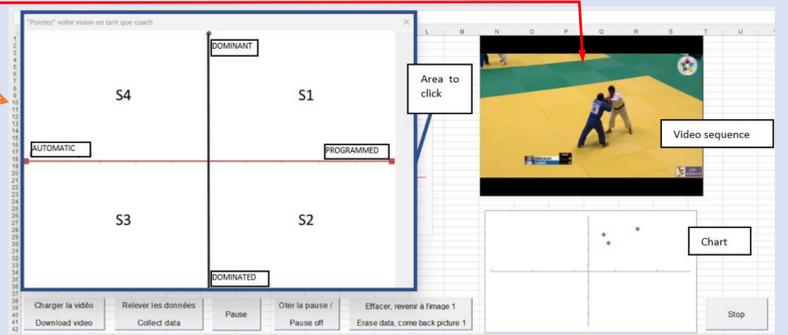
- 1) "dominant, i.e.: in a favorable organization to win" vs. "dominated"
- 2) "programmed/conscious" vs. "automatic" i.e.: for this latter term, a reflex organization [Potdevin, 2007].

Protocol to collect data

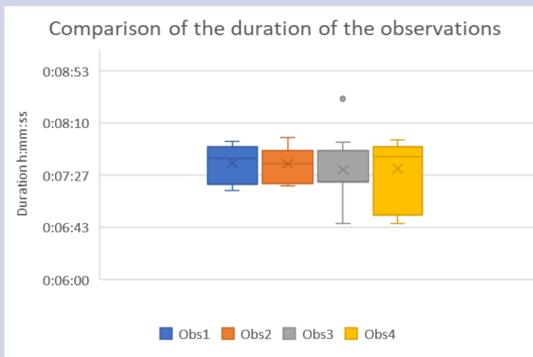
Students were asked to click next to the video in an orthonormal graph (Area to click) consisting of 4 sectors: dominant-programmed (S1); programmed-dominated (S2); dominated-automatic (S3); automatic-dominant (S4).

Each click in the "area to click" was recorded (X and Y coordinates),

Students' results expected were to sum more clicks in S1 and S3 than S2 and S4 (to find the S1=>S3 axis). After training, students analyzed 4 times a combat during 40 min.

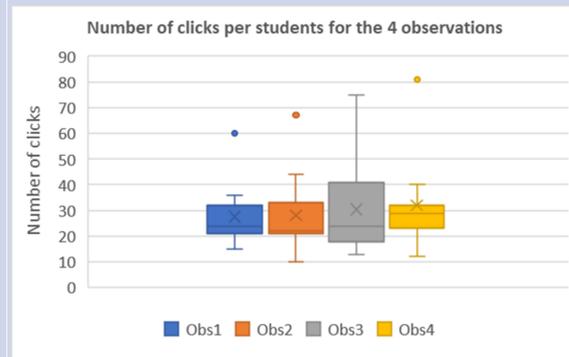


Comparison of the observation times



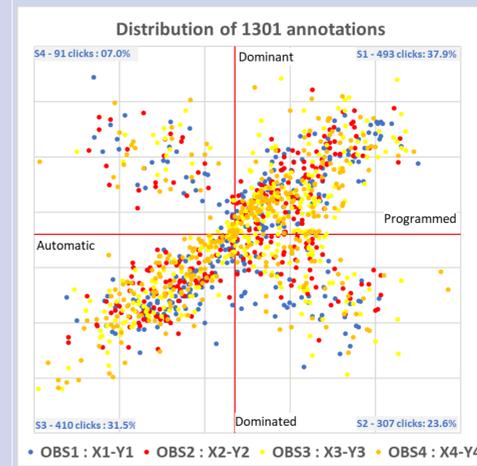
no significant difference was found for the observation times in the 4 observations (Kruskal-Wallis's test: p=0.919)

Comparison of the number of clicks



no significant difference was found for the number of clicks in the 4 observations (Kruskal-Wallis's test: p=0.715)

Distribution of the coordinates of the clicks



Regarding the clicks:
 37.9% were in the sector 1
 23.6% were in the sector 2
 31.5% were in the sector 3
 7.0% were in the sector 4.

Students who have found the S1=>S3 axis

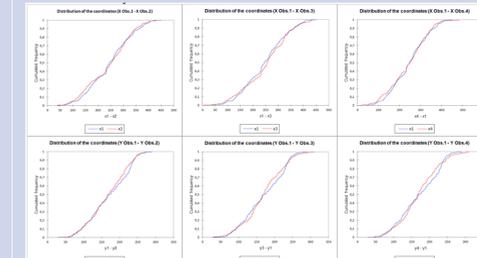
Nb students who found the S1 ↔ S3 axis		Sum and %
0/4	3	4 students
1/4	1	36.4%
2/4	1	7 students 63.6%
3/4	2	
4/4	4	

Distribution of X and Y coordinates of the clicks by bins



No significant difference was found for the distributions of clicks per bin in the 4 observations (Kruskal-Wallis's test: p=0.942 and p=0.968 respectively for X and Y coord.)

Two-by-two comparisons of the distributions of the X-Y for each obs.



No significant difference was found when comparing the distributions X and Y of the 4 observations with bilateral Kolmogorov-Smirnov test

Discussions

The application was useful, and data collected enabled the analyses. Whatever the number of clicks (low or high) students repeat their observations with the same number of clicks. The number of clicks obtained is just above of what was expected: a combat lasting 8 min 39 s with 2 clicks per min would yield 17 clicks and with 3 clicks per min it would yield 26 clicks. The results yielded 29.6 ± 4.9 clicks. Students' replies (69.4%) were mostly in the sector S1 (37.9 %) and in the sector S3 (31.5%) showing the good perception of this reversal of the force ratio. With the significant difference in the comparison of the distributions of collected and random coordinates, we can say that these results were not obtained by pure chance.

Conclusions / Perspectives

The identification of the reversal of the force ratio in the combat, the homogeneity and the repeatability of the analyses verify our hypotheses and confirm the previous study of 2019. It should be noted that 3 students did not pass this task at all (identify the reversal of the force ratio), whereas in our previous study 100% of the students correctly analyzed the ratio of force. This confirms the importance of this training, especially for coaching, teaching, and refereeing. This training could be integrated in the learning methods. On the theoretical level, this training is based on the learning systems used in robotics and particularly the "PDDA" loop (Perceive; Diagnose; Decide; Act). This loop is close thane the one used in management of quality: PDCA (Plan; Do; Check; Act)