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It-driven training system for referees in martial art kobudo

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Background. Refereeing service quality is ranked high on the lists of priority problems in many modern sport disciplines as confirmed by many competitive experiences, with the service quality being most critical in the sport disciplines where the competitive performance is scored by expert/ refereeing teams rather than impartial technical tools. Oriental martial arts formally certified by the national government may be ranked among such disciplines. Oriental martial arts competitions are normally classified into a few events/ programs, with some of them including bouts with sets of technical actions (Kata); and with the referees taking decisions and scoring every action based on the valid rules of competitions. It should be emphasized that the oriental martial arts referee is given a very limited time for decision and, hence, the decisions need to be made in a virtually automatic manner. This means that the referee training and excellence system to ensure the service quality plays a special role in this sport discipline.

Modern interactive computer technologies may be viewed among the most promising and effective ways to improve the referee training and excellence system. Presently the IT developments are increasingly applied in many sports [2-4] with a regretful exception for Kobudo. We believe, therefore that it is a high time to offer a modern IT-driven referee training and excellence system for Kobudo sport.

Objective of the study was to develop and test benefits of the Rules of Competitions and Refereeing Service in Kobudo application software in practice.

Methods and structure of the study. The study was completed at the Modern Information and Communication Technologies for Application in Physical Education and Sports (PES) Research Laboratory of the Physical Education, Gymnastics and Life Safety Theory and Practice Sub-department of the Udmurt State University's Physical Education and Sports Institute. The application software for the purposes of the study was designed using the latest version of the universal data processing system analyzed in [1].

For these purposes, we collected a database of actual competitive situations captured on video in the top-ranking competitions including the European Championship, Russian Championships, Russian Cups, and regional (Volga Federal District) tournaments and cups. These competitive data were used to form a library of competitive situations including the following categories:

- Key elements of competitions: athletes' coming-out ceremony, scoring procedure, nomination of winners;
- Sign language of the referees and corner judges in bouts;
- 50 typical fight situations;
- 35 sample competitive performances in Kata; and
- 25 sample competitive performances in Taiho Jutsu Kata.

The sample fight situations and competitive performances were selected and scored by an expert team of three first- and national-class referees, with the decisions taken by a simple majority vote of at least two experts. Situations with three conflicting decisions were omitted and replaced by the new ones. The Rules of Competitions and Refereeing Service in Kobudo System offers comprehensive tools for the trainees including: data processing and presentation tools; training machine; knowledge and skills tests tools; and an expert service toolkit. The System design includes the following key modules visualized on Figure 1:

(1) **Rules of competitions:** This module gives the valid rules of Kobudo Oriental martial arts in a hyper-textual format with a multimedia toolkit for figures, diagrams and video clips. The module makes an emphasis on the valid rules of competitions, refereeing service requirements and rules of competitions in specific events/ programs. A beginner referee shall perfectly know materials of the module to pass the theoretical knowledge test.

Figure 1. *Head page of the System*

(2) **Theoretical knowledge test:** This module provides a practical toolkit to test the trainees' competency in the following three key components of the rules: rules of competitions; sign language of the referee and corner judge (see Figure 2); and rules of competitions in Kata. The componential design of the module simplifies the progress tests and self-tests in the training process.

Figure 2. *One of the optional test windows with a video clip and check options*

When studies of the rules of competitions are completed, the trainees' knowledge of the latter is tested in every section, with most of the rules-related questions complemented by questions on the competition design and management system. On the whole, the bank of test questions offers 155 tasks with optional (one or few)

